Can media images of obese people undermine health messages? An experimental study of visual representation and risk perception

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Introduction

Obesity is a significant public health issue, increasing the risk of a range of lifestyle diseases including diabetes, several cancers and cardiovascular disease. 1,2. It affects an increasing proportion of the population worldwide; for example, in the UK, where the present research was conducted, it is predicted that 60% of men and 50% of women will be obese by 2050. 3,4 Worldwide, overweight and obesity results in 2.8 million deaths and 35.8 million (2.3%) of global disability-adjusted life years each year. 5 Considerable research has focussed on how to reduce and reverse obesity through interpersonal interventions (e.g., lifestyle intervention and behavioural support), 6,7 but this individualistic approach has so far had a limited effect on reducing obesity prevalence. 8,9 It is argued that a more holistic approach, taking account of a range of socio-ecological influences is necessary to have any significant impact on levels of obesity over the long term. 10,11 The present study aims to explore how one such societal-level influence, namely the presentation of health messages in the media, may influence people’s views on their own risk and need for change.

Raising awareness of the negative health consequences of excess weight is an important first step in helping people to understand its associated risks, and in encouraging them to take action to manage their own weight. 12,13 Increasingly, people are turning to the media (e.g., television, print newspapers and online sources) as a trusted source of health information. 14,15 However, the way in which the media presents news and information about the health consequences of excess weight often varies considerably from the methods advocated by health promotion professionals, and very little research has been conducted to explore what impact this may have. Given the aims of images in the media to attract readers rather than provide factual illustration, 16 in the case of obesity, images of overweight adults are often presented in a stigmatising way (e.g., engaged in sedentary activities, eating high fat foods). 17–19 Similarly, images of obese and morbidly obese individuals [i.e., body mass index (BMI) >30, or >40] are commonly used in articles communicating messages about the negative health consequences of being overweight (i.e., a BMI >25 but <30), thus overestimating the body size to which health messages refer.

Visual content can have a strong effect on people’s responses to written material, as the reader’s focus is drawn to a picture first, 20 and can therefore frame message perception and interpretation beyond their level of awareness. 21 The use of exaggerated or stigmatised images is of particular concern as people are unlikely to associate themselves with a stigmatised group, 22 and thus may use images as a shorthand to dissociate themselves from potentially relevant health messages. No research has yet been conducted to evaluate the impact of using exaggerated images in the reception of health messages.

The aim of the present study is to experimentally test the hypothesis that the presence of an exaggerated overweight model alongside a factual article about the risks of being overweight will result in people (i) underestimating the body size that incurs increased health risks, and (ii) being less likely to perceive health messages as personally relevant. Past work from other health domains (e.g, smoking) suggests that a number of other factors may moderate the acceptance of health messages, including a person’s own level of the risk behaviour, 23 health concern, 24 and existing motivation towards improving their health. 25 These potential moderating variables will therefore be included in the analysis.

Background: Images depicting morbidly obese models [i.e. body mass index (BMI) >40] often accompany media articles about the health risks of being overweight (i.e. BMI 25–30). Little is known about the effect of this mismatch on people’s understanding of risk, and perceptions of message relevance. Methods: In total, 563 participants (291 overweight/obese and 272 healthy weight) were randomly allocated to read a health message about the risk of heart disease posed by being overweight, presented alongside (i) a photo of an overweight model, (ii) a morbidly obese model or (iii) no photo. Between-group differences in the primary outcomes of message relevance, and the body size perceived to be ‘at risk’, were assessed, and the potential moderating effects of motivation, weight concern and existing risk knowledge explored. Results: Overweight and obese participants in the exaggerated (morbidly obese) image condition interpreted health risks to relate to a larger body size than those who saw no image ($F(2, 290) = 4.06$, $P = 0.02$). There was no experimental effect on perceived personal relevance ($F(2, 290) = 0.25$, $P = 0.38$). No significant moderation effects were detected, and there was no effect of study condition in healthy weight participants for either outcome. Conclusion: The findings suggest that the use of morbidly obese models in messages regarding the health risks of being overweight may undermine the impact of these messages among those who they most aim to reach; the reader may perceive a reduced risk of being ‘only’ overweight, and that a higher weight is needed for the negative effects of excess weight to occur.
Methods

Design
The study comprised an online randomised controlled trial. Participants were randomised to read a health message informing them about the risks of heart disease for overweight people, presented with (i) a photo of an overweight model (BMI >25 and <30), (ii) a morbidly obese model (BMI >40) or (iii) no photo. The images used were gender specific.

Participants
Participants were recruited from a press release in local newspapers, Facebook, Twitter, online health fora and a panel of volunteers registered to a UK weight-related charity. Volunteers were eligible if they were aged >18 years old, and had a good command of English.

Materials
Three photographic images were created specifically for the present study using volunteer photographic models, selected on the basis of their (self-reported) BMI: an overweight female model (BMI 29.0), an overweight male model (BMI 29.8) and a morbidly obese female model (BMI 41.5). The recruitment of morbidly obese male model was unsuccessful, so an existing available image with a similar amount of central adiposity to the female obese model was selected. Photos were presented in line with typical portrayal of obese people in the media [9], i.e. a front view, visible from their neck down, wearing close-fitting street clothes walking along the same city street (see figure 1).

New text was created for the article, but matched to the style and language of articles published on the health section of the BBC (British Broadcasting Corporation) website. Accessibility was compared using the Flesch Reading Ease test score (BBC template = 53.4; study article = 58.5) to reflect a level easily understood by 15–16 year olds.

Measures

Demographic characteristics
Gender, age, weight, height, ethnic group, employment and education level were recorded. Participants’ BMI was calculated from self-reported measurements, as weight (kg)/height (m)². Participants were classed as underweight (BMI <18.5), healthy weight (BMI between 18.5 and 24.9), overweight (BMI 25–29.9) and obese (BMI ≥30) in line with standard medical criteria for the purposes of categorical analyses.26

Perceived weight status. Participants were asked to estimate their weight by indicating which of a series of nine same-sex silhouettes in increasing size their body size most resembled, taken from the Weight and Lifestyle Inventory.27 This scale was developed for behavioural evaluation of patients seeking bariatric surgery, and has shown appropriate discriminant validity in community samples.28 Participants’ current engagement with weight control activity, weight concern and perception of the risk of excess weight to health were assessed using a three-item measure developed for use in a study of weight concern among Australian adults.24

Message relevance
The degree to which participants considered the message to be personally relevant was assessed using a one-item measure constructed specifically for the present study. This scale was designed in line with the principle of staging algorithms [e.g. transtheoretical model29 and precaution adoption process model30] which seek to locate respondents on a continuum from zero to maximal engagement with particular issues or activities. Possible responses were generated by the research team and piloted with a subsample of respondents to ensure all appropriate responses were included. Participants selected one of six possible options: (i) ‘I didn’t read it’; (ii) ‘I skimmed it and didn’t really put much thought into it’; (iii) ‘I read it, but didn’t really retain much or get a clear message from it’; (iv) ‘I read it, understood the message, but it doesn’t really interest me’; (v) ‘I read it, found the message interesting, but it doesn’t really apply to me’; (vi) ‘I read it, found the message interesting and think it applies to me’. Because of the unequal distribution of responses across categories, this variable was recoded as a binary variable (the article does or does not apply to me) for analysis.

Perceived health risk
Participants estimated the degree of overweight that they believed to confer the health risk using the same gender-specific silhouettes as they had used at baseline to indicate their own weight (i.e., Weight and Lifestyle Inventory).27 A measure of ‘weight discrepancy’ was computed from calculating the difference between a participant’s estimate of their own body size, and the one they considered to be at risk (positive numbers indicate perceiving oneself to be smaller than the at-risk figure). Participants’ perceptions of their comparative risk of heart disease and stroke was measured using two questions: ‘Compared with others of the same age and sex, how would you rate your risk of having a heart attack/stroke within the next 10 years?’, assessed on a 5-point Likert scale.31

Motivation for weight control was assessed using the Treatment Self-Regulation Questionnaire,32 adapted to refer to weight control. The scale has 16 items across three motivational domains scored on a 7-point Likert scale from 1 ’not at all’ to 7 ‘very true’. Items were combined into two subscales (in line with the authors’ instructions) to provide a measure of autonomous (e.g. ‘Because I feel that I want to take responsibility for my own health’) and controlled (e.g. ‘Because I would feel bad about myself if I did not’) motivation. The adapted scale demonstrated good internal consistency in the present study (Cronbach’s α = 0.88 for autonomous, and α = 0.85 for controlled motivation).

Manipulation check
Accuracy of recognition of the content of the article was measured using two questions: ‘In what scientific journal was the study

Figure 1 Example of an image used in the study (overweight female model).
described in the article published?’ and ‘According to the article, how much more likely to develop heart disease are people who are overweight (BMI 25–30)?’ These items were included to assess and control for the degree to which participants had engaged with the content of the article.

Procedure
Ethical approval for the study was provided by the authors’ institutional ethics committee. Participants were informed that the study aimed to explore how people respond to different media messages about obesity, but were not explicitly informed that the images presented in each condition would vary. Participation was facilitated entirely online. After reading the participant information sheet and consenting to take part in the study, participants reported their perceived health and weight status. Online survey software (SurveyMonkey.com) was then used to randomly allocate participants to one of the three study conditions. Participants were then asked to read the same article about the link between being overweight and heart disease risk, presented either with or without an accompanying image. All other measures were then completed; the design ensured that it was not possible for participants to return to the article once they had proceeded onto the questionnaires. Participants were debriefed about the true purpose of the study after completion of all measures.

Analysis
Data were analysed using IBM SPSS Statistics 20. The primary analyses were conducted using analysis of covariance in two separate analyses, with (i) with the body size perceived to relate to increased health risk, and (ii) acceptance of the message as personally relevant as the dependent variables. Participants’ own weight status [overweight vs. healthy weight; analysis (i) only] and experimental condition were entered as independent variables, and age and education level as covariates (as these factors differed between groups at baseline). Following confirmation of an effect of participant weight status, post hoc tests were conducted to explore the effects of experimental condition on outcomes for obese and overweight participants only.

Secondary analyses to explore the predicted moderator effects were conducted using stepwise regression (logistic regression for the binary outcome of perceived personal relevance). In line with statistical recommendations, the independent variables were entered as step 1 (experimental condition and age), predicted moderating variables as step 2 (weight concern, weight discrepancy, comparative risk perception, gender and motivation) and interaction terms between significant independent and moderator variables as step 3; moderation is demonstrated if an interaction term adds significant explanatory variance to the regression model. To ensure parsimony, regression analyses only included variables demonstrating significant associations with the dependent variables established through preliminary bivariate correlation analyses.

Results
Participants
Five hundred and sixty-three respondents completed the survey (M age 38.01 years, SD = 14.17; 68.2% female). Eleven (1.9%) were classified as underweight, 261 (46.4%) as healthy weight (BMI 18.5–24.9), 133 (23.6%) as overweight (BMI 25–29.9) and 158 (28.1%) as obese (BMI >30). For analytical purposes, participants were grouped into two categories: underweight/healthy weight [48.3% (N = 272)] and overweight/obese [51.7% (N = 291)]. As expected, healthy weight participants reported lower health and weight concerns than overweight and obese participants, were less likely to be trying to lose weight and perceived themselves to have better health. However, healthy weight participants were also less aware of the health risks of being overweight, and were younger, better educated and included a greater proportion of men (full details in table 1).

A manipulation check confirmed that the sizes of the models in the two image-conditions were correctly differentiated (rated 5.93 vs. 7.09 on a 9-point scale in the overweight vs. obese condition; \( F(1, 369) = 103.06, P < 0.001 \)). Content recall did not differ significantly between experimental conditions or weight categories (\( \chi^2 = 3.86; \text{df} = 5; P = 0.57 \)).

Main analysis
For the sample as a whole, there was no main effect of experimental condition on the body size considered to be at risk (\( F(2, 562) = 2.28; P = 0.10 \)). However, there was a significant effect for participant weight status (\( F(1, 562) = 18.89, P < 0.001 \)); overweight and obese participants perceived health risks to start from a smaller body size than healthy weight participants (\( F(1,562) = 18.89, P < 0.001 \)). Age was also a significant covariate; younger participants perceived the risk of heart disease to start from a larger body size than older participants.

However, when analysing overweight and obese participants independently, the main effect of experimental condition was significant (\( F(2, 290) = 4.23, P < 0.05 \)); overweight and obese participants viewing a morbidly obese image perceived health risks to start from a significantly higher body weight than those who saw no image (5.34 vs. 5.02 on a 9-point scale; small to moderate effect size: \( d = 0.41 \)). There was no significant difference between ratings in the overweight vs. obese image conditions, although the trend was in the expected direction (overweight model condition; 5.12 (figure 2).

Only 47.8% (139) of the overweight/obese participants perceived the health message in the article to be personally relevant to them; there was no effect of experimental condition on perceived message relevance (\( F(2, 290) = 0.25, P = 0.38 \)).

Moderating factors
The influence of study condition on the outcome of body size perceived to be ‘at risk’ was not moderated by any of the variables included in the analysis. However, younger participants, those perceiving the message as more personally relevant, and those perceiving themselves to be closer to the ‘at risk’ body size, perceived health risks to start from a higher body weight (\( F(4,224) = 3.67, P < 0.01 \)).

Similarly, no significant moderating relationships were found for study variables on the effects of experimental condition on perceptions of message relevance (\( \Delta \chi^2 = 5.11, \text{df} = 3, \text{NS} \)). However, the predictor variables reliably distinguished between those who considered the article to be personally relevant and those who did not (\( \chi^2 = 46.82; P < 0.001 \); \( d = 4 \); Nagelkerke’s \( R^2 = 0.20 \)); higher autonomous motivation towards weight control, greater weight concern, a higher BMI and female gender were all positively associated with greater likelihood of finding the message personally meaningful (table 2).

Discussion
The present study provides tangible evidence that the presence of exaggerated images alongside articles reporting on the risks of being overweight can have a negative impact on people’s interpretations of health risk. The effect was only found for people who were themselves overweight or obese. Specifically, the presence of morbidly obese models caused overweight people to downgrade the risks they perceived to be associated with an overweight body size, relative to the estimates of people reading the same article with
Table 1: Demographic characteristics, weight concern and weight control practices by study condition and weight status

<table>
<thead>
<tr>
<th></th>
<th>Healthy weight (46.4%)</th>
<th></th>
<th>Overweight/obese (53.6%)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Condition 1 (obese)</td>
<td>Condition 2 (overweight)</td>
<td>Condition 3 (no photo)</td>
<td>Total</td>
</tr>
<tr>
<td>Gender (% female)</td>
<td>66.2</td>
<td>61.6</td>
<td>62.0</td>
<td>62.5</td>
</tr>
<tr>
<td>Ethnicity (% White)</td>
<td>93.7</td>
<td>86.9</td>
<td>87.1</td>
<td>89.0</td>
</tr>
<tr>
<td>Education (% higher degree)</td>
<td>76.2</td>
<td>73.7</td>
<td>74.2</td>
<td>74.6</td>
</tr>
<tr>
<td>Perceived weight status (%)</td>
<td>90.0</td>
<td>90.9</td>
<td>89.2</td>
<td>90.1</td>
</tr>
<tr>
<td>Slightly overweight/very overweight</td>
<td>10.0</td>
<td>9.1</td>
<td>10.2</td>
<td>9.9</td>
</tr>
<tr>
<td>Weight control (%)</td>
<td>86.2</td>
<td>75.8</td>
<td>79.6</td>
<td>80.1</td>
</tr>
<tr>
<td>Weight harmful to health (%)</td>
<td>72.9</td>
<td>70.7</td>
<td>72.0</td>
<td>76.5</td>
</tr>
<tr>
<td>Weight concern (%)</td>
<td>88.8*</td>
<td>70.7*</td>
<td>72.0*</td>
<td>76.5*</td>
</tr>
<tr>
<td>Weight harmful to health (%)</td>
<td>12.2*</td>
<td>29.3*</td>
<td>28.0*</td>
<td>23.5*</td>
</tr>
<tr>
<td>Weight harmful to health (%)</td>
<td>97.3</td>
<td>93.9</td>
<td>95.6</td>
<td>95.4</td>
</tr>
<tr>
<td>Weight harmful to health (%)</td>
<td>2.7</td>
<td>6.1</td>
<td>4.4</td>
<td>4.6</td>
</tr>
<tr>
<td>Identification of correct article content (%)</td>
<td>90.0</td>
<td>84.7</td>
<td>80.6</td>
<td>84.9</td>
</tr>
</tbody>
</table>

*P<0.01, **P<0.001: Pearson chi-square by condition (within healthy weight or overweight/obese).  
1P<0.05, 2P<0.001: Pearson chi-square by weight status.

**No image. Although a similar disruptive effect of the presence of mismatched text and images has been demonstrated in children’s comprehension tasks, this is the first study to investigate the potential negative effects of this phenomenon in adults.**

**Estimations of risk**

The inclusion of potential moderator variables in the analysis provides some insight into potential mechanisms of this effect; the experimental effects were not brought about by differences in message recall (which was similar across all groups), or moderated by participant characteristics such as motivation, weight concern or risk awareness. Instead, the most important discriminator of outcome was the weight status of the person reading the article, suggesting that healthy and overweight people respond differently to the visual component of weight-related messages. A number of reasons for this difference are suggested by past research: first, overweight people may be less able to focus on objective judgement criteria because of the level of perceived threat in the message. Perceived threat in health messages has been shown to lead to psychological reactance such as anger, denial or an attempt to dissociate oneself from a stimulus perceived to be stigmatising. Given the stigma surrounding obesity, an exaggerated image could arguably be seen as stigmatising by overweight people. The findings may also suggest that overweight and obese participants engage in conscious or unconscious comparisons with the model, and respond differently according to how far they perceive their body size to be from the pictured image. Our results showed that greater distance was associated with acceptance of the health message, the presence of an exaggerated image did not undermine it. However, as over half of the overweight and obese participants did not believe the message was relevant to them despite having largely accurate estimates of their own body size (consistent with the unrealistic optimism reported in other health domains), this may also reflect lack of sample variability or message sensitivity.

**Acceptance of the health message**

Past work reports that adults perceive health promotion materials to be irrelevant if they do not perceive themselves to be similar to the pictured individuals. However, no such effect was found in the present study. To some degree, this is a positive finding; even if an accurate image did not enhance identification with a health message, the presence of an exaggerated image did not undermine it. However, as over half of the overweight and obese participants did not believe the message was relevant to them despite having largely accurate estimates of their own body size (consistent with the unrealistic optimism reported in other health domains), this may also reflect lack of sample variability or message sensitivity.

![Figure 2](https://academic.oup.com/eurpub/article-abstract/24/6/930/609606/933)  
Comparison of size risk threshold in each study condition for overweight vs. healthy weight participants
The research was funded by a University of Bath studentship.

**Table 2** Predictors of health message acceptance among overweight and obese participants

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Odds ratio</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>1.73</td>
<td>0.89, 3.34</td>
</tr>
<tr>
<td>Male</td>
<td>1.00</td>
<td>–</td>
</tr>
<tr>
<td>Experimental condition</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obese model</td>
<td>1.00</td>
<td>–</td>
</tr>
<tr>
<td>Overweight model</td>
<td>0.95</td>
<td>0.48, 1.84</td>
</tr>
<tr>
<td>No photo</td>
<td>0.92</td>
<td>0.48, 1.76</td>
</tr>
<tr>
<td>Current engagement in weight control</td>
<td>1.00</td>
<td>–</td>
</tr>
<tr>
<td>Not doing anything</td>
<td>1.00</td>
<td>–</td>
</tr>
<tr>
<td>Avoiding weight gain/trying to lose weight</td>
<td>0.98</td>
<td>0.54, 1.77</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower degree</td>
<td>1.00</td>
<td>–</td>
</tr>
<tr>
<td>Higher degree</td>
<td>0.64</td>
<td>0.35, 1.17</td>
</tr>
<tr>
<td>Recognition of the article main message</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incorrect answer</td>
<td>1.00</td>
<td>–</td>
</tr>
<tr>
<td>Correct answer</td>
<td>2.76</td>
<td>1.17, 6.52*</td>
</tr>
<tr>
<td>Perceived weight discrepancy**</td>
<td>0.76</td>
<td>0.58, 0.99*</td>
</tr>
<tr>
<td>Weight harmful to health</td>
<td>0.91</td>
<td>0.53, 1.57</td>
</tr>
<tr>
<td>Weight concern</td>
<td>1.30</td>
<td>0.76, 2.23</td>
</tr>
<tr>
<td>Autonomous motivation</td>
<td>1.08</td>
<td>1.03, 1.13*</td>
</tr>
<tr>
<td>Age</td>
<td>1.04</td>
<td>1.01, 1.06*</td>
</tr>
<tr>
<td>BMI</td>
<td>0.96</td>
<td>0.91, 1.01</td>
</tr>
</tbody>
</table>

*Denotes significant values (P<0.05)**; calculated as the discrepancy between participant’s estimation of their current weight and the weight at which the risk of heart disease starts to increases

**Limitations**

Despite the relatively large sample size, the majority of participants were very well-educated and may thus not be representative of the population as a whole. A second limitation was the use of a schematic drawing of a visual figure rating scale to measure body size of risk. While this facilitated the test of our hypotheses, it did not permit conclusions as to the fundamental accuracy of risk perceptions. Finally, participant BMI was estimated from self-reported weight and height. However, this is unlikely to compromise the findings as people typically under-report their body weight, resulting in a more conservative classification of overweight status.

**Conclusions and Future Research**

The present study provides new insight suggesting that the use of exaggerated images accompanying messages about the health risks of being overweight could result in overweight and obese people understimating these risks. Future research exploring the potential mechanisms of this effect would be useful as a starting point for working to minimise such impacts, for which the application of psychological theories of reactance and stigma may be useful. Given the current primacy of the media as a source of health information, further research to explore the extent of such impacts on important precursors to behaviour change is critical to forming an evidence base from which to inform policy and practice.

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**Conflicts of interest:** None declared.

**Key points**

- The use of morbidly obese models in images accompanying health messages of the risks of being overweight can cause people to underestimate the degree of overweight associated with health risks.
- The use of morbidly obese models in health messages does not influence the degree to which overweight and obese people feel a health message applies to them personally.
- Motivation towards weight control, awareness of health risks and level of personal health and weight concern are associated with risk perceptions and perceptions of relevance, but do not moderate the effects of exaggerated images on these outcomes.

**References**

Parental leave and increased physical activity of fathers and mothers—results from the Northern Swedish Cohort

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Background: Physical activity is an important public health issue. Factors shown to be associated with physical activity are parenthood and country-level gender equality, while the importance of individual gender equality (in parenthood or in general) remains to explore. In Scandinavia, where parental leave can be shared equally between mothers and fathers, parental leave is one dimension of gender equality in parenthood. The aim of this study was to investigate parental leave in relation to increased physical activity among men and women. Methods: Participants in the Northern Swedish Cohort with a child born 1993–2005 (n = 584) were investigated with questionnaires at ages 21 and 42; register data on parental leave between ages 28 and 42 were obtained from Statistics Sweden. The relationships between parental leave between ages 28 and 42 and meeting WHO guidelines for physical activity at age 42, as well as changes in physical activity between ages 21 and 42, were tested with multilevel regression, controlling for socio-economic status and birth year of the child. Results: For women, the length of parental leave was not associated with increased physical activity or with meeting WHO guidelines at age 42. For men, parental leave was associated with increased physical activity, controlling for socio-economic status and age of the child, but not with meeting WHO guidelines for physical activity at age 42. Conclusions: A gender non-traditional out-take of parental leave might be associated with an increase in physical activity among men at the lower end of the physical activity spectrum, but not among women.