How to lose weight bias fast! Evaluating a brief anti-weight bias intervention

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Abstract

Objectives: Although experiencing weight bias is associated with poor physical and psychological health, health professionals often stigmatise overweight and obese clients. The objective of this study was to evaluate a brief educational intervention that aimed to reduce weight bias among Australian pre-service health students by challenging beliefs about the controllability of weight.

Design: Non-equivalent group comparison trial.

Methods: Undergraduate psychology students were assigned to an intervention (*n*=30), control (*n*=35), or comparison (*n*=20) condition. The intervention condition received a lecture on obesity, weight bias and the multiple determinants of weight, the comparison condition received a lecture on obesity and the behavioural determinants of weight, and the control condition received no lecture. Beliefs about the controllability of weight and attitudes towards overweight and obese people were assessed one week pre-intervention, immediately post-intervention, and three weeks post-intervention.

Results: After receiving the lecture, participants in the intervention group were less likely to believe that weight is solely within individual control, and were also less likely to hold negative attitudes towards overweight and obese people and rate them as unattractive. These changes were maintained three weeks post-intervention. There were no such changes in the control or comparison groups. Disparagement of overweight and obese peoples' social character increased over time for participants in the control condition, but did not change in the comparison or intervention groups.

Conclusions: This study provides evidence that brief, education-based anti-weight bias interventions show success in challenging weight controllability beliefs and reducing weight bias among pre-service health students.

Keywords: weight bias, weight stigma, anti-fat, intervention, health professionals

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Overweight and obese individuals face discrimination and prejudice due to their body weight and appearance – a phenomenon known as 'weight bias'. Weight bias can manifest in prejudiced implicit and explicit attitudes, including the attribution of negative labels (e.g., unattractive, lazy, unclean, unintelligent, unhealthy), towards overweight and obese people. It can also include discriminatory actions towards an individual based upon their weight and appearance, such as weight-based teasing, and the suboptimal healthcare of overweight and obese people (Carr & Friedman, 2005). Following race, gender, and age-based discrimination, weight bias is the fourth most common form of discrimination in the United States (Puhl, Andreyeva, & Brownell, 2008). Moreover, its prevalence has increased among North American women and men from 7% in 1995-1996 to 12% in 2004-2006 (Andreyeva, Puhl, & Brownell, 2008). Despite its associated negative health consequences, health professionals and pre-service health students are frequent sources of weight bias (Puhl & Heuer, 2009). Specifically, doctors (Bocquier et al., 2005; Brandsma, 2005; Foster et al., 2003; Hebl & Xu, 2001), obesity specialists (Schwartz, Chambliss, Brownell, Blair, & Billington, 2003; Teachman & Brownell, 2001), nurses (Brown, 2006), dietitians (Berryman, Dubale, Manchester, & Mittelstaedt, 2006; Oberrieder, Walker, Monroe, & Adeyanju, 1995) and psychologists (Davis-Coelho, Waltz, & Davis-Coelho, 2000; Harvey & Hill, 2001) have all been found to hold negative attitudes towards overweight and obese individuals. Although there has been a substantial amount of research, policy and advocacy dedicated to understanding the causes of and methods for preventing other forms of discrimination, research, policy and social action addressing weight bias has largely been neglected (Brownell, 2005). In particular, few published studies address the development and evaluation of interventions to reduce weight bias. In addition, no studies to date look at how specific interventions might selectively influence different facets of weight bias.

In the present paper we address this gap in the literature through the evaluation of an intervention that aimed to reduce weight bias among Australian pre-service health students, by challenging beliefs about individuals' ability to control their weight and providing information on the prevalence and consequences of weight bias. To assess the degree to which challenging controllability beliefs differentially impacts on certain aspects of weight bias, we assessed two facets of weight-bias-related attitudes; bias related to the perceived physical and romantic attractiveness of overweight and obese people, and bias related to the perceived social character of overweight and obese people.

Consequences of Weight Bias

The need for interventions that reduce weight bias is evident in light of its negative consequences for its victims across employment, education, interpersonal and health settings (Puhl & Brownell, 2001; Puhl & Heuer, 2009; Puhl, Moss-Racusin, Schwartz, & Brownell, 2008). In particular, research indicates that experiencing weight bias is associated with negative body image, depressed mood and poor self esteem (Eisenberg, Neumark-Sztainer, & Story, 2003; Keery, Boutelle, van den Berg, & Thompson, 2005). Being a victim of weight bias can also have a negative effect on physical health by placing individuals at an increased risk for disordered eating and resistance to physical activity (Annis, Cash, & Hrabosky, 2004; Puhl, Moss-Racusin, & Schwartz, 2007; Vartanian & Shaprow, 2008). Furthermore, overweight and obese individuals often delay seeking healthcare due to concerns about experiencing weight bias from health professionals (Amy, Aalborg, Lyons, & Keranen, 2006; Drury & Louis, 2002; Fontaine, Faith, Allison, & Cheskin, 1998). This reluctance to seek healthcare because of weight bias in the health professions appears well founded; health students and physicians are often reluctant to carry out medical procedures on obese women (Adams, Smith, Wilbur, & Grady, 1993), spend less time with overweight patients (Hebl & Xu, 2001), and frequently make derogatory comments about obese patients (Wear, Aultman,

Varley, & Zarconi, 2006). Furthermore, the current infrastructure of healthcare environments is not size-friendly (e.g., small examination gowns, waiting room- and wheel-chairs), and may act as a barrier to overweight and obese individuals seeking healthcare (Puhl & Brownell, 2001).

Given the serious consequences of weight bias and its prevalence within health professions, there is a need to develop effective, theoretically driven anti-weight bias interventions. Existing research suggests that attributions about the individual controllability of weight reliably predict biased attitudes towards overweight and obese people (Crandall et al., 2001). Specifically, people who believe that overweight and obese people can control their own weight are more likely to disparage and discriminate against them (DeJong, 1993). Consequently, the development of the current intervention was guided by attribution theory.

Attributions and Weight Bias

Attribution theory rests on the premise that people try to make sense of their social world through causal explanations or attributions about events and behaviours, and that these attributions are primarily external or internal (Heider, 1958). External attributions ascribe outcomes to factors beyond individual control, and internal attributions to those within individual control (Brogan & Hevey, 2009). Research has shown that internal attributions are often used to justify the social and economic disadvantage of stigmatised groups (e.g., "bad things happen to certain people or groups because they are generally lazy/violent/inferior") (Doosje & Branscombe, 2002).

In relation to weight bias, research has consistently found that people who hold an ideology that endorses individual responsibility are more likely to stigmatise overweight and obese individuals (Puhl & Brownell, 2003; Quinn & Crocker, 1999). Specifically, people who make internal attributions about the causes of weight, and believe that weight is within an individual's control (i.e., individuals can change their weight through will power, exercise

and dietary choices), are more likely to hold negative attitudes towards overweight and obese people (Crandall, 1994). In line with past research, we suggest that changing these attributions about the causes of obesity from modifiable, behavioural factors to a more accurate, multi-determinant explanation may be associated with a reduction in weight bias.

Existing Anti-Weight Bias Interventions with Adults

Although findings with children are mixed (e.g., Anesbury & Tiggemann, 2000; Bell & Morgan, 2000), several studies provide some evidence to suggest that educating adults on the multiple determinants of weight (e.g., genetics, hormones, dietary intake, physical activity levels, socioeconomic status) can change attitudes towards overweight and obese individuals. For example, in separate studies, Crandall (1994) and Puhl, Schwartz and Brownell (2005) found that reading a brief article that emphasised the importance of uncontrollable factors in weight determination (e.g., genetics and physiology) was associated with more positive attitudes towards overweight and obese individuals, than was reading an article about the physiology of stress, or, an article that highlighted controllable factors associated with weight (e.g., diet and exercise). Hague and White (2005) also found that an online intervention that provided information on weight bias and the multiple determinants of obesity resulted in a reduction in weight bias among university students that was maintained at six weeks follow-up.

Other research, however, has produced less clear results. For example, in another study with adults, participants read either an article describing genetic, uncontrollable causes of obesity, or an article describing overeating and lack of exercise (i.e., controllable factors) as the cause of obesity (Teachman, Gapinski, Brownell, Rawlins, & Jeyaram, 2003). This study found that there was no significant difference in implicit or explicit attitudes towards overweight and obese people between the conditions after reading the articles.

A further limitation to the current literature on anti-weight bias interventions is that the maintenance of any post-intervention change is rarely assessed, with only Hague and White (2005) conducting follow-up measures. Also, it is not clear to what degree challenging weight controllability beliefs can affect different facets of weight bias (e.g., prejudiced attitudes towards overweight and obese people regarding the attractiveness of their appearance, or, prejudiced attitudes regarding their social character). It is therefore evident that further development and evaluation of anti-weight bias interventions is necessary.

Despite mounting evidence of the presence of weight bias in the health professions, there is also little research on the development and evaluation of strategies to reduce weight bias among health professionals and pre-service health students (Harvey & Hill, 2001). To our knowledge, only two published studies have evaluated anti-weight bias interventions in this population. The first study showed that a two-hour seminar on the negative consequences of weight bias and the multiple causes of obesity resulted in modest improvements in medical students attitudes towards overweight and obese individuals (Weise, Wilson, Jones, & Neises, 1992). However, a more recent study found that exposure to five one hour intervention sessions that emphasised the socio-environmental and genetic reasons for obesity resulted in a reduction in implicit weight-bias-related attitudes, but no reduction in weight-bias-related explicit attitudes study among pre-service health students (O'Brien, Puhl, Latner, Mir, & Hunter, in press). These mixed findings demonstrate the need for further research into the development of effective anti-weight bias interventions among health professionals and pre-service health students.

Current Study

In the present paper we answer the call for further research into weight bias reduction strategies (Puhl & Heuer, 2009) by evaluating an anti-weight bias intervention in a sample of Australian pre-service health students. We sought to improve participants' attitudes towards

overweight and obese individuals by changing beliefs about the individual controllability of weight through a brief educational session on the negative consequences of weight bias and the multiple determinants of weight. The intervention group was compared to a control group (who received no intervention), and a comparison group (who received an educational session on the behavioural determinants of obesity and weight). In addition to the applied benefits of testing an anti-weight bias intervention on a sample of pre-service health students, on a theoretical level we wished to explore the degree to which challenging controllability beliefs differentially impacts on people's ratings of overweight and obese people as attractive, as well as their social disparagement of overweight and obese people. Consistent with attribution theory and past research, we hypothesised that learning about the negative consequences of weight bias and the multiple determinants of weight would be associated with a reduction in negative attitudes towards overweight and obese people.

Methods and Procedures

Design and Participants

We conducted a non-equivalent group comparison trial to evaluate the effectiveness of an intervention aimed at reducing weight bias among pre-service health students. The trial consisted of an intervention, control and comparison group. Baseline assessment was conducted one week prior to the intervention, with post-test evaluation occurring immediately after the intervention and follow-up at three weeks post-intervention. Participants were advised that the study was being conducted to explore attitudes and beliefs about health and health-related behaviours. Ethical approval to conduct the study was granted by the Human Research Ethics Committee at the university at which the study was conducted.

The sample consisted of undergraduate students enrolled in three psychology courses

at a large Australian university[2] (initial *N*=140; final *N*=85). Each course was assigned to one of three conditions; intervention (4th year health psychology course; initial *n*=39; final *n*=30), control (3rd year psychometrics course; initial *n*=42; final *n*=35) and comparison (3rd year health psychology course; initial *n*=59; final *n*=20). Assignment to conditions was based on convenience. The first author was invited to present a guest lecture to the 4th year health psychology course and therefore the students enrolled in this course were assigned to the intervention condition. The 3rd year health psychology course students were assigned to the comparison condition as they were already scheduled to receive a lecture on obesity in accordance with the standard course curriculum, while the 3rd year psychometrics students were an accessible sample for the control condition[3]. Participation was not a course requirement and raffle tickets to win movie passes were provided as compensation for participation. All students who were present in class during the intervention and assessment sessions gave consent to participate. The final sample sizes reported here reflect the number of students who completed the measures at all three time points. Demographic characteristics of the three participant groups in the final sample are summarised in Table 1.

[Insert Table 1 about here]

Procedure

The pre-test measures were completed during class time (Time 1). One week later, participants in the intervention and comparison conditions who attended class received

[2] In Australia, psychology students are required to complete a four year undergraduate degree and a two year Masters degree prior to becoming fully registered psychologists. Students do not have patient contact during their undergraduate degree.

[3] Completion of the 3rd year health psychology course was not a requirement for enrolment in the 4th year health psychology course, and as such only 10 of the 48 students enrolled in the 4th year course had previously completed the 3rd year course. Although we do not know if these 10 students completed all three time points of measurement and were therefore included in the final sample, preliminary analyses outlined in the results section demonstrate that there was no significant difference in pre-existing attitudes towards overweight and obese people between the conditions at pre-test. This suggests that any effects of the intervention can be confidently attributed to the intervention lecture, rather than possible past exposure to lectures on obesity.

lectures on body image, obesity and weight-related health. Immediately following the lectures, these participants completed the post-test measure (Time 2). Participants in the control group also completed a post-test measure, one week after pre-test. To assess the maintenance of any changes in controllability beliefs and weight-bias-related attitudes, participants in the control, intervention and comparison conditions completed a follow-up test three weeks post-intervention (Time 3).

Materials

Intervention lecture. The two hour intervention lecture was developed and presented by the first author, who was external to the usual course teaching staff. Topics covered in the lecture included body image, obesity and weight bias. The lecture aimed to raise awareness of the prevalence and consequences of weight bias, with a particular focus on research that has addressed health and the healthcare setting. It also involved a detailed exploration of the empirical evidence that demonstrates that body weight is determined by multiple factors (i.e., genetic, biological, behavioural, social, cultural and environmental variables); some of these factors cannot be modified by individuals with ease or, in some cases, at all. In line with attribution theory, this multi-determinant explanation of weight was presented with the aim of directly challenging beliefs about the individual controllability of weight. The lecture also included information on practical strategies to avoid weight bias and to promote size acceptance in healthcare settings and research (e.g., avoiding weight-based assumptions about health and abilities; addressing issues related to nutrition and physical activity with all clients regardless of size).

Comparison lecture. The two hour comparison lecture was given by a senior lecturer external to the research team, who was the primary course instructor. This lecture followed the standard curriculum for a third-year health psychology course component on obesity. The lecture aimed to increased knowledge about risk factors and treatment strategies for

overweight and obesity. To begin with, statistics were used to highlight the increasing prevalence of obesity among Western populations. This was followed by a detailed discussion of lifestyle factors that are associated with the development and treatment of overweight and obesity, with a particular emphasis on sedentary behaviour and energy dense and nutrient poor diets. Finally, an overview of counselling, surgical, pharmacological, commercial and public health weight-loss interventions that aim to modify diet and increase physical activity was presented. Therefore, in contrast to the intervention lecture, the comparison lecture emphasised modifiable behaviours and the individual controllability of weight as an etiological explanation for overweight and obesity, and as a focus for treatment.

Measures

Participants completed the following self-report measures at pre-test, post-test and follow-up.

Demographics. Participants recorded their gender, age, height, weight, ethnicity, course enrolment, enrolled degree and major.

Overall weight-bias-related attitudes. The Antifat Attitudes Test (AFAT) (Lewis, Cash, Jacobi, & Bubb-Lewis, 1997) was administered to measure participants' attitudes towards overweight and obese people. The AFAT contains three subscales (described below) and 13 additional items measured on a Likert response scale (e.g., 'jokes about fat people are funny'; 1="definitely disagree" to 5="definitely agree"; Cronbach's α=*.95).* To provide an overall measure of participants' weight-bias-related attitudes, total AFAT scores were calculated by summing scores on all items, with higher scores indicating more negative attitudes.

Beliefs about the controllability of weight. Scores on the 'Weight Control/Blame' subscale of the AFAT were calculated to measure participants' beliefs about the individual controllability of weight. This subscale consists of nine items (e.g., 'most fat people are lazy';

1="definitely disagree" to 5="definitely agree"; Cronbach's α=.84). Responses were averaged with higher scores indicating a stronger belief that weight is under the control of overweight or obese individuals.

Attitudes regarding the unattractiveness of overweight and obese individuals. To measure participants' perceptions of the unattractiveness of overweight and obese individuals and their suitability for romantic partnership, scores on the 'Romantic/Physical Unattractiveness' (10 items; e.g., 'It's hard not to stare at fat people because they are so unattractive'; Cronbach's α=.80) subscale of the AFAT were calculated. This subscale has the same response format and scoring procedure as the 'Weight Control/Blame' subscale, with higher scores indicating greater perceived unattractiveness of overweight and obese individuals.

Attitudes regarding the social disparagement of overweight and obese individuals. To measure participants' social disregard and attribution of undesirable personality characteristics to overweight and obese individuals, scores on the 'Social/Character disparagement' (15 items; e.g., "I'd lose respect for a friend who started getting fat'; Cronbach's α=.89) subscale of the AFAT were calculated. This measure has the same response format and scoring procedure as the two previous subscales of the AFAT, with higher scores indicating greater social disparagement of overweight and obese individuals.

Results

Preliminary Analyses

Attrition analyses. There were no significant differences in the demographic characteristics and Time 1 scores on the psychological variables between the final sample, who completed all measures, and those who completed measures at Time 1 only or Times 1 and 2 only (see Table 2 for a summary of the attrition analyses).

[Insert Table 2 about here]

Demographic equivalence of groups. There were no significant differences in ethnicity ($X^2(2,n=85)=2.90,p=.234$), age ($F(2,83)=1.50,p=.240$) or BMI ($F(2,82)=.27,p=.765$) between the groups assigned to each condition. Because of the small number of men in each group, we could not assess gender equivalence.

Time 1 equivalence of beliefs and attitudes. In regards to the initial sample (i.e., all participants who completed Time 1 measures), there were no significant differences between the conditions at Time 1 on overall anti-fat attitudes ($F(2,136)=.52,p=.597$), beliefs about the controllability of weight ($F(2,136)=.84,p=.433$), and unattractiveness ratings ($F(2,136)=.38,p=.684$). Participants in the comparison condition ($M= 1.82$, $SD=.61$) reported significantly higher levels of social disparagement at Time 1 than those in the control condition ($M=1.56$, $SD=.45$; $M^{dif}=.26$, $p=.049$; $F(2,136)=3.17,p=.045$). For the final sample, who completed measures at all three time points, there were no significant differences between the conditions at Time 1 on overall anti-fat attitudes ($F(2,82)=.18,p=.834$), beliefs about the controllability of weight ($F(2,82)=1.58,p=.319$), unattractiveness ratings ($F(2,82)=.53,p=.592$) and social disparagement ($F(2,82)=1.49,p=.230$). Means and standard deviations for the final sample on all measures by condition and time are displayed in Table 3.

[Insert Table 3 about here]

Per-Protocol Intervention Analysis

The analysis carried out in this section was conducted with the final sample. To assess the effectiveness of the anti-weight bias intervention we conducted a 3 (intervention, control, comparison) x 3 (Time 1, 2, 3) mixed-model multivariate analysis of variance (MANOVA), with Bonferonni adjusted follow-up comparisons. The dependent variables were overall weight-bias-related attitudes, controllability beliefs, unattractiveness ratings, and social disparagement ratings. There was a significant multivariate between-subjects main effect for

condition (*Wilks'λ* = 0.77, *F*(8,160) = 2.70, *p* = *.008*, partial η^2= .12) and a significant multivariate within-subjects effect for time (*Wilks'λ* = 0.58, *F*(8,75)=6.78, *p*=<*.001*, partial η^2=.42). These multivariate main effects were qualified by a significant multivariate interaction between time and condition (*Wilks'λ*=0.62, *F*(16,150)=2.54, *p*=*.002*, partial η^2=0.22). Specifically, changes in weight-bias-related attitudes and controllability beliefs over time differed between conditions.

Overall weight-bias-related attitudes. Subsequent to the multivariate tests, univariate *F* tests indicated that there were no significant univariate main effects of condition or time on overall weight-bias-related attitudes (*F*(2,82)=.84, *p*=.437; *F*(1,82)=.1.86, *p*=.177), however, there was a significant time by condition interaction (*F*(2,82)=6.24, *p*=.003, partial η^2=.13). Follow-up pairwise comparisons showed that participants in the intervention condition were less likely to hold anti-fat attitudes at Time 2 compared to Time 1 (M^{dif}=-.14, *p*=.002). While overall anti-fat attitudes did not change again between Times 2 and 3 (M^{dif}=-.04, *p*=.563), the improvement from Times 1 to 2 was maintained at Time 3. Specifically, at Time 3 participants in the intervention group held less negative attitudes towards overweight and obese individuals than they did at Time 1 (M^{dif}=-.18, *p*<.002). For participants in the comparison and control groups there was no change in overall anti-fat attitudes across the three time points (M^{dif}s<.06,*p*s>.42).

Beliefs about the controllability of weight. There was a significant univariate main effect for condition (*F*(2,82)=3.94, *p*=.023, partial η^2=.09) and time (*F*(1,82)=9.30, *p*=.003, partial η^2=.10) on controllability beliefs, however, this was qualified by a significant time by condition interaction (*F*(2,82)=5.34, *p*=.007, partial η^2=.12). Follow-up pairwise comparisons showed that the intervention condition were less likely to believe that weight is controllable at Time 2 compared to Time 1 (M^{dif}=-.237, *p*=.002). Although there was no further decrease in controllability beliefs from Time 2 to Time 3 (M^{dif}=-.141,*p*=.075), the improvement from

Time 1 to Time 2 was maintained at Time 3; at Time 3 participants in the intervention group were less likely to believe that weight is within individual control than they did at Time 1 (M^{dif}=-.38, p<.001). For those in both the comparison and control groups there was no change in beliefs about the controllability of weight over the three time points (M^{dif}s<.16,ps>.15).

Ratings of unattractiveness of overweight people. There was no significant univariate main effect of condition on unattractiveness ratings (F(2,82)=.14, p=.867), however, there was a significant main effect of time on unattractiveness ratings (F(1,82)=13.60, p<.001, partial η^2=.14), and a significant time by condition interaction (F(2,82)=3.98, p=.007, partial η^2=.09). Follow-up pairwise comparisons indicated that participants in the intervention condition were less likely to rate overweight people as unattractive at Time 2 than at Time 1 (M^{dif}=-.26,p<.001). While ratings of unattractiveness did not change again between Times 2 and 3 (M^{dif}=-.08, p=.508), the improvement in unattractiveness ratings was maintained at Time 3. At Time 3 participants in the intervention group rated overweight people as significantly less unattractive than they did at pre-intervention, at Time 1 (M^{dif}=-.34, p<.001). Again, neither participants in the comparison group nor participants in the control groups varied in their ratings of the unattractiveness of overweight people over time (M^{dif}s<.16, ps>.10).

Social disparagement of overweight people. There was no univariate main effect of either condition (F(2,82)=.65,p=.524) or time (F(1,82)=2.66,p=.107) on the social disparagement of overweight people. A significant time by condition interaction emerged again, however (F(1,82)=4.60,p=.013, partial η^2=.10). Follow up comparisons revealed that only participants in the control condition changed their social disparagement of overweight people over time. Specifically, although there was no significant increase in their disparagement of overweight people between Time 1 and Time 2, (M^{dif}=.11, p=.097),

participants in the control condition significantly disparaged overweight people more at Time 3 than they did at both Times 2 (M^{dif}=.11,p<.005) and 1 (M^{dif}=.22,p=.001). Neither participants in the intervention group nor participants in the comparison group varied in their levels of social disparagement of overweight people over time (M^{dif}s<.06,ps>.71).

Intention-to-treat Intervention Analysis

To ascertain if attrition affected the study outcomes reported in the per protocol analysis we also conducted an intention-to-treat analysis. This analysis included all participants from the initial sample, and any missing values were imputed by carrying forward scores from the last completed measure. The results were predominantly consistent with the findings from the per protocol analysis. There were only two substantive changes in findings; the addition of a significant univariate main effect for time on social disparagement (F(2,270)=4.17,p=<.016), and the finding that participants in the intervention condition also experienced a further significant decrease in controllability beliefs from Time 2 (M=2.38, SD= .69) to Time 3 (M=2.23, SD=.72; M^{dif}=-.15,p<.006).

Discussion

The primary aim of this study was to evaluate the effectiveness of an anti-weight bias intervention in a sample of Australian pre-service health students. A secondary aim was to assess the effect of the intervention on specific aspects of weight bias (e.g., perceptions of attractiveness, and perceptions of social character). Based upon attribution theory (Heider, 1958) and past research (e.g.,Crandall, 1994; Hague & White, 2005; Puhl, et al., 2005), we predicted that exposure to an intervention that provided information on weight bias and challenged beliefs about the controllability of weight would result in reduced weight bias. Indeed, the current intervention was successful in changing beliefs about the controllability of weight and in reducing weight-bias-related attitudes. Specifically, compared to their scores pre-intervention (Time 1), at post intervention (Time 2) participants in the intervention

condition were less likely to believe that weight is solely within individual control, and were less likely to hold weight-bias-related attitudes and to rate overweight and obese people as unattractive. These changes in beliefs and attitudes were maintained at three weeks follow-up (Time 3). No such positive improvement was evident in either the control or comparison conditions.

Contrary to our predictions, however, this pattern of positive change did not extend to the social disparagement of overweight and obese individuals. In the intervention condition participants' ratings of social disparagement of overweight and obese people remained stable over time. Likewise, social disparagement did not change in the comparison condition. Interestingly in the control condition, however, participants' social disparagement of overweight and obese people increased from Time 1 to Time 3. This finding, however, should be interpreted with caution as participants in the control condition had significantly lower levels of social disparagement at Time 1 than the comparison condition.

A number of factors may explain the lack of reduction in social disparagement in the intervention condition. Firstly, social disparagement of overweight and obese people among all conditions was initially low and, therefore, there was limited scope for improvement. Consequently, a floor effect may explain these results. Alternatively, this finding might suggest that weight controllability beliefs only influence certain aspects of weight bias. Knowledge of weight bias and the multiple determinants of weight may be relevant to reducing overall weight-bias-related attitudes and perceptions of unattractiveness of overweight and obese people, while some other, and as yet unknown, factor may be more important in reducing social disparagement. For example, the belief that being overweight and obese is universally linked to poor health behaviours and health outcomes may be one such factor. If increased body weight is thought to be unequivocally linked to poorer health, we suggest, people may feel justified in disparaging overweight and obese people on the

basis that they are putting their own health at risk. Consequently, challenging this belief in future interventions by including a discussion of research which shows that a considerable proportion of overweight and obese individuals are metabolically healthy (e.g., Wildman et al., 2008), may improve the ability of the current intervention to reduce social disparagement of overweight and obese people. At this point it is also important to highlight our finding that for those in the control condition, social disparagement of overweight and obese people increased over time. Whilst our results were not encouraging regarding the reduction of social disparagement in the intervention condition, at least there was no increased bias as in the intervention condition.

Applied Implications and Suggestions for Future Research

From our review of the literature, it is evident that weight bias is detrimental to the psychological and physical health of overweight and obese people. Further to this, health professionals and pre-service health students have been found to engage in weight bias, which may manifest in the sub-optimal treatment of overweight and obese individuals (Adams, et al., 1993; Wear, et al., 2006). Consequently, it is critical to challenge weight bias among the health professions. Our research presents the first Australian study to evaluate a brief, anti-weight bias intervention among adults, and is one of three studies internationally to do so with a sample of pre-service health students. Although the intervention effects were small to moderate in size, they are nonetheless promising in light of the relatively small sample size. Furthermore, our intervention was delivered in a two hour lecture format, and even this limited intervention created positive change in attitudes which were maintained at three weeks follow-up.

There were some aspects of the current study, however, that could be improved in future studies to strengthen the evidence base for effective anti-weight bias interventions. Firstly, based upon convenience, we assigned participants to conditions by group and

therefore did not have random assignment of participants to conditions. The participants in the intervention condition were also more advanced in their psychology degrees than those in the control and comparison groups. It is therefore possible that participants in the intervention condition were more receptive to change over time than were those in the control and comparison conditions. However, given that demographic characteristics, controllability beliefs and weight-bias-related attitudes were equivalent between the conditions at Time 1, we believe that this explanation of the results in unlikely. Secondly, the comparison group had a larger attrition rate than the intervention and control groups. Poor class attendance for participants in the comparison group, however, was consistent throughout the teaching semester and was not specific to the classes involved in the current study. Furthermore, our attrition analyses indicate that there were no differences in the demographic characteristics and pre-existing weight-bias-related attitudes of the participants who completed measures at all three time points and those who did not. Finally, past research has shown that the credibility and appearance of the person presenting an anti-weight bias intervention can impact on the intervention's success. For example, credible overweight presenters have been shown to be more effective than credible normal weight presenters in reducing weight bias (Hague & White, 2005). In this study, the presenter of the information differed between the intervention and comparison conditions (i.e., a young woman presented the intervention lecture, whereas a middle-aged man presented the comparison lecture). We suggest that future research should address this by exploring or controlling for the potential impact of presenter characteristics.

In relation to the field in general, future research is needed to investigate the utility of anti-weight bias interventions on attitudinal *and* behavioural outcomes. This is particularly important as some research has suggested that implicit and explicit anti-fat attitudes are not necessarily related to prejudiced behaviour towards overweight and obese people (O'Brien et

al., 2008). We suggest that adding additional dependent measures (e.g., signing a petition to lobby for equitable treatment of overweight and obese clients in healthcare settings; observed behaviours in an interaction with an overweight or obese confederate) would strengthen our results and demonstrate the behavioural utility of anti-weight bias interventions.

Conclusions

The current study answers the recent call for further research into the development of effective anti-weight bias interventions (Puhl & Heuer, 2009). Furthermore, our results, in conjunction with similar others (Crandall, 1994; Hague & White, 2005; Puhl, et al., 2005), provide evidence that brief, education-based anti-weight bias interventions show some success in challenging weight controllability beliefs and reducing weight bias in pre-service health students and the general adult population. Importantly, however, our results also suggest that further research is necessary to investigate how interventions affect different facets of weight bias. Furthermore, it is imperative these individual-level interventions are also complemented by broader, multi-level strategies which aim to address weight bias through legislation, policy and social action. We look forward to future contributions from the growing body of researchers campaigning for an equitable, health-focussed approach to improving the medical and social treatment of overweight and obese people.

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Table 1.

Participant demographic information.

	Control (n=35)		Intervention (n=30)		Comparison (n=20)		Total (N=85)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Age	22.00	4.49	24.43	8.37	22.25	4.10	22.92	6.11
Body Mass Index	22.24	3.88	21.58	4.87	21.49	3.98	21.83	4.24
	Freq	%	Freq	%	Freq	%	Freq	%
Gender								
Women	30	85.70	26	86.70	17	85.00	73	85.90
Men	5	14.30	4	13.30	3	15.00	12	14.10
Ethnicity								
White Australian	30	85.70	21	70.00	17	85.00	68	80.00
Other	5	14.30	9	30.00	3	15.00	17	20.00

Table 2

Attrition analyses for demographic characteristics and Time 1 scores on psychological variables.

	Time 1 only vs. final sample*	Time 1 and 2 only vs. final sample*
Demographics		
Gender	$X^2(1,n=120)= 1.58, p=.209$	$X^2(1,n=105)= .10, p=.754$
Ethnicity	$X^2(1,n=120)= .01, p=.919$	$X^2(1,n=105)= 1.30, p=.254$
Age	$t(118)= -.99, p=.326$	$t(103)= -.65, p=.519$
Body mass index	$t(117)= -.84, p=.403$	$t(103)= -.15, p=.880$
Time 1 Psychological Variables		
Overall anti-fat attitudes	$t(117)= -.81, p=.419$	$t(103)= 1.68, p=.096$
Weight controllability beliefs	$t(117)= -.74, p=.463$	$t(103)= 1.70, p=.093$
Unattractiveness ratings	$t(117)= -.83, p=.410$	$t(103)= 1.75, p=.074$
Social disparagement	$t(117)= -.02, p=.983$	$t(103)= 1.17, p=.246$

**Final sample refers to participants who completed the measures at all three time points (Time 1, 2, and 3).*

Table 3

Means and standard deviations for attitudes and beliefs for all conditions across time for the final sample.

	Time 1 Mean (SD)	Time 2 Mean (SD)	Time 3 Mean (SD)
Control			
Overall Attitudes	2.18 (.55)	2.21 (.55)	2.23 (.61)
Controllability Beliefs	2.84 (.74)	2.74 (.67)	2.79 (.78)
Unattractiveness	2.74 (.60)	2.65 (.63)	2.65 (.71)
Social Disparagement	1.57 (.48)	1.68 (.56)$_{a}$	1.79 (.60)$_{b,c}$
Intervention			
Overall attitudes	2.18 (.50)	2.04 (.54)$_{a}$	2.00 (.63)$_{c}$
Controllability Beliefs	2.60 (.71)	2.37 (.73)$_{a}$	2.23 (.75)$_{c}$
Unattractiveness	2.80 (.58)	2.54 (.65)$_{a}$	2.46 (.76)$_{c}$
Social Disparagement	1.67 (.46)	1.63 (.48)	1.64 (.57)
Comparison			
Overall Attitudes	2.26 (.65)	2.31 (.60)	2.26 (.65)
Controllability Beliefs	2.87 (.68)	2.99 (.70)	2.84 (.73)
Unattractiveness	2.62 (.73)	2.70 (.71)	2.54 (.75)
Social Disparagement	1.83 (.72)	1.78 (.61)	1.84 (.64)

Note. a= significant difference between Time 1 and Time 2, $p<.05$; b = significant difference between Time 2 and Time 3, $p<.05$; c = significant difference between Time 1 and Time 3, $p<.05$.