


## ORIGINAL ARTICLE OPEN ACCESS

# Views Among the General Public on New Anti-Obesity Medications and on the Perception of Obesity as a Failure of Willpower

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## ABSTRACT

**Background:** The experience of obesity stigma is associated with negative clinical outcomes that include increased mental health problems and additional weight gain. Researchers have treated the public view that obesity is caused by poor willpower as both an *element* of obesity stigma and as a *cause* of obesity stigma. Here we test the hypothesis that awareness of new and effective glucagon-like peptide receptor agonist anti-obesity medications (AOMs) will encourage the view that obesity is a biologically-determined medical condition rather than a personal willpower failure and thereby lessen obesity stigma.

**Materials and Methods:** Two questionnaire studies, in which participants were randomly assigned to either read about the success of AOMs or to read various alternative material ( $N = 640$  in total), investigated the effect that AOM awareness has on views of obesity.

**Results:** Contrary to the study hypotheses, reading about AOMs did not increase the degree to which participants viewed obesity as a medical condition, nor did it reduce the role willpower failure was believed to play in obesity. Across conditions, participants reporting more personal success in weight loss without medication indicated greater belief that obesity was amenable to self-control, expressed greater obesity stigma, and held less positive attitudes toward the use of AOMs to manage weight.

**Conclusion:** Taken together, these two studies provide no evidence that the success of AOMs will, in the short-term, lead to changes in how people view the etiology of obesity or to a reduction in obesity stigma. Correlational data suggest the possibility that blame and stigma associated with obesity may be robustly informed by participants' understanding of their own experiences managing weight.

## 1 | Introduction

There is a great deal of stigma associated with obesity [1–3], which manifests in a wide range of adverse experiences,

including worse treatment from healthcare professionals [4] and poorer employment and income outcomes, especially for women [5, 6]. The experience of obesity stigma is also associated with elevated mental health problems, including anxiety and

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depression [7, 8]. Additionally, previous research has shown that the bodily stress response associated with the experience of obesity stigma promotes weight gain [1–3].

Many researchers consider the view that obesity is readily controllable by “willpower” (however understood) to be an aspect of obesity stigma. In their characterization of stigma content, Puhl and colleagues include the tendency to view those with obesity as lacking in willpower and as personally to blame for their weight [1]. Consistent with this, a common measure of explicit obesity stigma—in this case, stigma directed toward the self—includes items such as, “I became overweight because I am a weak person,” and “I don’t have enough self-control to maintain a healthy weight” [9].

As an alternative to its framing as an *element* of stigma, the perception that obesity is a failure of willpower may also be considered as a *cause* of obesity stigma. Supporting this proposition, Diedrichs and colleagues found that exposing participants to scientific evidence regarding biological causes of obesity (e.g., evidence regarding the contribution played by genetics) resulted in a decrease in obesity stigma, including decreased ratings of individuals with obesity as unattractive [10]. Similarly, Latner and colleagues [11] observed that blame and stigma toward individuals with obesity were lowered when the causes of obesity were characterized as physiologically comparable to a disease model of drug addiction [12]. In another experiment, medical students who were randomly assigned to read about the genetic causes of obesity expressed less obesity stereotyping than students who read about behavioral causes [11]. Consistent with these findings, research has shown that describing a biological rather than psychological cause of obesity led to lower conceived volitional control, and with that, less attribution of blame [13]. It should be noted that the reduction in blame-related stigma in response to adopting a biological disease model of obesity may come at a cost, as it appears to also convey that obesity is an unchanging and essential part of the individual [14–16].

Glucagon-like peptide 1 receptor agonist drugs such as semaglutide (e.g., Ozempic, Wegovy) have recently emerged as highly effective anti-obesity medications (AOMs) [17]. Increased public awareness that obesity can be effectively treated through medication may lead to a reduction in obesity stigma. On this view, seeing people achieve dramatic weight loss through the use of a prescribed drug will encourage people to view obesity as a medical disorder. Instead of attributing obesity to a failure of willpower, focus might shift to the biological causes of obesity [18, 19], which might, in turn, lessen obesity stigma [10, 12]. Lending partial support to this conjecture, a recent study observed that learning about a specific individual’s weight loss through AOMs did promote a tendency to view the etiology of the depicted individual’s obesity as more biological [20]. However, the same study found no support for diminished stigma directed at an individual with obesity who used the medication (and did find increased stigma for an individual who used the medication despite not having overweight). Nevertheless, given that the Post and Persky study addressed stigma directed at an individual who uses the medication, it remains possible that increased awareness of the success of AOMs will promote a less stigmatizing understanding of obesity *as a condition*, even if a

particular individual who uses medications is judged negatively. Such an impact would be clinically beneficial given the pernicious impacts of obesity stigma.

The primary goal of Study 1 was to investigate whether learning about (or being reminded about) the success of AOMs affects the way obesity is understood. In particular, does reading about the effectiveness of these medications cause people to view obesity more as a medical disorder and less as a failure of willpower? To test this, participants in Study 1 first read a general description of obesity and were then presented with either (1) a description of effective anti-obesity medications, (2) a description of effective support group intervention for weight loss, or (3) no additional content about treatment. Next, all participants completed a survey in which they (1) rated the importance of various factors that might be relevant to weight-loss outcomes *for the given treatment*; and, most importantly, (2) responded to questions about *obesity in general*, including questions about whether it should be considered a medical condition, and the degree to which it is related to failure of willpower. The first set of questions was directed at better understanding how participants view the mechanisms of treatment, while the second set was directed at assessing the potential impact of learning about AOMs on how participants thought about obesity, which is the central issue of the study. We hypothesize that participants will attribute whether or not an individual succeeds in losing weight during medication treatment (relative to group treatment) to be more related to biology, and less related to willpower. In addition, we hypothesize that after exposure to information about medication success, participants will express greater agreement that obesity is a medical condition, and less agreement that obesity is related to willpower.

## 2 | Study 1

### 2.1 | Methods

Except where noted, study hypotheses were pre-registered on Open Science Framework (OSF) prior to data collection (<https://osf.io/sxv28?revisionId=64ac7bed32cbdb01d9c53905>). In addition, all study data are publicly available at <https://github.com/USC-ASC-LAB/Weight-loss-drug-project.git>. Surveys were designed in Qualtrics and participants were recruited and participated through Prolific.com. A recent study that compared online data collection platforms found data acquired through Prolific to be of substantially higher quality (e.g., fewer failed attention checks and instruction violations) than data acquired through the MTurk platform [21]. Eligible participants were adult U.S. citizens with a Prolific approval rate of over 98% (indicating past research participation with low incidence of response disqualification). Participants received \$2 for completing the study. The time of data collection might be important with regard to the outcome of this study as public familiarity with newly emergent AOMs has rapidly increased and will likely continue to do so. It is possible that participants’ knowledge about these medications could moderate the impact of the study manipulation (which is taken into consideration in Study 2).

Surveys began with a brief characterization of the challenge of losing weight, available in full online at <https://github.com/USC-ASC-LAB/Weight-loss-drug-project.git>. The randomizing feature (“Randomizer”) in Qualtrics randomly assigned participants to one of three conditions at the start of participation ( $n = 80$  in each condition). One group of participants read text describing the success of AOMs. A second group of participants read text describing the success of a support group treatment. The description of both interventions stated that research has shown each to “often help with weight loss.” A third group of participants did not read about treatment success.

All participants answered a series of questions related to obesity and weight loss. Some questions referred specifically to weight loss in the context of the treatment described. These questions addressed participants’ views regarding the relevance of several factors in determining whether people succeeded in losing weight during the treatment. Specifically, participants rated the degree to which the intervention outcome was related to individual differences in “biology” and “willpower,” as well as to differences in “motivation to lose weight,” “eating habits,” and “activity level.” Ratings were made on a 7-point scale anchored at the endpoints with the text, “No impact” and “Extremely high impact.”

In addition to the above, after reading the intervention materials, participants were asked about their views about obesity in general, including whether it should be considered a medical condition. These questions used a 7-point scale anchored by “Definitely not” and “Definitely yes.” Most importantly, given the primary study objective, participants were asked whether obesity is related to an individual’s willpower. To assess the perceived relevance of willpower, the average response to two items was calculated: (1) “*To what degree, if any, do you think individuals are able to control whether or not they maintain a healthy weight?*” (answered on a 7-point scale anchored with “No control” and “Complete control”), and (2) “*If all you knew about someone was that they had good self-control in other areas of life, do you think it is more likely than average that they would be a healthy weight?*” (answered on a 7-point scale anchored with “Not at all more likely” and “Much more likely”). The neutral condition (in which no weight-loss intervention was described) was not included in the assessment of participants’ inferences about the sources of treatment outcome, but was included in the assessment of study hypotheses related to general views about obesity. At the end of each survey, participants were asked to indicate their height in feet and inches and weight in pounds. The formula  $(\text{pounds} \times 703) / \text{inches}^2$  estimated BMI. Demographic information was available through each participant’s Prolific account and did not have to be re-obtained.

MANOVA (which is robust to single-item ordinal dependent measures [22]) was used to assess participants’ attributions regarding the determinants of treatment outcomes, and ANCOVA was used to assess the possible effects of study conditions on participants’ general views about the causes of obesity. In both cases, the study condition was the primary independent variable. For tests of statistical significance,  $\alpha$  was 0.05. Because initial inspection of the data indicated that participant biological sex and BMI were associated with study dependent variables at the significance threshold noted above (female sex and higher

BMI were each associated with greater agreement that obesity should be considered a medical condition and less agreement that obesity should be considered a failure of willpower), these variables were included in statistical models to reduce unexplained variance and thereby improve statistical power. It is worth noting, however, that when analyses included in this report were repeated without the inclusion of demographic covariates, no changes were observed in the outcomes of significance tests. Since demographic variables were not directly related to study hypotheses, associated statistics were not included in this report (though are available <https://github.com/USC-ASC-LAB/Weight-loss-drug-project.git>). For the MANOVA test used to assess treatment outcome attributions, the study condition was included as the primary independent variable with two levels (the condition in which participants did not read about a treatment was not comparable for tests of this study hypothesis). Five dependent variables were included, corresponding to the five items that participants rated as potential factors in treatment response. The sample size of  $N = 80$  per group, with  $\alpha = 0.05$ , provided 80% power to detect an effect of Cohen’s  $f = 0.33$ . For the ANCOVA tests used to assess whether general views regarding the causes of obesity were affected by the study condition,  $\alpha$  was again 0.05 and the sample size of  $N = 80$  per group provided 80% power to detect an effect of Cohen’s  $f = 0.36$ . The University of Southern California Institutional Review Board (UP-20-01036) approved the study, which collected data (Study 1) in July of 2023.

## 2.2 | Study 1: Results

Across groups, the sample was 59.6% male, predominantly white (76.3%), with an average age of  $40.4 \pm 13.1$ , and average BMI of  $27.4 \pm 6.0 \text{ kg/m}^2$ . Across the sample, 61.9% of participants met the BMI cutoff for classification as overweight ( $\text{BMI} \geq 25 \text{ kg/m}^2$ ) and 25.4% met the cutoff for classification as obese ( $\text{BMI} \geq 30 \text{ kg/m}^2$ ). No significant differences in these variables were observed among the groups formed by study condition randomization (all  $p$ -values  $> 0.55$ ). Following the original pre-registered sample size, final analyses included the first 80 participants in each condition who completed the survey.

Participants’ overall views on the importance of the five provided factors in determining weight-loss treatment outcome (biology, willpower, eating habits, motivation to lose weight, and activity level) differed between the Medication and Support Group contexts ( $F(5, 148) = 3.29, p = 0.008$ ). Follow-up tests of between-subjects factors were used to evaluate the study hypotheses about participants’ attributions regarding treatment outcome. Contrary to one expectation, participants in the Medication condition did not rate biology as a more important factor in why some people given medication fail to lose weight ( $5.0 \pm 0.16$ ) as compared to participants in the Support Group condition ( $5.0 \pm 0.17$ ) on a 7-point scale ( $F(1, 152) = 0.003, p = 0.96$ ). However, consistent with expectations, participants did view willpower as less impactful on whether people lost weight ( $F(1, 152) = 6.56, p = 0.01$ ) in the Medication condition ( $5.0 \pm 0.15$ ) than in the Support Group condition ( $5.6 \pm 0.16$ ), though it should be noted that both means

**TABLE 1** | Primary dependent variables from Study 1. Top rows show condition differences in the perceived importance of each factor in treatment outcome. Bottom rows compare views of obesity between study groups.

|  | <i>F</i> -stat; <i>p</i> -value | Medication      | Support group   | No treatment    |
|--|---------------------------------|-----------------|-----------------|-----------------|
| Given specified treatment, the importance of |                                 |                 |                 |                 |
| Biology                                      | $F = 0.003; p = 0.96$           | $4.99 \pm 0.16$ | $4.98 \pm 0.17$ | —               |
| Willpower*                                   | $F = 6.56; p = 0.01$            | $5.02 \pm 0.15$ | $5.59 \pm 0.16$ | —               |
| Eating habits                                | $F = 2.44; p = 0.12$            | $5.78 \pm 0.12$ | $6.06 \pm 0.12$ | —               |
| Motivation*                                  | $F = 16.56; p < 0.001$          | $5.05 \pm 0.15$ | $5.90 \pm 0.15$ | —               |
| Activity                                     | $F = 2.29; p = 0.13$            | $5.70 \pm 0.14$ | $6.01 \pm 0.14$ | —               |
| Questions about obesity in general           |                                 |                 |                 |                 |
| Obesity as medical condition                 | $F = 1.48; p = 0.23$            | $5.18 \pm 0.20$ | $5.00 \pm 0.20$ | $4.70 \pm 0.20$ |
| Relevance of willpower                       | $F = 0.30; p = 0.74$            | $4.87 \pm 0.12$ | $4.98 \pm 0.13$ | $4.99 \pm 0.13$ |

\* indicates significance at  $p < 0.05$ .

were above the scale midpoint of 4.0. Among the other factors rated for potential impact on weight, the rated importance of motivation was also significantly lower ( $F(1, 152) = 16.56, p < 0.001$ ) in the Medication ( $5.0 \pm 0.15$ ) condition relative to the Support Group condition ( $5.9 \pm 0.15$ ). Again, however, in both conditions, mean responses were above the 4.0 midpoint. The importance of eating habits and activity level did not differ by condition ( $p$ -values greater than 0.1, see Table 1).

Participants also indicated their views on obesity in general, including whether it should be considered a medical condition and whether it is a willpower failure. Contrary to Study 1's hypothesis, the material characterizing the success of AOMs did not result in greater agreement that obesity should be considered a medical condition ( $F(2, 231) = 1.48, p = 0.23$ ) or in lesser agreement that obesity is a willpower failure ( $F(2, 231) = 0.30, p = 0.74$ ). Marginal means derived from these analyses are presented in Table 1.

### 2.3 | Study 1: Discussion

Study 1 described the challenge many people face in managing their weight, followed by either text about the success of AOMs, text about the success of support group treatment, or no text about treatment. The participants then reflected on what factors might contribute to failed weight-loss efforts given the treatment described. Contrary to Study 1's hypothesis, there was no condition effect on the perceived importance of biology as a determinant of treatment outcome. However, participants in the Medication condition, relative to those in the Support Group condition, did view willpower as significantly less relevant to treatment success. One plausible interpretation of this effect is that participants rated willpower as less relevant because of the described appetite suppressing effects of AOMs, which could reasonably be interpreted as lowering the willpower challenge. This does not imply that reading about effective anti-obesity medications impacted how participants viewed the causes of obesity in general.

The central idea that motivates this study is that the emergence of effective anti-obesity medications will change how people understand the etiology of obesity by invoking a medical

framework in which obesity is understood as primarily determined by individual biology [18, 19]. According to this view, the shift in understanding will reduce the attribution of obesity to lack of willpower, which in turn will reduce obesity stigma. However, in Study 1, no condition effect was observed on how participants viewed obesity. Contrary to the study hypothesis, reading about the success of AOMs did not lead to greater agreement that obesity should, in general, be considered a medical condition, nor to reduced agreement that it reflects willpower failure.

### 3 | Study 2

Study 2 replicated Study 1 and extended it in several ways. Participants were again randomly assigned to read material about weight-loss struggle, and then answered questions about their attitudes and beliefs about obesity. Unlike Study 1, Study 2 was structured as a vignette describing a specific woman with obesity who had experienced years of unsuccessful attempts to reduce her weight. There is strong evidence that narrative information tends to be more impactful on health behaviors than abstract information about overall outcomes [23]. Prior to answering questions, participants read either (1) a description of the vignette protagonist's weight-loss struggle followed by successful AOMs, (2) a description of the vignette protagonist's weight-loss struggle followed by successful support group treatment, (3) a description of the vignette protagonist's weight-loss struggle without any weight loss, or (4) no text. As in Study 1, participants answered questions about the degree to which they viewed obesity as biologically determined and whether obesity could be overcome through willpower. Participants also completed a validated questionnaire measure of obesity stigma [24], which enabled a direct assessment of the conjecture that learning about AOMs would lead to reduced obesity stigma.

Study 2 also included a novel assessment of participants' attitudes toward the use of AOMs for weight loss. This included questions about the fairness of AOM use for individuals with only slight overweight, views on insurance coverage for AOMs, and general perceptions of the fairness of using AOMs. As with bariatric surgery [25, 26], people sometimes view medication usage for weight loss negatively, as "taking the easy way out"

[20, 27]. It is plausible that this sentiment would be more common among individuals who viewed obesity as a condition that could readily be overcome through willpower.

In addition, participants gave information about their own history of “efforts to lose weight,” and about how successful those efforts were. There is a wealth of data indicating very low rates of sustained weight loss through dieting [28]. Therefore, it is plausible that the more personal experience individuals had trying to lose weight, the less inclined they would be to view obesity as a failure of willpower. Finally, participants in Study 2 provided information about their prior knowledge of, and experience with, glucagon-like peptide 1 receptor agonist AOMs. This is potentially important because information presented about these medications might have less impact on participants already familiar with them.

In addition to allowing a second assessment of the hypothesis that reading about effective AOMs would lead participants to view obesity more as a medical condition and less as a willpower failure, Study 2 more explicitly tested the hypothesis that reading about AOMs would reduce negative attitudes directed at individuals with obesity. Study 2 also considered several correlational hypotheses. The first anticipated that attitudes toward the use of AOMs would be more favorable among those who viewed obesity as more biologically determined, and less favorable among those who viewed obesity as more controllable through willpower. Additionally, given the high failure rate of diets [28], another hypothesis of Study 2 was that those with greater personal history with weight-loss efforts would view obesity as less controllable through willpower. It is important to note that the pre-registration of this study included only discussion of the potential effects of study condition on views of obesity, and therefore did not include hypotheses about the association of study variables.

### 3.1 | Methods

The study recruited participants on [Prolific.com](https://www.prolific.com) with inclusion requiring that they identify the U.S. as their nationality and had an approval rate of over 98% based on past research participation. Participants received \$2 for completing the study. In one of the four study conditions (Neutral), participants directly answered questions without reading any content about obesity and weight

loss. In the remaining three conditions, surveys began with a vignette about an individual, Anne, who struggles with obesity and has been unsuccessful in her attempts to lose weight through diet and exercise. In one condition (“Struggle Only”), no further information was provided. In another condition (“Struggle + Med”), this was followed by a description of AOM-based success. In the final condition (“Struggle + Support”), this was followed by depiction of support group-based success. As in Study 1, the randomization feature (“Randomizer”) in Qualtrics randomly created the four groups.

To assess perceptions of obesity as a medical condition, participants expressed their degree of agreement with three statements: “Obesity is a disease,” “Genetics play an important role in determining who will have problems with their weight,” and “Obesity is caused mainly by underlying biological factors.” Participants also completed the 13-item Anti-Fat Attitudes (AFA) questionnaire [24], which includes three subscales: (1) AFA-Volition (e.g., *some people are fat because they have no willpower.*), (2) AFA-Fear (e.g., *I worry about becoming fat.*), and (3) AFA-Dislike (e.g., *I tend to think that people who are overweight are a little untrustworthy.*) The AFA-Volition subscale was used as the index of perceived role of willpower in obesity, and the AFA-Dislike subscale was used as the index of explicit obesity stigma.

Participants answered seven novel questions probing their attitudes toward the use of anti-obesity medication (e.g., *If a medical weight-loss drug is safe and effective, then using the drug is a good way to lose weight*). These items used a Likert scale ranging between 1 and 9, anchored with “Strongly disagree” and “Strongly agree.” One of the seven items was dropped because it overlapped semantically with the AFA-Volition scale, and a second item was dropped because it did not share sufficient variance with other items on the scale. The remaining five items formed a Medication Attitude Questionnaire (MAQ) (see Table 2 for items). Participants also indicated their pre-study awareness of AOMs (*Outside of this study, how familiar are you with weight loss medications such as Ozempic, Wegovy, and Mounjaro?*) on a 5-point scale anchored with “Not at all familiar” and “Very familiar.” Participants were also asked whether they had ever used AOMs.

Finally, participants answered questions about their own history of weight-loss effort (*To what extent do you have personal*

**TABLE 2** | Individual item means for medication attitude questions.

| Medication attitudes questions   | 1 = strongly disagree, 9 = strongly agree |
|--|---|
| If a medical weight loss drug is safe and effective, then using the drug is a good way to lose weight                                      | 6.11 ± 2.02                               |
| Medical drugs should be a last resort for weight loss <sup>a</sup>   | 6.45 ± 2.24                               |
| Even if it is safe and inexpensive, there is something that feels unfair about using a drug that makes it easy to lose weight <sup>a</sup> | 3.65 ± 2.30                               |
| It is acceptable for individuals who are only slightly overweight to take weight-loss drugs in order to become thinner                     | 5.06 ± 2.33                               |
| In general, insurance should cover weight-loss drugs   | 6.35 ± 2.29                               |

<sup>a</sup>When computing scale composite scores, items expressing negative views were reversed (subtracted from 10) so that higher scale scores would indicate more positive attitudes.

experience with effort to lose weight?”) Participants responded on a 5-point scale with anchors of “No experience” and “Extensive experience” at the endpoints, and with “Moderate experience” at the midpoint. Participants who reported having experience with weight-loss efforts were also asked to rate, “How successful have the efforts to lose weight been?” This item was also reported on a 5-point scale, with “Not at all successful” and “Very successful” as endpoint anchors, and “Somewhat successful” as the midpoint anchor. Data for Study 2 were collected between September 28 and October 6, 2023.

ANCOVA analyses evaluated hypotheses regarding the effects of study condition on views of obesity and obesity stigma, and Pearson correlation coefficients were used to assess hypotheses regarding the relationship between views of obesity and both attitudes about the use of AOMs as well as with personal experience with weight-loss efforts. As in Study 1,  $\alpha$  was set to 0.05 for all tests of significance. For the ANCOVA tests assessing the effects of study condition, condition was included as the primary independent variable (four levels). BMI and biological sex were independent variables in these models, with statistics associated with these demographic variables reported online only. The sample size of  $N = 100$  per group in the ANCOVA analyses, with  $\alpha = 0.05$ , provided 80% power to detect an effect of Cohen's  $f = 0.38$ . Pearson coefficients computed to assess the above correlational hypotheses were based on the entire sample, collapsing across study conditions. The sample of  $N = 400$ , again with  $\alpha = 0.05$ , provided 80% power to detect a true correlation of  $r = 0.14$ . Follow-up regression models evaluated correlational hypotheses, with the above demographics (BMI and biological sex) included as predictor variables. The results of these analyses were comparable to the results of the Pearson correlation coefficients and are not included in this report.

### 3.2 | Study 2: Results

Across study conditions, the sample was 53.3% male, 44.3% female, and 2.5% other/prefer not to answer. Participants were predominantly white (68.8%) with an average age of  $37.1 \pm 12.6$  and average self-reported BMI (after removing one implausible weight entry that resulted in a BMI below  $8 \text{ kg/m}^2$ ) of  $27.0 \pm 7.0 \text{ kg/m}^2$ . The BMI cutoff for overweight (BMI  $\geq 25 \text{ kg/m}^2$ ) was met by 52.4% of the sample, and the cut-off for obesity (BMI  $> 30 \text{ kg/m}^2$ ) was met by 22.7% of the sample. There were no significant differences in these variables among the groups formed by study condition randomization. Twelve participants (3.0%) reported personally using GLP-1 medications, though not

necessarily for weight loss. Most participants (60.8%) reported low familiarity with AOMs (responses of “1” or “2” on a 5-point Likert scale in which “3” corresponded to moderate familiarity). Most participants (70.5%) across groups reported a history of at least moderate weight-loss efforts (3 or higher on a 5-point scale). Within this group, most (81.2%) reported that their past efforts were at least “somewhat successful” (corresponding to a response of 3 or higher on a 5-point scale).

Three items were intended to be directly related to the conception of obesity as a medical condition (“Obesity is a disease,” “Genetics play a big role in determining who will have problems with their weight,” and “Obesity is caused mainly by underlying biological factors”). These items were correlated (pairs ranging from  $r = 0.48$  to  $r = 0.74$ ) and had an overall Cronbach's  $\alpha = 0.78$ . The analysis therefore averaged responses on these three items to form an “Obesity as Medical Condition” (OMC) composite score. Ratings indicated substantial support for the view that obesity is a medical condition, with mean response =  $6.04 \pm 1.60$ , on the 1–9 scale. Participants also viewed obesity as substantially controllable through willpower, with the Willpower (“Volition”) subscale of the AFA mean above the midpoint on the 9-point scale ( $5.5 \pm 2.0$ ).

The OMC and Willpower subscales were negatively correlated ( $r(400) = -0.37, p < 0.001$ ). Contrary to the a priori study hypothesis (but consistent with results of Study 1) study condition did not affect participant agreement (see Table 3 for means) that obesity should be considered a medical condition ( $F(3, 382) = 1.69, p = 0.17$ ), and this remained the case when including only the 60.8% of participants who reported little to no familiarity with the anti-obesity medication described ( $F(3, 232) = 0.64, p = 0.59$ ). Also, contrary to expectations (and again consistent with Study 1 results) Study 2 did not show evidence of an effect of condition on ratings of the potential role of willpower in obesity ( $F(3, 382) = 1.31, p = 0.27$ ). This remained the case when this analysis was repeated using only participants with low anti-obesity medication familiarity ( $F(3, 232) = 2.30, p = 0.08$ ).

Obesity stigma (operationalized as the AFA-Dislike composite score, see above) was strongly associated with the Willpower composite score ( $r(400) = 0.47, p < 0.001$ ), indicating that those who expressed more agreement that obesity is controllable through willpower also expressed more explicit obesity stigma. Obesity stigma was weakly negatively correlated with agreement that obesity is a medical condition ( $r(400) = 0.17, p < 0.001$ ). The treatment group did not impact expressed obesity stigma ( $F(3, 382) = 0.02, p = 0.99$ ; see Table 3 for

**TABLE 3** | Primary dependent variables from Study 2. Comparison of general views on obesity across the four text exposure interventions.

|                              | <i>F</i> -stat; <i>p</i> -value | Struggle + med<br>success | Struggle + support group<br>success | Struggle<br>only | Neutral        |
|------------------------------|---------------------------------|---------------------------|-------------------------------------|------------------|----------------|
| Obesity as medical condition | $F = 1.69$ ;<br>$p = 0.17$      | $6.1 \pm 1.63$            | $5.7 \pm 1.55$                      | $6.1 \pm 1.61$   | $6.3 \pm 1.56$ |
| Relevance of willpower       | $F = 1.31$ ;<br>$p = 0.27$      | $5.6 \pm 1.84$            | $5.5 \pm 1.90$                      | $5.8 \pm 2.02$   | $5.2 \pm 2.09$ |
| Obesity stigma               | $F = 0.02$ ;<br>$p = 0.99$      | $2.7 \pm 1.59$            | $2.7 \pm 1.64$                      | $2.7 \pm 1.70$   | $2.6 \pm 1.60$ |

means). This remained the case when the analysis was repeated including only participants low in familiarity with AOMs ( $F(3, 232) = 0.16, p = 0.92$ ).

Five items made up a composite score of attitudes toward the use of anti-obesity medications (see Table 2). The Cronbach's alpha for the five retained items was 0.75. A single medication attitude composite was computed as the mean of these five items, with negative attitude items reverse scored so that higher numbers always indicated more favorable attitudes. The mean composite score was slightly above the favorability midpoint ( $5.5 \pm 1.5$  on a 1–9 scale).

Consistent with the study hypotheses, more positive attitudes toward the use of anti-obesity medications were associated with greater belief that obesity is a medical disorder ( $r(400) = 0.34, p < 0.001$ ) and with reduced belief that obesity can be overcome through willpower ( $r(400) = -0.20, p < 0.001$ ). The two items on the medication attitude questionnaire that contributed most strongly to these relationships were (1) an item expressing that there is something that feels unfair about using anti-obesity medications (agreement with which was associated with viewing obesity less as a medical disorder and more as a failure of willpower;  $r(400) = -0.20, p < 0.001$  and  $r(400) = 0.24, p < 0.001$  respectively), and (2) an item indicating that insurance should pay for anti-obesity medications (agreement with which was associated with viewing obesity *more* as a medical disorder and *less* as a failure of willpower;  $r(400) = 0.41, p < 0.001$  and  $r(400) = -0.24, p < 0.001$ , respectively).

As noted above, participants rated their personal experience with weight-loss efforts, and those reporting having had experience trying to lose weight also rated how successful those efforts were (both ratings on a 5-point scale). Most participants (70.5% of the sample) reported at least a moderate amount of experience trying to lose weight. A greater degree of personal experience was slightly positively associated with viewing obesity as a medical condition ( $r(400) = 0.17, p = 0.001$ ), but was not significantly associated with attitudes toward the use of AOMs ( $r(400) = 0.09, p = 0.07$ ). Moreover, contrary to the study

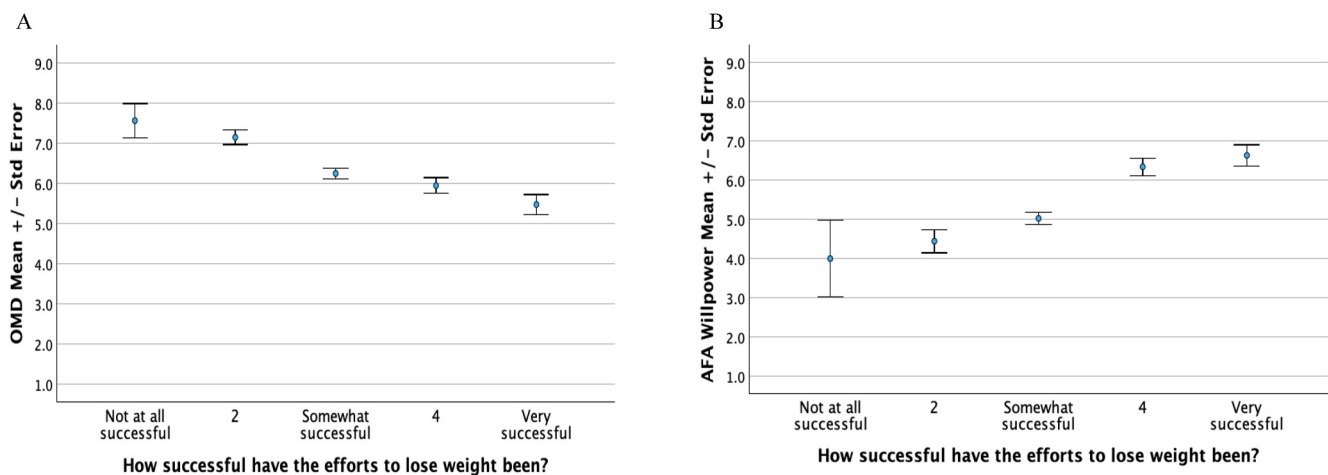
hypothesis, greater personal experience with weight-loss effort was not related to participants' view that obesity could be controlled through willpower ( $r(400) = 0.01, p = 0.98$ ).

A post hoc follow-up analysis on the 70.5% of the sample reporting at least a moderate history of weight loss investigated whether reported success was associated with opinions of obesity. Among this subset, most (81.2%) reported that their efforts were at least "somewhat successful," including 19.5% of the sample who rated their efforts as the maximum 5, corresponding to "very successful." As shown in Figure 1A, these ratings of success were strongly predictive of viewing obesity less as a medical condition ( $r(282) = 0.32, p < 0.001$ ). As shown in Figure 1B, these ratings were also strongly associated with viewing obesity as more controllable through willpower ( $r(282) = -0.40, p < 0.001$ ). Ratings of weight-loss success were also associated with greater expression of explicit obesity stigma as measured by the AFA-Dislike subscale ( $r(282) = 0.30, p < 0.001$ ) and with less favorable attitudes toward the use of AOMs ( $r(282) = 0.26, p < 0.001$ ).

### 3.3 | Study 2: Discussion

The results of Study 2 were consistent with those of Study 1 while extending the findings in several ways. As in Study 1, Study 2 showed no support for the primary hypotheses that reading about the success of AOMs would increase the degree to which participants viewed obesity as a medical condition and decrease the degree to which participants thought obesity could be overcome through willpower. The results also did not provide any evidence of reduced obesity stigma after reading about the medications. These findings did not change meaningfully when analyses were limited to the subset of participants who were most unfamiliar with the medications prior to the study (the group that would plausibly be most impacted by study interventions).

Consistent with the hypotheses, individuals who indicated greater agreement that obesity is a medical condition and who



**FIGURE 1** | Associations with reported success managing weight. Among the 70.5% of the sample reporting at least a moderate amount of experience trying to lose weight, greater reported personal success predicted viewing obesity less as a medical disorder (A) and more as a failure of willpower (B).

viewed it as less controllable through willpower expressed more positive attitudes toward the use of AOMs. For example, those individuals who viewed obesity as more controllable through willpower expressed agreement that use of AOMs is unfair (“easy way out”) and lower agreement that insurance should pay for medications. Even if the emergence of highly effective AOMs does not change beliefs about the role willpower plays in obesity, those beliefs may impact the public’s embrace of AOMs. However, causal evidence for this would require effective manipulation of views on the etiology of obesity.

The ubiquity of weight-loss efforts was striking, with the majority of participants (70.5%) reporting at least “moderate experience” trying to lose weight. In general, primary variables were *not* strongly associated with the degree of personal experience with weight loss. Personal weight-loss effort was only weakly predictive of viewing obesity as a medical condition, not significantly associated with attitudes toward the use of AOMs, and not associated with viewing obesity as less controllable through willpower.

However, while views on the etiology and controllability of obesity were minimally associated with the *amount* of personal experience participants had in trying to lose weight, they were robustly associated with the reported *success* of those efforts. Among the 70.5% of the sample that reported significant experience trying to lose weight, greater reported weight-loss success was strongly predictive of viewing obesity less as a medical condition and more as a failure of willpower. Participants reporting greater success at weight loss also expressed greater obesity stigma and indicated less positive attitudes toward the use of anti-obesity medications. To the extent that this sample is representative of adults in the United States, these findings imply that most people consider themselves to have personal experience trying to lose weight and that their views on the success of those efforts are strongly predictive of how they view obesity, including the perceived role of willpower.

## 4 | General Discussion

Obesity stigma inflicts extraordinary psychological and physical harm [1, 3], and has remained high in the US, even as at least some aspects of sexual and racial minority stigma have declined [29]. This persistence may be related to the public perception that obesity is something that individuals can control [1, 30]. It was previously suggested that the new GLP1 agonist AOMs will change the way society understands obesity by encouraging the public to view obesity from a medical framework and discourage the view that obesity reflects a willpower failure [18, 19]. Studies 1 and 2 sought to examine this by randomly assigning participants to read about these medications. Both studies failed to find support for the hypotheses that reading about the success of AOMs would cause participants to view obesity more as a medical condition and less as a willpower failure. This was true both when the medication was described in general terms (Study 1) and when it was described in the context of an individual’s success after a long and previously unsuccessful struggle to lose weight (Study 2). Moreover, this remained true when considering only participants who had little

to no prior familiarity with AOMs (the group for whom the study information was novel, and so plausibly most impactful). Interestingly, while reading about AOMs did not change the degree to which participants judged obesity to be a failure of willpower, those who most strongly did view it as failed willpower felt the least positive about the use of those medications.

It is notable that among the participants with some experience trying to lose weight (70.5% of the sample), most (81.2%) rated their efforts as at least somewhat successful. This is surprising in light of the dismal reality of dieting efforts [28]. These judgments might reflect a view that temporary weight-loss, a common outcome of diets [31], implies some degree of success. Alternatively, participants may believe, rightly or wrongly, that their current weight is lower than it would be were it not for their efforts. Whatever the reason, the more successful participants judged their weight-loss efforts to have been, the more they viewed obesity to be a failure of willpower and the less they viewed obesity to be a medical disorder. There is, of course, no way to establish a causal relationship between these associated variables in the present study. But for a participant who believes that they lost weight through willpower, even temporarily, that interpretation of their experience could inform how they think about obesity. Reported success in weight-loss efforts was also associated with the expression of more explicit obesity stigma, though it should be noted that the overall mean endorsement of all items on the explicit stigma scale was well below the midpoint.

The absence of support for the primary study hypothesis may appear inconsistent with prior evidence (discussed above, and reviewed elsewhere [32, 33]) that educating people about the biological causes of obesity reduces stigma [10–13]. If calling attention to biological causes leads people to view obesity less as a failure of willpower and more as a medical condition, it might be expected that learning about a medication that leads to significant weight loss would have a similar impact on the way people understand obesity. However, it bears emphasis that participants in the present study learned about a biological antecedent to obesity. Participants did, in fact, view willpower as less relevant to weight-loss outcomes given medication than to outcomes of a counseling intervention. Materials provided to participants did not suggest that AOMs worked by correcting an underlying abnormality; therefore, they did not carry strong implications about the etiology of obesity in the general population.

The results of these studies should be considered in light of important limitations. First, both studies relied on convenience samples comprised of individuals who chose to participate in online research for money, and so cannot be assumed to be representative of the U.S. population. For example, compared to the U.S. adult population, the studies’ samples were more male (59.6% male in Study 1 and 53.3% in Study 2, compared with 49.5% in the U.S. population) and had a lower prevalence of overweight (61.9% in Study 1 and 52.4% in Study 2, compared with an estimated 74.0% among adults in the U.S.; [34]). Given that obesity stigma is more pronounced among males [24, 35, 36] and among those in the healthy weight range [37, 38], it is likely that the empathy extended to individuals with obesity was atypically low in these studies. Future work with more

representative samples is necessary to establish the degree of generalizability of the present findings, both to the U.S. population, and potentially to non-U.S. populations.

Another limitation of these data concerns the idiosyncrasies of the study material and measures. The vignettes and questions tended to frame overweight and obesity as a problem. This framing may have created demand characteristics [39] that influenced participants' responses, particularly among those participants who do not ordinarily view being overweight negatively [40]. Moreover, many of the dependent variables used in this study were developed specifically for this study, and thus do not benefit from independent development of their psychometric properties. Future studies directed at measure development would be highly valuable.

Finally, the central question of the study concerns the effect that public awareness of effective AOMs might have on how people understand obesity. However, study methods only consider the immediate effect of learning about, or in some cases being reminded about, effective AOMs. The results of this study cannot address the long-term changes that AOMs might have on how obesity is understood. Future work employing a different approach is needed to investigate this issue. But the absence of any evidence for an immediate reduction in either perceived controllability or stigma provides some basis for skepticism that the emergence of more effective AOMs will discourage the public from viewing obesity as a failure of willpower.

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M.G., B.S. and J.M. conceived the studies and M.G. and J.M. carried them out. M.G. and J.M. carried out analyses. All authors were involved in writing the paper and had final approval of the submitted and published versions.

## Conflicts of Interest

The authors declare no conflicts of interest.

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