

Does presenting obesity as a disease or food addiction reduce stigma and increase support for approaches addressing obesity amongst fitness practitioners?

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Abstract

The present study examined the effects of presenting the etiology of obesity as a food addiction, disease, or ‘traditional’ caloric imbalance on anti-fat attitudes (AFA), and support for approaches addressing obesity in a cohort of fitness practitioners. The approaches included the direct allocation of time in the form of personal training (PT) sessions and support for policy initiatives at a societal level. Fitness practitioners were chosen as they represent a vocation seen to be increasingly important for addressing the escalating prevalence of obesity. Concerns have been raised that high levels of AFA may exist within this cohort, however, which may limit the effectiveness of weight-loss interventions. Practitioners ($n = 249$) were randomly assigned to one of four experimental conditions and asked to read a short article describing obesity as either a food addiction, disease, or caloric imbalance. A control group read an unrelated article about sales techniques. Measures of AFA, allocation of PT sessions, and support for obesity-related policy initiatives were then completed. Practitioners from the food addiction condition recorded significantly lower AFA than practitioners from the disease condition on measures relating to belief in the controllability of bodyweight. Practitioners in the food addiction condition showed significantly stronger support than practitioners in the control condition for policies advocating for the subsidisation of active obesity treatments such as PT. Practitioners in the food addiction condition also showed significantly stronger support than practitioners in the traditional condition for a policy requiring foods high in added sugar and fat to be treated in the same regulatory way as tobacco. No differences were found between the experimental conditions for the allocation of PT sessions. The study concluded that presenting the etiology of obesity as a food addiction may be more effective at reducing obesity stigma than the disease etiology, and more effective at building support for policies aimed at ameliorating obesity rates than the traditional obesity etiology or a control group.

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The Picture of Obesity: Prevalence, Projections and Consequences

The World Health Organisation (WHO, 2020) defines overweight and obesity as ‘abnormal or excessive fat accumulation that presents a risk to health’. Overweight and obesity in adults is most commonly measured by the Body Mass Index (BMI) which divides a person’s weight in kilograms by the square of their height in metres. A BMI between 25.0 and 29.9 classifies a person as overweight, while a BMI over 30 classifies as person as obese (WHO, 2020).

Globally, the WHO (2020) reveals that obesity rates have tripled since 1975 with 39% of the world’s adults (approximately 1.9 billion people) estimated to be overweight in 2016, and 13% of the world’s adults (approximately 650 million people) estimated to be obese. In New Zealand, 30.9% of the adult population were estimated to be obese at the most recent national health survey, which equated to 1.22 million adults (Ministry of Health, 2019). New Zealand is one of four OECD (Organisation for Economic Cooperation and Development) countries where more than 30% of the adult population classifies as obese, the others being the United States, Mexico and Hungary. Obesity has also increased in other OECD countries. More than 25% of the adult populations of Australia, Canada, Chile, South Africa and the United Kingdom (UK) classify as obese (Devaux et al., 2017). Increases in obesity are not confined to OECD countries either; 42% of Chinese adults were identified as overweight or obese in 2012, an increase of over 10% since 2002 (Wang et al., 2017).

The global increase in obesity has been attributed to increases in physical inactivity and the consumption of foods high in added fat and sugar (WHO, 2020). Unless these factors are addressed, the average New Zealand adult is projected to classify as obese by the mid-2030s (Wilson and Abbott, 2018). According to Wilson and Abbott (2018), a high BMI has already overtaken tobacco as the greatest single contributor to health loss in New Zealand. Such projections also exist for countries where the prevalence of obesity is similar to New

Zealand. The UK Government estimates that 60% of adults in the UK could classify as obese by 2050, resulting in an estimated seven-fold increase in direct healthcare costs. In Mexico, 88% of the adult male population and 91% of the adult female population are forecast to be either overweight or obese by 2050. More of the adult Mexican population are forecast to be obese rather than overweight by 2050, with 54% of the male and 57% of the female population expected to classify as obese (Rtveladze et al., 2014).

Obesity is a major risk factor for cardiovascular diseases which were the leading cause of death worldwide in 2012 (WHO, 2020). Obesity is also considered a major risk factor for hypertension, type 2 diabetes, musculoskeletal disorders such as osteoarthritis, some cancers (i.e., breast, prostate, liver, kidney and colon cancers), and a number of adverse psychological conditions including depression, anxiety and low self-esteem (Khaylis et al., 2010; WHO, 2020). In Mexico, the prevalence of diseases linked to obesity, in particular type 2 diabetes, cardiovascular disease and certain cancers, is expected to double by 2050 (Rtveladze et al., 2014). According to the UK Government, obesity is associated with a 50% higher risk of premature death in young adults, and up to 13 or eight years of life may be lost prematurely in males or females respectively (Butland et al., 2007).

Based on the current and projected prevalence of obesity and its associated consequences, it is clear that obesity is one of, if not the greatest health problem of our times. Improving our understanding of the etiology of obesity may help to improve the effectiveness of weight-loss interventions, for which there appears to be a clear and urgent need.

How Effective are Current Behavioural Interventions for Obesity?

As the prevalence of obesity increases, so too does the availability and variety of weight-loss interventions, the success of which are inconsistent, according to Halliday et al. (2019). Booth et al. (2014) conducted a meta-analysis to estimate the effectiveness of behavioural weight-loss interventions that focused on changing people's dietary intake and/or

physical activity levels. The interventions were delivered in primary care settings and included 15 randomised controlled trials with 4539 participants, and a minimum follow-up period of 12 months. The pooled results found a mean weight loss of 1.36kg at the 12-month follow-up measurement, and 1.23kg for the studies that included a 24-month follow-up measurement. Neither of these results met the threshold required to achieve clinically significant weight loss, equivalent to 5% or greater of total bodyweight.

A moderately high level of heterogeneity ($I^2 = 63.8\%$, $p < .01$) was raised as an issue in Booth et al's. (2014) analysis, which may reflect the variability in theoretical and methodological approaches used across different interventions. Three of the interventions used principles from social cognitive theory, another based its intervention on the transtheoretical model of behaviour change, and another reported using cognitive approaches with elements from other fields, including feminist theory. Of the methods that were used to facilitate behaviour change, self-monitoring was used in nine trials, followed by behavioural goal setting and barrier identification / problem solving, which were used in eight trials. Not only does a moderately high level of heterogeneity make it hard to determine which methods and theories may have been effective at producing weight loss, it suggests there may be a lack of understanding regarding the causes of obesity, and therefore how best to design and deliver interventions to address it.

Podina and Fodor (2018) argue that an exclusive reliance on one behavioural change technique, such as the increasingly popular motivational interviewing, may also impede the effectiveness of weight-loss interventions. According to Podina and Fodor (2018), behavioural weight-loss interventions need to do more than just help people to decide if and what they want to change, as is often the case with motivational interviewing, they must also provide people with the skills and tools to enact change. To test this, these authors conducted a meta-analysis of interventions that utilised at least two behavioural change techniques in

order to change people's dietary intake and/or physical activity levels. Using 47 randomised controlled trials with 15,349 participants, interventions were delivered in person or supported via e-health platforms such as the internet or phone. Like the Booth et al. (2014) analysis, Podina and Fodor's (2018) analysis also failed to find a clinically significant level of weight loss across the 47 trials. This suggests that the focus of the techniques used in the interventions may have been more of an issue than the quantity of techniques that were used.

While the results of these meta-analyses are somewhat uninspiring, it is important to note that the success of the interventions were measured primarily in weight loss, and the maintenance of weight loss over significant follow-up periods. Focusing only on weight loss means that positive health-related outcomes tend to be ignored. Such outcomes may include increases in lean body tissue and a reduction in blood pressure, which are common as people become more physically active. According to Halliday et al. (2019), weight loss and weight maintenance need to be differentiated because they involve different processes and health outcomes. Where initial weight loss may result from a reduction in overall body mass, the maintenance of weight loss requires people to overcome key metabolic, hormonal and cognitive adaptations that are fighting to achieve weight gain and resist weight loss.

An example of this is provided by Yoo (2003), who studied the reality television show *The Biggest Loser*. The show revolves around two fitness practitioners who direct obese contestants to adhere to a strict combination of vigorous exercise and restrictive diets in order to lose as much weight as possible in a fixed time period. Contestants typically lose large, clinically significant quantities of weight during each season of the show. However, that weight is usually regained by the majority of contestants in the years immediately after the show (Fothergill et al., 2016). Yoo (2003) notes that when weight-loss interventions focus exclusively on exercise and diet, then the crucial societal, biological and environmental

contributors to obesity are ignored, which limits the longer-term effectiveness of the interventions.

The exclusive focus on exercise and/or diet may be due to what Taubes (2013) refers to as a ‘conventional wisdom’ that has held since the 1950’s where obesity results from a net positive energy balance – people gain weight when they consume more calories than they expend. Consequently, efforts to address obesity focus on inducing a negative energy balance by consuming less food or exercising more. When the etiology of obesity is understood from this conventional wisdom, practitioners may not be encouraged to adapt interventions to also address the contributors that Yoo (2003) considers to be key.

The importance of these contributors have also been raised by the WHO (2020) and the OECD (Devaux et al., 2017). According to the WHO, individuals need to be supported through the sustained implementation of population-based policies that make regular physical activity and healthier diet choices available, easily accessible, and affordable to everyone. In its most recent Obesity Update, the OECD notes that of the OECD countries with the highest prevalence of obesity, only Mexico has implemented such policies. Improving interventions and embracing the policies recommended by the WHO and OECD may require the conventional wisdom regarding obesity to be challenged with alternative etiologies that encourage people to think differently about obesity. A focus of this study is to examine whether levels of support for policies aimed at addressing obesity change according to different obesity etiologies. Because New Zealand has acted to regulate the availability and promotion of tobacco and BMI has now overtaken tobacco as the greatest single contributor to health loss in New Zealand (Wilson and Abbot, 2018), one policy is of particular interest in this study. This policy asks participants whether they support foods high in added fat and sugar being regulated in the same way that tobacco is regulated.

Before the alternative obesity etiologies are discussed, another factor that may impede the effectiveness of obesity interventions will be addressed, namely obesity stigma.

Is Obesity Stigma a Significant Issue?

Negative attitudes towards, and beliefs about, people because of their weight is known as a weight bias, which manifests in stereotypes and/or prejudice towards people who are overweight or obese (WHO, 2017). According to the WHO, weight bias can lead to obesity stigma, which involves actions against people with obesity that can result in marginalisation, exclusion and discrimination in health care, education and employment settings. As the prevalence of overweight and obesity have increased, so too has the stigmatisation of overweight and obese people. Andreyeva et al. (2008) estimate that weight-based discrimination increased by 66% in the United States between the years 1995-1996 through 2004-2006, to become as, and in some cases more prevalent than race or age-based discrimination. When studying patterns of attitudinal change between 2007 and 2016, Charlesworth and Banaji (2019) found that implicit attitudes towards overweight and obese people worsened, in contrast to attitudes towards sexual orientation, race, skin tone, age and disability which either improved or showed no change. This was consistent with Latner et al. (2008) who found that bias towards 'fat' targets was significantly stronger than bias towards 'gay' or 'Muslim' targets amongst university students from New Zealand and the United States.

According to Puhl and Heuer (2010), as the stigmatisation of overweight and obese people has remained a socially acceptable form of bias, anti-fat attitudes and negative stereotypes towards obese persons have been frequently reported amongst teachers, physicians, nurses, medical students, psychologists, dieticians, family members, peer groups, co-workers and employers. Health care settings in particular have been found to be a significant source of obesity stigma. According to Puhl and Heuer (2010), stigmatisation in

these settings undermines the obese patient's chances of receiving effective care, as a key manifestation of obesity stigma is that practitioners tend to spend less time in appointments with, and provide less health education to, obese patients when compared to thinner patients.

As examples of the negative attitudes and stereotypes expressed towards overweight and obese people, 24% of Canadian nurses who took part in a nationally representative survey agreed or strongly agreed with the statement 'Caring for an obese patient usually repulses me' (Bagley et al., 1989). Tomiyama et al. (2015) found that health professionals and obesity researchers who attended a national obesity conference were more likely to describe 'fat' people as more lazy, stupid and worthless than 'thin' people. Puhl and Brownell (2001) cite findings from a range of studies that include: 28% of surveyed school teachers agreeing that 'becoming obese is one of the worst things that could happen to a person', 46% agreeing that 'obese persons are undesirable marriage partners for non-obese people', and 39% of general practitioners stating that their obese patients were 'lazy'.

Because of the association between obesity, diet and physical inactivity, weight-based stigmatisation amongst dietitians and fitness practitioners is of particular interest for this study. In a study that presented dietetic students with mock health profiles that varied only by the subject's gender or weight status (obese or non-obese), the students rated obese patients (whom they had never met) as less likely to comply with treatment, and more likely to have a poorer diet quality and health status than non-obese patients (Puhl et al., 2009). O'Brien et al. (2007) compared the anti-fat bias of psychology students with physical education (PE) students, many of whom become fitness practitioners after completing their studies. The study found that PE students displayed significantly higher levels of anti-fat bias than the psychology students, as well as many other health professionals. O'Brien et al. (2007) expressed concerns that such high levels of anti-fat bias might result in PE students being less

likely to help or encourage overweight or obese people as opposed to ‘normal’ weight people, if they eventually became fitness practitioners.

Puhl and Heuer (2010) note that there is a common perception whereby obesity stigma is justified on the grounds that it somehow motivates people to lose weight and adopt healthier behaviours. Numerous studies are cited by Puhl and Heuer (2010) that counter this perception, and show that the effects of weight-based stigmatisation are profoundly negative on those who experience it. For example, a longitudinal study into the effects of weight-based stigmatisation on 6157 residents in the United States found that experiencing weight-based discrimination increased the odds of people becoming obese by two and half times, and tripled the odds of people remaining obese (Sutin and Terracciano, 2013). Similar results were found in a longitudinal study of 2944 residents of England, where perceived weight discrimination amongst participants was associated with a significant increase in weight and waist circumference (Jackson et al., 2014). It was concluded from these studies that weight-based stigmatisation does not motivate people to lose weight, rather it promotes weight gain and the maintenance of obesity. Puhl and Luedicke (2012) provide insight into the relationship between discrimination and obesity. In a study of 1555 adolescents who had experienced weight-based victimisation at school, the authors found that overeating is a common emotion-regulation strategy where those who feel the stress of stigmatisation often cope by eating more, avoiding physical activity and binge eating.

Based on the negative effects of obesity stigma, it appears clear that reducing such stigma amongst practitioners will be important to improve the effectiveness of the weight-loss interventions they help to deliver.

Is Obesity an Issue of Personal Responsibility and Self-Control?

A key factor underlying obesity stigma, and a stable predictor of anti-fat attitudes, is the belief that bodyweight is controllable, with obesity believed to result from a lack of self-

control or willpower (Alperin et al., 2014, O'Brien et al., 2013). This belief is reinforced through avenues such as popular media. Yoo (2013) studied the outcomes of watching the reality television show *The Biggest Loser* on 684 undergraduate students at an American university. Yoo (2013) concluded that the show increases the viewer's belief that bodyweight is under personal control. In turn, this belief significantly predicts the belief that obesity is an issue of personal responsibility, which leads to the formation of anti-fat attitudes. When the show's contestants do not adhere to the restrictive diet and intense exercise regime that is prescribed to them, it is presented as a failure of the individual contestants, and not the intervention itself. This contributes to misperceptions regarding the controllability of bodyweight, which appear to be widespread. A nationally representative survey conducted by the National Opinion Research Centre (NORC, 2016), found that 75% of surveyed Americans believe that obesity results from a lack of willpower, from which the best treatments were believed to be taking personal responsibility, exercising, and going on a diet.

According to Brownell et al. (2010), the concept of personal responsibility has been central to current approaches to obesity, evokes the language of blame, weakness and vice, and is a leading basis for inadequate government efforts to address the environmental conditions that explain obesity. This assertion is supported by the OECD's most recent 'Obesity Update' where only Mexico, of the OECD countries with the highest prevalence of obesity, has enacted any of the recommended policies targeting the food environment (Devaux et al., 2017).

The food environment does appear to have a significant influence on obesity. Moss (2013) observes that billions of dollars are invested by the food industry into the development and manufacture of foods and drinks to deliver the optimal physiological reward to consumers upon consumption. This physiological reward then encourages further consumption, and is achieved by loading products with large quantities of sugar, salt and fat.

The consumption of these products is then cued by a disproportionate level of advertising and promotion. For example, researchers at the Yale Rudd Centre for Food Policy and Obesity found that in 2012, \$4.6 billion (US) was spent on advertising fast food in the United States, as opposed to \$367 million being spent on all advertising for fruit, vegetables, bottled water and milk (Harris et al., 2013). Disproportionate levels of fast food versus healthy food advertising and promotion have also been reported in other OECD countries, including New Zealand (Obesity Health Alliance, 2017, Obesity Health Alliance, 2018, New Zealand Ministry of Health, 2006). The effect of acute exposure to unhealthy food advertising was investigated in the meta-analysis of Boyland et al. (2016). The analysis revealed a small to moderate effect size (Standardised mean difference (SMD): 0.37, 95% CI [0.009, 0.65]). This suggests that such advertising does at least slightly increase the likelihood that people will eat more unhealthy food after they are exposed to it.

As self-control (or a perceived lack thereof) is commonly believed to be a key driver of obesity stigma, it is important to consider the validity of this belief. Milyavskaya and Inzlicht (2017) investigated the role of temptations and effortful self-control on goal pursuit and the cognitive state of depletion. A sample of 159 university students were followed during one semester. The study monitored the frequency of, and responses to, temptations that the students experienced that might conflict with the goals they had set for the semester. When students in the study were required to exercise self-control to resist temptation, they reported increased feelings of cognitive depletion, or fatigue. Even when the students were not required to exercise self-control, they reported the simple experience of temptation as cognitively depleting. The study found that people who generally experienced more temptations were less likely to achieve their goals than those who experienced fewer temptations. While not denying that self-control can be improved through training and practice, the authors suggested that removing the temptations available in a person's

environment is more important than trying to increase the person's self-control so that they are better equipped to resist those temptations.

Milyavskaya and Inzlicht's (2017) study fits with a limited resource model of self-control, where self-control is thought to 'run out' after prolonged use. Subsequent research (Milyavskaya and Inzlicht, 2018) suggests that self-control is affected by attentional focus and shifting goal priorities. Under the shifting priorities model of self-control, immediate goals such as satisfying hunger pangs may outweigh more distal goals such as losing weight. A person's attentional focus may shift towards satisfying an immediate goal and increase the subjective value of foods and drinks that may be immediately available. The abundance of unhealthy foods and drinks, and their disproportionate advertising and promotion, serve to shift people's attention to satisfying immediate goals such as hunger with the products that are most readily available. As such, reducing the availability and promotion of unhealthy foods and drinks through policies such as those recommended by the OECD (Devaux et al., 2017), and the WHO (2020) would appear to be more useful than ascribing problems with overweight and obesity to a lack of individual self-control.

The belief that overweight and obese people are lazy and lack self-control and willpower was challenged by Thomas et al. (2008), who explored the experiences of people living with obesity. All of the 76 participants in this qualitative study had attempted to lose weight numerous times. Most had tried a variety of approaches, often concurrently, which included commercial weight-loss programmes as well as pharmacological interventions. Whilst the participants often lost some weight on a particular programme, the inability to sustain weight loss often reinforced their feelings of failure, and resulted in many feeling depressed and angry. Participants often perceived the weight-loss interventions to be unrealistic, unsustainable, not suited to their lifestyles, and focused on food rather than people's behaviour. These responses support the assertion of Yoo (2003), that the crucial

societal, biological and environmental contributors to obesity are ignored when interventions focus exclusively on diet and exercise, in accordance with the traditional etiology of obesity.

Collectively, the studies of Milyavskaya and Inzlicht (2017; 2018) and Thomas et al. (2008) challenge the belief that a lack of self-control or willpower are significant contributors to obesity. A key focus of this study is to examine whether this belief can be influenced by presenting alternative obesity etiologies to a group of practitioners whose vocation involves helping people to lose weight.

Should Obesity be Considered as a Disease?

According to the World Obesity Federation (cited in Bray et al., 2017), when considered from an epidemiological perspective, obesity fits the definition of a chronic, relapsing, progressive disease, which is caused by an agent that adversely affects a host. In the case of obesity, foods with high energy density, as well as physical inactivity, act as the obesogenic agents. When these agents exist in abundance they interact with the genetic susceptibility of the host to produce a disease state that causes organ damage.

An editorial in *The Lancet Diabetes Endocrinology* (2017) argues that the prevalence of obesity is unlikely to be reduced until obesity is universally recognised as a chronic disease, and not as a lifestyle choice for which individuals are personally responsible. In the opinion of the editorial, governments will only take action to reduce the availability of obesogenic agents when there is recognition that agents exist, result in disease, and can be controlled. The editorial argues that at a population level, only governments can change the food environment through the implementation of taxes and the regulation of industries to control the availability and affordability of healthy and unhealthy food. Governments can also have a major impact on the built environment to encourage physical activity at a population level, improve access to affordable leisure facilities, and legislate for employers to reduce sedentary work practices. While prominent medical associations such as the American

and Canadian Medical Associations have recognised obesity as a disease, the governments of very few countries have done likewise.

Recognising obesity as a worldwide chronic disease pandemic that affects all ages, genders, cultures, races and ethnicities is crucial to achieve a number of important aims according to The Obesity Society (cited in Jastreboff et al., 2019). These aims include reducing stigma and discrimination directed towards people with obesity, countering the abundance of inappropriate and unscientific weight-loss products and claims, educating health care providers on the etiology of obesity, and advancing the view that managing obesity in clinical and community settings is a vocation worthy of effort and respect.

In terms of how the public view the classification of obesity as a disease, Puhl and Liu (2015) surveyed 1118 adults in the United States and found more support than opposition for the classification. Almost 60% of respondents agreed that the classification was an important step in helping people gain access to obesity treatments, and that more resources would be dedicated to research for obesity prevention and treatment. A majority (55%) of respondents agreed that the classification was an important step in acknowledging the complexity of obesity. Many respondents opposed the classification however. Concerns were cited that a disease classification might result in medical professionals relying too much on medications and surgery. Over 44% of respondents thought that a disease classification would shift the focus away from encouraging healthy diets and regular exercise, or addressing environmental factors such as the advertising and availability of unhealthy versus healthy foods. A full 35% of respondents thought that because so many diseases are difficult to cure, the classification would lead obese individuals to feel pessimistic about improving their health.

Concerns with the disease classification were also raised in a study by Hoyt et al. (2014). Participants in the study were required to read either a published article about the decision of the American Medical Association (AMA) to classify obesity as a disease, or an

information-based article highlighting tips and tools for managing bodyweight. Relative to the information-based article, the obesity as a disease article was associated with less importance being placed on health-focused dieting and exercise, and reduced concerns about bodyweight amongst obese individuals. Hoyt et al (2014) suggested that the disease classification encourages people to perceive that bodyweight is unchangeable, and therefore attempts to change one's weight are futile. This is thought to result in feelings of hopelessness and ultimately disengagement from attempts to regulate bodyweight amongst overweight and obese people.

Hoyt et al's. (2014) findings were reinforced in a series of subsequent studies where participants were again required to read either a short article about why the AMA categorised obesity as a disease, or about the capability of humans to change their weight (Hoyt et al., 2017). It was found that there was decreased blame and anti-fat prejudice directed towards obese people by participants who read either of these articles. However, the belief that weight is unchangeable was strengthened amongst participants who read about obesity as a disease. Through this mechanism, anti-fat prejudice actually increased as this belief leads people to think that there is little that can be done to change bodyweight, and therefore, there is little point trying to change one's own weight, or to help others change their weight. This effect has become known as the 'obesity stigma asymmetry model' (Hoyt et al., 2017).

Based on the experimental design employed by Hoyt et al. (2014, 2017), there is reason to be cautious with interpreting these findings, and the validity of the obesity stigma asymmetry model. When one group of participants reads about the changeability of weight it is reasonable to expect that group will view bodyweight as more changeable, than a group whose reading does not talk about weight being changeable. In relation to their findings, Hoyt et al. (2017) make two key points however. Firstly, people need to feel that it is possible to change their weight, and secondly, future messages regarding weight need to be designed to

not only decrease the blame ascribed to overweight and obese people, they must also encourage a belief that weight is changeable, regardless of how it is classified.

Should Obesity be Considered a Food Addiction?

An alternative to understanding the etiology of obesity as a disease is understanding obesity from the perspective of food addiction. According to Kenny and Johnson (2010), common hedonic mechanisms in the brain's reward circuits may underlie obesity and drug addiction in humans. When studying obese rats, Kenny and Johnson (2010) found that the excessive consumption of high-fat, high-sugar foods induced a state of reward hyposensitivity and the development of compulsive like eating behaviours. The underlying mechanism for this response was considered to be the down regulation of dopamine D2 neuro-receptors, occurring as a maladaptive response to a diet of highly palatable foods. This maladaptive response results in the consumption of progressively larger quantities of such foods in order to achieve the same level of physiological reward that smaller quantities initially provided. Kenny and Johnson (2010) note that similar patterns of deficits in striatal dopamine D2 signalling have been reported in humans addicted to drugs of abuse, such as cocaine or heroin. As Moss (2013) has observed, the food industry loads the foods and drinks they manufacture with extra sugar, salt and fat in order to make them as physiologically rewarding as possible. The repetitive consumption of those foods is then cued via advertising and promotion that is significantly disproportionate to the advertising of healthy foods (Harris et al., 2013).

Concerns have been raised that when obesity is presented as an addiction, the stigmatisation of overweight and obese people may be increased due to the negative beliefs and stereotypes that are associated with both obesity and addiction. Latner et al. (2014) addressed this concern in a study investigating the effects on stigma, blame and the perceived psychopathology of presenting food addiction as a causal model of obesity. Participants in the

study read a short article that explained obesity from either an addiction model or a non-addiction model. Participants then read a short vignette about an obese or 'normal' weight person. The study found that participants who read about the addiction model attributed less stigma and less blame to the obese person, than participants who read about the non-addiction model. Latner et al. (2014) concluded that presenting obesity as an addiction does not increase weight bias, and could actually help to reduce the widespread prejudice that exists against obese people.

The relationship between obesity stigma and beliefs concerning the etiology of obesity was also investigated in a study by Khan et al. (2018). The study involved 463 participants who evaluated a target person with obesity after reading about the etiology of obesity from a psychological, genetic, or behavioural perspective. The least amount of prejudice was elicited in participants when the etiology of obesity was presented from a genetic perspective. The greatest amount of prejudice was elicited when the etiology was presented from a behavioural perspective. Khan et al. (2018) observed that the differences in prejudice were a function of the control ascribed to the person's obesity, with a genetic etiology being associated with having low control, while higher control was ascribed to the target whose obesity was explained by behavioural causes. This supported an earlier study of Teachman et al. (2003) who found that higher levels of implicit anti-fat bias were produced, relative to controls, when study participants were informed that obesity is caused predominantly by overeating and a lack of exercise.

Just as substantial levels of public support were found for the classification of obesity as a disease (Puhl and Liu, 2015), 72% of 479 surveyed adults from Australia and the United States believed that an addiction to certain foods caused obesity (Lee et al., 2013). Lee et al's (2013) survey also found that 54% of respondents agreed that obesity should be treated as an addiction, and 80% believed that some foods could be as addictive as alcohol, nicotine and

cocaine. Only 25% of the respondents believed that diet was the most effective treatment for obesity, while 44% listed psychotherapy and counselling as the most effective treatments for food addiction. Schulte et al. (2016) found that a belief in food addiction was significantly associated with greater support for policies targeted at reducing obesity. These policies included subsidising gym memberships as well as fresh fruit and vegetables, making minimal amounts of physical activity compulsory in schools, supporting public service campaigns to advertise the addictive qualities of sugar and other processed foods, and restricting the type of foods that can be advertised to children. Schulte et al. (2016) provide a cautionary note however. They observe that, despite the addictive properties of nicotine being identified in the early 1980's, it took many years before policies were implemented to reduce smoking. As such, while there may be substantial public agreement that certain foods are addictive, history suggests that this may not translate into the rapid implementation of policies targeting the food environment.

Concerns that an addiction model of obesity, just like a disease model, might undermine people's belief in their ability to regulate their weight were also addressed by Lee et al. (2013). It was found that 55% of surveyed respondents believed that obese individuals retained control over their eating, as opposed to 36% of respondents who believed that obese individuals had no control. Lee et al (2013) concluded that supporting the food addiction model of obesity did not necessarily remove people's belief that weight is controllable.

When compared to the disease classification of obesity, there may be advantages to considering obesity from a food addiction perspective. While both demonstrate substantial public support, and are associated with a reduction in obesity stigma, it may be that a higher level of control over one's weight is ascribed to people when obesity is considered as a food addiction. In line with Khan et al's (2018) findings, this may be because addictions are perceived to have a more psychological etiology than diseases for which the etiology is

perceived to be more genetic. If this is the case, we might expect practitioners working in the weight-loss industries to allocate more of their time and energy to helping overweight and obese people when they view obesity as a food addiction. This allocation would be due to the perception that food addiction was more controllable, and therefore worthy of an investment of time and energy, than a disease, for which they may feel unable to have any positive impact on. Answering this question forms one of the hypotheses of the present study.

As well as examining the influence of different obesity etiologies on the AFA, and support for approaches addressing obesity of fitness practitioners, this study also examines the influence of various personal characteristics of those practitioners.

What Additional Factors Might Influence the Effectiveness of Interventions?

O'Brien et al (2007) highlight the social dominance orientation (SDO), self-identity and years spent in an environment that values physical attributes, as factors that may also contribute to obesity stigma and impede the effectiveness of weight-loss interventions. A person's SDO measures the extent to which they believe in group-based hierarchies and whether they see their in-group (a group with which they identify) as superior to out-groups (i.e., groups which they do not consider themselves to be a part of). High levels of SDO are thought to predict prejudicial and discriminatory behaviour towards out-groups (Pratto et al., 1994). In a physical education (PE) context, O'Brien et al found that high levels of SDO were positively associated with the AFA of PE students. As people with high SDO tend to be discriminatory in their allocation of resources to groups they consider to be inferior, the implication of this finding was that if PE students became fitness practitioners they would be less likely to provide attention, help or encouragement to overweight or obese people, than to 'normal' weight people.

O'Brien et al's (2007) study measured the AFA and SDO of PE students who were in either the second week of their first year or near the end of their third year of study. The AFA

were found to be higher in the third-year students than the first-year students. Where SDO was positively associated with one of three measures of AFA in the first-year students, it was positively associated with all three measures in the third-year students. O'Brien et al (2007) hypothesised that the PE student's belief in their superiority over obese individuals was reinforced over the duration of their studies, which occurred in a specific PE environment. In turn, O'Brien et al hypothesised that the increase in the students' SDO that occurred over the duration of the study may have contributed to the increase in their AFA.

O'Brien et al (2007) were also interested in the degree to which PE students identified with their in-group. According to the social identity theory of Tajfel and Turner (1979), greater identification with one's own group leads to more prejudice when the comparisons to another group are important (Brown, 2010). O'Brien et al. (2007) found that PE students displayed significantly higher levels of in-group identification than a comparative group of psychology students. This higher level of in-group identification amongst the PE students was associated with higher levels of anti-fat bias than were exhibited by the psychology students. O'Brien et al suggested that identifying as part of a group that values physical attributes and abilities may result in more negative beliefs and attitudes being held towards those whose attributes are perceived to run counter to their own

The influence of SDO, self-identity and years in practice, on the AFA and support for approaches aimed at reducing obesity amongst fitness practitioners will be explored in the present study.

The Present Study

One of the major focuses of this study is to determine if the anti-fat attitudes (AFA) of fitness practitioners can be significantly reduced by presenting the etiology of obesity as either a disease or a food addiction, as opposed to a traditional caloric imbalance. Rather than examining the impact of these different etiologies separately and across different samples as

previous studies have done, this study examines the impact of these etiologies all at once. Where previous studies have used students and members of the general public as participants, this study uses a sample of practitioners whose professional practice involves working with overweight and obese people. The attitudes of fitness practitioners are an important focus for such a study because, as O'Brien et al. (2007) observe, overweight and obese people are increasingly likely to be referred to fitness practitioners for help, because of the association between obesity and physical inactivity. The AFA of fitness practitioners have not been measured in previous studies although they are expected to be reasonably high, as PE students who often become fitness practitioners have recorded particularly high AFA (O'Brien et al., 2007).

As well as examining obesity stigma through AFA, the study also focuses on examining obesity stigma through the willingness of fitness practitioners to personally engage in approaches aimed at helping obese people. These approaches include a direct allocation of time to help obese people and support for policies targeting obesity at a societal level. This links to the major role of fitness practitioners which is to help people become more physically active, increase their consumption of healthy foods and reduce their consumption of unhealthy foods. As such, the fitness practitioner role typically covers both sides of the traditional energy balance equation: reducing calories consumed through diet, and increasing caloric expenditure through exercise. Based on the importance of the fitness practitioner role, the support of these practitioners for approaches aimed at reducing obesity is important to measure as they are likely to be consulted with in order to help governments shape policy development in this area.

Based on the review of literature, the study aimed to test the following major hypotheses:

Hypothesis 1: The AFA of fitness practitioners will be significantly lower when obesity is presented to them as a disease or a food addiction, as opposed to when it is presented as a traditional caloric imbalance.

Hypothesis 2: Fitness practitioners will allocate more time to help people with obesity when the etiology of obesity is presented to them as a food addiction, as opposed to a disease or caloric imbalance.

Hypothesis 3: Fitness practitioners will demonstrate more support for policy initiatives aimed at reducing obesity when the etiology of obesity is presented to them as a disease or a food addiction, as opposed to a caloric imbalance.

While not a major focus, the study also aimed to explore the influence of social dominance orientation (SDO), self-identity and years in practice, on the AFA and support for approaches aimed at reducing obesity, of fitness practitioners. Consequently, the study aimed to test the following exploratory hypothesis:

Hypothesis 4: The AFA of fitness practitioners will be higher amongst those who have practiced for longer, as well as those who have a higher SDO and who identify more strongly as fitness practitioners.

Method

Participants

Participants for the study came from two sources. The initial source was graduate students from two tertiary education organisations that deliver exercise-specific courses to adult students across New Zealand. These courses lead to qualifications that are approved by the New Zealand Qualifications Authority (NZQA), registered on the New Zealand Qualifications Framework (NZQF), and enable graduates to operate as fitness practitioners within New Zealand and overseas. The majority of these students pursue work as fitness

practitioners upon graduation. Email lists of eligible students were generated by staff of the respective organisations. The total number of people on these email lists were 4613.

With the expectation of a low response rate that might not generate the required number of participants for the study to achieve statistical significance, an additional source of participants was generated. This source came from a New Zealand company that specialises in providing fitness practitioners with tools and informational resources to assist them in their vocation, via a subscription-based website. As of January 2020, there were approximately 27,000 domestic and international subscribers to this website. Based on Internet Protocol (IP) addresses, an email list of 2918 New Zealand subscribers was generated as potential participants.

Of the 7531 total participants who were invited to take part in this study, 389 responses were recorded by the Qualtrics online platform that hosted the study. This equated to a response rate of 5.17%. The responses of 123 participants were eliminated because of insufficient completion of the study questionnaires. An additional four participants had their responses eliminated upon their own request (i.e., they indicated at the time of debrief that they did not wish to have their data included). A further 13 participants were eliminated because of failing both of the relevant manipulation checks within the study. This resulted in a final sample of 249 participants. Participants who completed the study went into a draw to win one of 12 vouchers (10 \$50 vouchers and 2 \$250 vouchers). The descriptive statistics of this sample are presented in Table 1.

The mean age of respondents was 37.49 years with a standard deviation of 10.6 years. The majority of participants were female (59.8% versus 40.2%). 81.8% of participants had worked as fitness practitioners for at least one year, 22% of those having worked for more than 10 years. A quarter (24.5%) of participants were not currently working as fitness

practitioners, and 44.6% of those who were working spent fewer than 20 hours per week working as fitness practitioners.

The majority of participants identified as New Zealand European (75.1%), 20.1% identified as New Zealand Māori and 13.7% identified their ethnicity as ‘other’ (participants were able to identify with more than one ethnic group). Participants tended to be qualified: 94.3% identified as currently holding an exercise qualification, while only 5.7% identified as currently studying towards an exercise qualification. The mean BMI of the participants was 26.28, which is categorised as overweight. In comparison, by self-categorisation, the majority of participants (63.8%) identified their BMI as a healthy weight, while only 28% identified themselves as overweight and another 7.3% categorised themselves as obese. While the actual BMI of participants in the sample was consistent with the New Zealand population, where the majority of adults are identified as either overweight or obese (Ministry of Health, 2019), the self-categorisation of BMI was not consistent with the wider New Zealand population.

Table 1
Descriptive Statistics of the Sample

	<i>n</i>	<i>% or M</i>	<i>SD</i>
Age (years)	249	37.49	10.60
Gender			
Female	149	59.80%	
Male	100	40.20%	
Ethnicity			
NZ European	187	75.10%	
NZ Māori	50	20.10%	
Samoan	11	4.40%	
Cook Island Māori	2	.80%	
Tongan	1	.40%	
Niuean	3	1.20%	
Chinese	2	.80%	
Indian	0	.00%	
Other	34	13.70%	
Study Status			
Achieved exercise qualification	233	94.30%	
Studying towards qualification	14	5.70%	
Years as a fitness practitioner (FP)			
Less than 1 year	45	18.30%	
1-2 years	31	12.60%	
2-3 years	18	7.30%	
3-4 years	25	10.20%	
4-5 years	22	8.90%	
5-6 years	16	6.50%	
6-7 years	13	5.30%	
7-8 years	9	3.70%	
8-9 years	4	1.60%	
9-10 years	9	3.70%	
More than 10 years	54	22.00%	
Hours currently working as FP (per week)			
0 hours	61	24.50%	
1-10 hours	61	24.50%	
11-20 hours	50	20.10%	
21-30 hours	37	14.90%	
31-40 hours	25	10.00%	
More than 40 hours	15	6.00%	
Body Mass Index (BMI)	245	26.28	4.84
Self-identification of BMI			
Below 18.5 'Underweight'	2	.80%	
18.5-24.9 'Healthy weight'	157	63.80%	
25-29.9 'Overweight'	69	28.00%	
Over 30 'Obese'	18	7.30%	

Design

The study used a between-subjects design to examine the differences in anti-fat attitudes (AFA) and support for approaches aimed at addressing obesity between participants who were randomly assigned to one of four experimental groups. The influence of social dominance orientation (SDO), self-identity, and the number of years worked as a fitness practitioner were also measured as covariates. Based on the participant numbers used in previous studies that have investigated the relationship between obesity stigma and different obesity etiologies (Hoyt et al, 2014; 2017, Latner et al, 2014), it was determined that a minimum of 200 participants were required (50 per group). The study achieved this with a total sample size of 249. More than 50 participants were randomly assigned to each group. The groups differed according to the study manipulation their group was presented with.

Manipulation

The manipulations used in the study consisted of four short articles of equivalent length that presented the etiology of obesity from: 1) a traditional perspective, 2) a disease perspective, or 3) a food addiction perspective. The fourth article (the control condition) discussed sales techniques for fitness practitioners. To increase the perception of credibility, the articles were presented in a style akin to articles in scientific journals. Each article was accompanied with two multiple choice questions, which served as manipulation checks as well as reminders of the key points from each reading. The questions followed an identical format for all four manipulations (see Appendix C – ‘Manipulations and manipulation checks’).

Measures

A questionnaire was designed and hosted using the Qualtrics online survey software platform (<https://www.qualtrics.com>). First, participants were asked to provide demographic information. This was followed by measures of social dominance orientation (SDO) and self-

identity. Post-manipulation, participants completed measures on explicit anti-fat attitudes, the allocation of personal training (PT) sessions, and support for obesity-related policy initiatives (see Appendix C for all of the measures used in the study).

Demographic information. Participants were asked to identify their age, gender (male, female, other), height, weight, and ethnicity. Self-reported height and weight were used to compute BMI (weight/height²). The ethnic groups that participants were able to choose from were based on the 2018 New Zealand Census (New Zealand, Stats NZ, 2018). In terms of questions specific to fitness practitioners, participants were asked about their current study status with regard to exercise qualifications, how many years they had been a fitness practitioner for, and how many hours per week they spent working as a fitness practitioner. Participants were also asked to identify which BMI category they felt provided the best description of their bodyweight.

Social dominance orientation (SDO). A shortened SDO scale was developed by Pratto et al. (2013), and used in this study. This scale consists of four statements that participants indicate their level of agreement to on a Likert scale of 1 (extremely oppose) to 10 (extremely favour). An example statement is: 'Superior groups should dominate inferior groups'. The Cronbach's alpha of the scale in the current study was found to demonstrate poor internal consistency ($\alpha = .57$).

Self-identity. The four-item 'identity' subscale of Luhtanen and Crocker's (1992) collective self-esteem scale was used to assess the extent to which identifying as a fitness practitioner was central to the participants' sense of themselves. The items are scored on a Likert scale of 1 (strongly disagree) to 7 (strongly agree), and consist of generic statements such as: 'The social groups I belong to are an important reflection of who I am'. These statements were adapted to be specific to fitness practitioners. For example, the previous

statement became: 'Being a fitness practitioner is an important reflection of who I am'. The identity subscale was found to demonstrate acceptable internal consistency ($\alpha = .74$).

Allocation of personal training (PT) sessions. Based on Tajfel's (1970) minimal group paradigm, a measure was designed that asked participants to allocate PT sessions to four hypothetical clients. To avoid potential gender or age bias, the hypothetical clients were all female, ranging in age from 44 to 51. They were all described as having 'white-collar' occupations (i.e., General Practitioner, University Professor, Critical Care Nurse, and High School Principal). Two of the hypothetical clients had a BMI over 30 (i.e., 34 and 35, respectively) which rates them as being obese, while two had a BMI in the normal weight range (i.e., 22 and 23, respectively). Participants were asked to allocate either 9, 7, 5 or 3 PT sessions to the hypothetical clients. Means were computed for the PT sessions allocated to the obese, and healthy-weight clients across the study groups. A mean was also computed for the difference in PT session allocation to obese versus healthy-weight clients, across the study groups.

Explicit anti-fat attitudes (AFA). Crandall's (1994) 13-item explicit anti-fat attitudes (AFA) questionnaire was used to assess the anti-fat attitudes of participants as a predictor of obesity stigma. This measure is made up of the Dislike, Fear of Fat, and Willpower subscales. An individual's dislike of fat people is assessed in the Dislike subscale which consists of seven statements such as: 'I really don't like fat people much'. Personal concerns about weight and gaining weight are assessed in the Fear of Fat subscale which consists of three statements such as: 'I feel disgusted with myself when I gain weight'. Belief in the controllability of weight is assessed in the Willpower subscale which consists of three statements such as: 'Some people are fat because they have no willpower'. The participants' agreement or disagreement with the statements are scored on a Likert scale ranging from 1 (very strongly agree) to 9 (very strongly disagree). Means were computed for each of the

subscales across the study groups. The Cronbach's alphas' for each of the subscales were found to demonstrate internal consistency that ranged from good ($\alpha = .85$, Dislike), ($\alpha = .82$, Fear of Fat), through to acceptable ($\alpha = .63$, Willpower).

Support for obesity policy initiatives (SOPI). Seven items were adapted from Schulte et al's. (2016) 13 item SOPI questionnaire to measure the participants' support for policy initiatives aimed at reducing obesity. Four of the seven items related specifically to initiatives targeting the food environment and consisted of statements such as: 'The government should treat foods and drinks that are high in added fat and sugar the same way it treats tobacco – ban all advertising, and require plain packaging for all products'. Two items related to the subsidisation of active treatments for obesity and consisted of statements such as: 'The government should use taxpayer dollars to subsidise the services of fitness practitioners for people who are classified as obese'. One item related to the subsidisation of passive treatments for obesity such as bariatric surgery and drug-based treatments. The participants' level of agreement with the initiatives were scored on a six-point Likert scale ranging from 0 (strongly disagree) to 5 (strongly agree). Means were computed for the food environment, and the active and passive treatment sub-groupings. The Cronbach's alphas' demonstrated acceptable internal consistency ($\alpha = .61$, Food Environment), ($\alpha = .68$, Active Treatments).

Procedure

Prior to commencing data collection, approval for the study was sought and gained from the University of Canterbury Human Ethics Committee. Once ethics approval had been gained, email lists of prospective participants were generated. To protect the anonymity of participants, the researcher was not provided with these lists, which remained the property of the organisations that the participants originated from. The generation of lists included the elimination of any duplicate identities. Prospective participants were sent an invitation to take

part in the study via bulk emails from the respective mailchimp (<https://mailchimp.com>) accounts of the organisations the participants originated from (see Appendix A).

One reminder email was sent to each group of potential participants approximately one week after the initial email. An invitation to take part in the study was also posted on the Facebook page of the primary source of the participants. To minimise the chances of non-eligible people taking part, this invitation was targeted to only reach the Facebook accounts of those potential participants with an email address that also appeared on the respective email list.

The invitation email invited potential participants to take part in a study investigating ‘how well fitness practitioners understand their clients’. Interested participants then clicked on a link in their invitation email (or Facebook message) which took them to the online Qualtrics site that hosted the study. Before beginning the study, participants read an information sheet informing them about the purpose of the study (see Appendix B). Deception was used to deter participants from learning the real purpose of the study in order to minimise socially desirable responding.

Participants were directed to complete the demographic, SDO and self-identity measures first (see Appendix C – ‘Pre-manipulation measures’). Following this, participants were randomly assigned to one of the four study manipulations. After reading the respective manipulation article and completing the manipulation checks, participants were required to complete the measures of allocation of PT sessions, explicit anti-fat attitudes, and support for obesity policy initiatives (see Appendix C – ‘Post-manipulation measures’). Upon completion of these measures, participants were presented with a comprehensive debrief which revealed the true aims of the study, and explained why a deception was used (see Appendix D).

Participants were then presented with an option to provide consent to have their data used in the study, or to request that their data was not used. Regardless of whether or not

participants consented to their data being used, they were all invited to enter the prize draw for the vouchers. To enter the prize draw, participants clicked on a link to a separate Qualtrics survey page where they entered their email addresses. This was done to protect the anonymity of participants by ensuring that the email addresses could not be linked to their previous responses to the study questionnaires.

Data Analysis

IBM SPSS (Statistical Product and Service Solutions) versions 25 and 26 were used for the descriptive and inferential analyses. Prior to the results being established, the imported data from the Qualtrics questionnaires was prepared for analysis. This involved re-scoring negatively worded items in the SDO, self-identity and AFA measures.

To determine the internal consistency of the Likert scale measures used in the study, their Cronbach's alpha scores were computed. In general, the measures used in this study demonstrated acceptable or good internal consistency. However, the measure of SDO demonstrated poor internal consistency ($\alpha = .57$). Removal of item two from this measure increased its alpha to .63. Because this had no impact on the data analysis, the full four item SDO measure was used in the data analysis. Because of the low reliability of this measure however, all findings relating to SDO are to be interpreted with a degree of caution.

To test the study hypotheses, a variety of statistical measures were used. The Pearson product-moment correlation coefficient was used to measure the strength of relationship between the study measures. One-way analysis of variance (ANOVA) was used to measure differences in AFA, allocation of PT sessions and support for obesity policy initiatives, across the study groups. Analysis of covariance (ANCOVA) measured the influence of SDO, self-identity, and years as a fitness practitioner on the AFA, allocation of PT sessions and support for obesity policy initiatives of the study groups.

Results

Correlational Analysis

The results of the correlational analyses are presented in Table 2. Of particular interest were the relationships between social dominance orientation (SDO), self-identity and years worked as a fitness practitioner (FP), on the participants anti-fat attitudes (AFA), allocation of personal training (PT) sessions and support for obesity policy initiatives (SOPI).

One small positive correlation was found between years of practice and AFA; participants who had been in practice longer scored higher on the Dislike subscale of the AFA. One small negative correlation was found between years of practice and SOPI; participants who had been in practice longer showed less support for subsidising medical treatments for obesity. Self-identity was positively associated with age, and negatively associated with BMI and the self-identification of BMI. While these associations were all weak, they suggest that identifying as a fitness practitioner is more important for older practitioners, and that identifying as a fitness practitioner is less important for practitioners with higher BMI's.

An association of moderate strength was found between SDO and the AFA Dislike subscale. Weak associations were found between SDO and the Fear of Fat, and Willpower subscales. This suggests that fitness practitioners with higher SDO are more likely to demonstrate a greater dislike of fat people, more fear of fat, and a stronger belief that people who are fat, lack willpower. Weak, negative associations were found between SDO and SOPI targeting the food environment, and the difference in allocation of PT sessions that favoured obese versus healthy-weight people. This suggests that the practitioners with higher SDO would be less likely to support policy initiatives targeting the food environment, and would allocate fewer PT sessions to help obese people, as opposed to healthy-weight people.

Because age correlated with years worked as a FP, self-identity and SOPI aimed at subsidising active treatments for obesity, and gender correlated with the AFA Willpower subscale and the difference in allocation of PT sessions, the influence of age and gender were also considered as covariates during hypothesis testing.

Table 2

Pearson Product-Moment Correlation Matrix for Demographic and Study Measures

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Age	-														
2. Gender	.03	-													
3. Years as a FP	.40***	-.08	-												
4. Hours as a FP	.08	-.06	.32***	-											
5. BMI self- identification	-.05	-.11	-.06	-.08	-										
6. BMI	-.08	-.26***	-.12	-.03	.66***	-									
7. SDO	-.01	-.12	.17	.02	.08	.03	-								
8. Self-identity	.19**	.15*	.01	.12	-.13*	-.13*	-.07	-							
9. AFA Dislike	.06	-.10	.15*	.04	-.02	-.05	.34***	.02	-						
10. AFA Fear of Fat	.02	.05	.01	-.12	.06	.08	.15*	.00	.33***	-					
11. AFA Willpower	.01	-.20**	.02	-.05	-.06	.04	.14*	.04	.36***	.32***	-				
12. Allocation of PT sessions (difference)	.03	.16*	-.02	.01	-.02	-.10	-.15*	.12	-.03	-.06	.01	-			
13. SOPI Environ	.05	.08	.00	-.01	-.07	.03	-.14*	.07	-.07	.01	-.05	.06	-		
14. SOPI Active	.15*	.06	.07	.09	.03	.06	-.10	.04	-.11	-.05	-.13*	-.01	.42**	-	
15. SOPI Passive	.10	-.02	-.16*	-.08	.16**	.16*	-.05	.08	-.14*	.02	-.09	.00	.19**	.38**	-

* $p < .05$. ** $p < .01$. *** $p < .001$.

Hypothesis Testing

Obesity etiology and anti-fat attitudes (Hypothesis 1 and 4)

To test whether presenting the different obesity etiologies would be associated with lower AFA, a one-way analysis of variance (ANOVA) was used to compare the means of the experimental groups. The descriptive statistics for the experimental groups are presented in Table 3.

There were no statistically significant differences found between the group means for the Dislike subscale, $F(3, 245) = .34, p = .80, \eta_p^2 < .01$, or the Fear of Fat subscale, $F(3, 245) = 2.02, p = .11, \eta_p^2 = .02$. A statistically significant difference was found between the group means for the Willpower subscale, $F(3, 245) = 3.75, p = .01, \eta_p^2 = .04$. Post-hoc comparisons using the Tukey HSD test indicated that the mean score of the AFA willpower subscale was significantly lower for the addiction etiology group ($M = 4.89, SD = 1.45$) than the disease etiology group ($M = 5.76, SD = 1.61$). No significant differences were found between any of the other groups on the Willpower subscale.

The analyses were re-run, including age, gender, SDO, self-identity and years as a fitness practitioner as covariates. Including covariates did not change the results, hence only the original analyses are presented.

Table 3

Descriptive Statistics for Measures of Explicit Anti-Fat Attitudes (AFA) across Experimental Groups

		<i>n</i>	<i>M</i>	<i>SD</i>
AFA Dislike Subscale	Addiction Etiology	73	2.50	1.49
	Traditional Etiology	67	2.43	1.12
	Disease Etiology	55	2.62	1.35
	Control Group	54	2.38	1.23
	Total	249	2.48	1.31
AFA Fear of Fat Subscale	Addiction Etiology	73	4.56	2.07
	Traditional Etiology	67	4.66	2.08
	Disease Etiology	55	5.41	2.04
	Control Group	54	4.80	2.11
	Total	249	4.83	2.09

AFA Willpower Subscale	Addiction Etiology	73	4.89 ^a	1.45
	Traditional Etiology	67	5.40 ^{ab}	1.53
	Disease Etiology	55	5.76 ^b	1.61
	Control Group	54	5.20 ^{ab}	1.39
	Total	249	5.29	1.52

Groups that do not share superscripts were statistically different at the $p < .05$ level.

Obesity etiology and allocation of personal training sessions (Hypothesis 2 and 4)

The descriptive statistics for the allocation of personal training (PT) sessions across the experimental groups are presented in Table 4. Significantly more PT sessions were allocated to the obese clients ($M = 7.47$, $SD = 1.08$), than the healthy-weight clients ($M = 4.53$, $SD = 1.08$), $t(248) = 21.45$, $p < .01$, $d = 1.36$. A one-way ANOVA found no statistically significant differences between the experimental groups for this pattern of allocation, which favoured the obese clients, $F(3, 245) = 2.09$, $p = .10$, $\eta_p^2 = .03$.

The analyses were re-run, including age, gender, SDO, self-identity, and years as a fitness practitioner as covariates. This revealed a significant difference in the pattern of allocation across the experimental groups, $F(3, 245) = 2.83$, $p = .04$, $\eta_p^2 = .04$. When compared to the control group, the addiction, $t(245) = 2.42$, $p = .02$, $\eta_p^2 = .02$, traditional, $t(245) = 2.55$, $p = .01$, $\eta_p^2 = .03$, and disease, $t(245) = 2.27$, $p = .02$, $\eta_p^2 = .02$ etiology groups all allocated significantly more PT sessions to the obese clients as opposed to the healthy weight clients.

Table 4

Descriptive Statistics for Allocation of Personal Training (PT) Sessions across Experimental Groups

		<i>n</i>	<i>M</i>	<i>SD</i>
Sessions allocated to obese clients	Addiction Etiology	73	7.56	.93
	Traditional Etiology	67	7.58	1.02
	Disease Etiology	55	7.52	1.02
	Control Group	54	7.15	1.35
	Total	249	7.47	1.08
Sessions allocated to healthy-weight clients	Addiction Etiology	73	4.44	.93
	Traditional Etiology	67	4.42	1.02
	Disease Etiology	55	4.47	1.02

	Control Group	54	4.85	1.35
	Total	249	4.53	1.08
Difference in sessions allocated to obese vs healthy-weight clients	Addiction Etiology	73	3.12 (*3.13)	1.86 (**.25)
	Traditional Etiology	67	3.16 (*3.21)	2.03 (**.27)
	Disease Etiology	55	3.05 (*3.12)	2.03 (**.29)
	Control Group	54	2.30 (*2.19)	2.70 (**.29)
	Total	249	2.94	2.17

*Estimated marginal means after ANCOVA, **Standard error after ANCOVA

Obesity etiology and support for obesity policy initiatives (Hypothesis 3 and 4)

The descriptive statistics showing the experimental groups support for obesity-related policy initiatives are presented in Table 5. With total means above three, participants tended to agree with policy initiatives targeting the food environment ($M = 3.59$, $SD = .89$) and advocating for increased subsidisation of active treatments for obesity ($M = 3.57$, $SD = 1.09$). Conversely, with total means below three, participants tended to disagree with a policy advocating for increased subsidisation of passive treatments for obesity ($M = 2.33$, $SD = 1.41$).

One-way ANOVA's found no statistically significant differences between the group means in support of policies targeting the food environment, $F(3, 245) = .73$, $p = .53$, $\eta_p^2 < .01$ or funding for passive treatments such as bariatric surgery, $F(3, 244) = .96$, $p = .41$, $\eta_p^2 = .01$. A statistically significant difference was found between the group means for policies aimed at increasing funding for active treatments for obesity such as personal training (PT), and/or psychological treatments, $F(3, 245) = 3.07$, $p = .03$, $\eta_p^2 = .04$. Post-hoc comparisons using the Tukey HSD test indicated that the mean score for the addiction etiology group ($M = 3.69$, $SD = 1.00$) was significantly higher than the mean score for the control group ($M = 3.18$, $SD = 1.22$). No statistically significant differences were found between any of the other groups in relation to active treatments for obesity.

At an individual policy level, a statistically significant result was found between the group means for policy 1, $F(3, 245) = 2.68$, $p = .048$, $\eta_p^2 = .03$. This policy advocated for

treating foods high in added sugar and fat in the same way that tobacco is treated. Post-hoc comparisons using the Tukey HST test indicated that the mean score for the addiction etiology group ($M = 3.84$, $SD = 1.38$) was significantly higher than the mean score for the traditional etiology group ($M = 3.19$, $SD = 1.55$). No statistically significant differences were found between any of the other groups for this policy.

The analyses were re-run, including age, gender, SDO, self-identity and years as a fitness practitioner as covariates. Including covariates did not change the results, hence only the original analyses are presented.

Table 5
Descriptive Statistics measuring Support for Obesity Policy Initiatives (SOPI) across Experimental Groups

		<i>n</i>	<i>M</i>	<i>SD</i>
Food Environment (Policies 1,2,5 and 6)	Addiction Etiology	73	3.71	.88
	Traditional Etiology	67	3.56	.94
	Disease Etiology	55	3.55	.91
	Control Group	54	3.49	.80
	Total	249	3.59	.89
Active Treatments (Policies 3 and 4)	Addiction Etiology	73	3.69 ^a	1.00
	Traditional Etiology	67	3.63 ^{ab}	1.07
	Disease Etiology	55	3.70 ^{ab}	1.03
	Control Group	54	3.18 ^b	1.22
	Total	249	3.57	1.09
Passive Treatments (Policy 7)	Addiction Etiology	73	2.44	1.37
	Traditional Etiology	67	2.43	1.43
	Disease Etiology	55	2.31	1.49
	Control Group	54	2.06	1.37
	Total	249	2.33	1.41

Groups that do not share superscripts were statistically different at the $p < .05$ level.

Discussion

Summary of Findings

The main purpose of the present study was to investigate the effects of presenting obesity as a food addiction or a disease as opposed to a traditional caloric imbalance, on anti-fat attitudes (AFA) and support for approaches addressing obesity on a cohort of fitness practitioners. Participants took part in an online study where they were randomly assigned to

one of four experimental conditions and completed a variety of study measures. Each group read a short article about the etiology of obesity as either a food addiction, disease, or traditionally accepted caloric imbalance. Participants in a fourth condition acted as a control group and read about sales tactics.

The major hypotheses of the study were that: 1) presenting obesity as a food addiction or a disease, as opposed to a traditional caloric imbalance, would be associated with lower AFA, 2) more personal training (PT) sessions would be allocated to help people with obesity when obesity was presented as an addiction, as opposed to a disease or a caloric imbalance, and 3) there would be greater support for policy initiatives aimed at reducing obesity when obesity was presented as a food addiction or a disease, as opposed to a caloric imbalance. A fourth hypothesis was explored that: the AFA of fitness practitioners would be higher if they had practiced for longer, identified more strongly as fitness practitioners, and had a higher social dominance orientation (SDO).

Partial support was found for the third and fourth hypotheses. Practitioners in the food addiction group displayed more support than those in the control group for policy initiatives aimed at increasing public funding for active obesity treatments such as psychological treatments and/or PT. Additionally, practitioners in the food addiction group displayed more support than practitioners in the traditional group for a policy aimed at regulating foods high in added sugar and fat, in the same way that tobacco is regulated. Higher SDO scores were associated with higher scores on each of the AFA subscales. It was also found that working for longer as a fitness practitioner was associated with higher scores on the AFA Dislike subscale.

While the first and second hypotheses were not supported, two interesting results were found. On the AFA Willpower subscale, a significant difference was found between the food addiction and disease groups. The AFA of fitness practitioners were found to be lower

in the food addiction group, and higher in the disease group. In the PT session allocation measure, it was found that all of the obesity etiology groups allocated significantly more PT sessions to obese clients than the control group when the covariates age, gender, SDO, self-identity and years as a fitness practitioner were controlled for.

Obesity Etiology and Anti-Fat Attitudes

To the best of the author's knowledge, the present study provides the only example (to date) that examines the impact of the food addiction, disease and traditional etiologies of obesity all at once, on the AFA of a group of practitioners whose vocation is seen as increasingly important at addressing obesity. While the AFA of practitioners in the food addiction or disease etiology groups were not found to be significantly different to practitioners in the traditional or control groups, a significant difference in AFA was found between practitioners in the food addiction and disease etiology groups. Significantly lower scores were recorded by practitioners on the AFA Willpower subscale when the etiology of obesity was presented as a food addiction, as opposed to a disease. This result is consistent with Latner et al. (2014), who found that less stigma and blame were ascribed to target vignettes when obesity was explained from an addiction model as opposed to a non-addiction model. The non-addiction model used by Latner et al. (2014) simply opposed the claims of the addiction model. Additionally, the concerns of Hoyt et al. (2014; 2017) that classifying obesity as a disease may actually increase obesity stigma, are validated by the finding that scores on the AFA Willpower subscale were highest in the disease etiology group.

The results of the present study were not consistent with Khan et al. (2018) and Teachman et al. (2003) who found that the greatest amount of anti-fat bias was attributed to a traditional behavioural etiology of obesity, and the least amount to a genetic etiology. The results also contradict The Obesity Society's assertion (as presented by Jastreboff et al., 2019) that obesity must be recognised as a disease in order to reduce stigma and

discrimination towards overweight and obese people, and shift public perceptions away from the view that obesity is a lifestyle choice.

While a debate currently exists in the medical and psychological communities regarding whether or not addictions classify as diseases, this study indicates that a food addiction etiology is perceived by fitness practitioners to be distinctly different than a disease etiology. Because diseases are perceived to be less controllable, explaining obesity as a disease may provide a cognitive dissonance to practitioners whose roles involve helping people to lose weight, especially if those practitioners have experienced some degree of subjective success while helping people to lose weight. The higher scores on the AFA Willpower subscale among the disease group may represent a rejection of the disease etiology of obesity if it is perceived as an excuse used to justify people not attempting to lose weight. The disease etiology may also be perceived as an excuse used to justify an increased reliance on passive treatments such as bariatric surgery and pharmacotherapies, as opposed to more active treatments such as personal training and/or psychological therapies.

In contrast, presenting the etiology of obesity as a food addiction may resonate with fitness practitioners and provide an explanation that encourages consideration of the food environment, and helps practitioners to empathise with, and understand, the challenges people face when trying to lose weight. Improving the ability of practitioners to understand and empathise with those who struggle to lose weight may explain the lower AFA Willpower scores of the food addiction group, as opposed to the disease etiology group.

Obesity Etiology and Allocation of Personal Training Sessions

Fitness practitioners in this study allocated significantly more personal training (PT) sessions to the obese clients as opposed to the healthy-weight clients. When the covariates age, gender, social dominance orientation (SDO), self-identity and years in practice were controlled for, practitioners in the food addiction, disease and traditional obesity etiology

groups allocated significantly more PT sessions to the obese clients. This provided partial support for Puhl and Liu (2015), who found that a majority of the public agreed that classifying obesity as a disease would result in doctors spending more time talking to patients about their weight. Partial support was also provided for Lee et al. (2013), who found that the majority of the public believe that obese persons retain control over their eating when obesity is presented as a food addiction. If people are perceived to have control over their eating, then allocating resources to help them lose weight is likely to be considered a worthy investment. However, because practitioners in the traditional etiology group also allocated more PT sessions to the obese clients, this suggests that simply reading about obesity may have prompted participants in all of the obesity etiology groups to allocate more sessions to the obese clients. This point will be discussed further with regard to the limitations of the study.

The allocation of more PT sessions to obese clients did not support O'Brien et al's (2007) concerns that the AFA and SDO of physical education (PE) students would result in them allocating less help to obese people if they became fitness practitioners. While the SDO of the fitness practitioners was positively associated with each of the AFA subscales, and negatively associated with the allocation of PT sessions to the obese clients, these associations were weak, and the SDO measure lacked reliability. It must also be noted that the fitness practitioners in this study were not sourced from the PE programme that was used in O'Brien et al's study, and the AFA of the fitness practitioners was lower than the PE students.

Puhl and Heuer's (2010) observation that obesity stigma manifests in health practitioners spending less time in appointments and providing less health education to obese, as opposed to thinner, patients is also not supported. Despite the disease etiology group recording significantly higher AFA on the Willpower subscale than the food addiction group, this did not translate to the disease etiology group allocating fewer PT sessions to the obese

clients. Consistent with this finding, the obesity stigma asymmetry model of Hoyt et al. (2017) was also not supported as practitioners in the disease etiology group allocated more, rather than fewer, PT sessions to the obese clients as opposed to the healthy-weight clients.

Regarding the allocation of PT sessions, the most obvious interpretation is that presenting the etiology of obesity as a disease or a food addiction didn't affect the perceived controllability of bodyweight amongst fitness practitioners. Consequently, equivalent numbers of PT sessions were allocated to the obese clients across the different obesity etiology groups. This allocation favoured the obese over the healthy-weight clients. This simplistic interpretation ignores important contextual and methodological factors however. One of the most common reasons for people to join fitness centres and use the services of fitness practitioners is to help them lose weight. As fitness practitioners often work as independent contractors, overweight and obese people are seen as an obvious group who could benefit from a fitness practitioner's guidance, and provide a source of clients for the practitioner's businesses. In this context, the preferential allocation of PT sessions to obese clients across the experimental groups may simply represent standard professional practice, where those whose need is seen as greatest, receive greater assistance. Issues with this measure will be discussed further with regard to the limitations of the study.

Obesity Etiology and Support for Obesity Policy Initiatives

Across the experimental groups, fitness practitioners tended to agree with policy initiatives targeting the food environment, and supporting active treatments for obesity such as psychological therapies and personal training (PT). Agreement with these policies is consistent with the directives of the WHO (2020) and the OECD (Devaux et al., 2017). It is also consistent with the research of Milyavskaya and Inzlicht (2017; 2018) who suggest that reducing the availability and promotion of unhealthy food means that people do not have to work as hard to resist the temptation, or keep their attention focused on distal goals such as

weight loss, when a proliferation of unhealthy food dominates the food environment.

Regardless of experimental groups, fitness practitioners also tended to disagree with policies advocating for an increase in funding for passive treatments such as bariatric surgery or pharmacotherapies. This finding appears to be consistent with the concerns of those who opposed classifying obesity as a disease for fear that it would lead to an increased reliance on medications and surgery as treatments (Puhl and Liu, 2015). Clearly, fitness practitioners do not support an increased medicalisation of obesity.

Practitioners in the food addiction group were found to be more supportive of policies advocating for active treatments for obesity, and for a policy targeting the food environment which suggested that foods high in added fat and sugar should be regulated in a similar way to tobacco. This is consistent with Schulte et al. (2016), who found that greater support for policies targeting the food environment were associated with a belief in the food addiction model of obesity.

Support was not provided for the editorial view of the Lancet, which argues that obesity must be considered as a disease in order for governments to change the food environment through the implementation of taxes and regulation of the food industry (The Lancet Diabetes Endocrinology, 2017). While prominent medical associations such as the American Medical Association have recognised obesity as a disease since 2013, few governments in the OECD have followed suit. These governments have also been critiqued for their lack of regulatory action regarding obesity (Devaux et al., 2017; WHO, 2020). Grant Scofield, a professor of public health at Auckland University of Technology, recently referred to the New Zealand government's failure to implement sugar taxes and regulate the food industry as 'astonishing negligence' (Jones, 2019).

Encouraging governments to change the food environment may require a significant change in the way obesity is viewed at a societal and political level. Based on the responses

of fitness practitioners in this study, recognising obesity as a disease may not be the most effective way to achieve this change, as shown by significantly higher AFA recorded in the disease versus food addiction etiology groups. In contrast, the food addiction model of obesity may help to change the way obesity is viewed by making the dangers of the food environment more overt to the public and practitioners in health and wellbeing vocations. Greater levels of support from practitioners and the public alike might help to drive government action, and make their continued regulatory inaction harder to justify.

Anti-Fat Attitudes and Fitness Practitioner Characteristics

The pattern of anti-fat attitudes (AFA) and social dominance orientation (SDO) found among fitness practitioners was consistent with the pattern found among physical education (PE) students by O'Brien et al. (2007). In both studies, the highest AFA were recorded on the Willpower subscale, indicating that both PE students and fitness practitioners tended to agree that bodyweight is controllable, and a lack of willpower among overweight and obese people was a significant contributor to their weight. Higher levels of SDO were associated with higher AFA in both studies. However, caution is needed when interpreting the SDO results in this study because of the poor internal consistency of the SDO measure, along with the absence of evidence that fitness practitioners were discriminatory in their allocation of PT sessions against the obese clients.

While the pattern of AFA amongst fitness practitioners is consistent with PE students, fitness practitioners recorded lower AFA than first-year and third-year PE students on all of the AFA subscales. In comparison to the third-year PE students whose AFA were higher than the first-year students, fitness practitioners scored lower on the Dislike subscale ($M = 2.48$ versus $M = 3.26$), Fear of Fat subscale ($M = 4.83$ versus $M = 5.66$), and Willpower subscale ($M = 5.29$ versus $M = 6.46$). It is also notable that working for more years as a fitness practitioner was not associated with higher scores on the AFA Fear of Fat subscale or the

Willpower subscale in the current study. However, those who had worked longer as a fitness practitioner did score slightly higher on the Dislike subscale.

The finding that fitness practitioners in the current study reported lower AFA scores than did PE students in O'Brien's study could be related to the fact that the fitness practitioners were on average older and had higher BMIs (M age = 37; M BMI = 26) compared to the PE students (M age = 20; M BMI = 23). In addition, differences in the focus of the educational courses undertaken by the fitness practitioners and PE students may be a contributing factor. In a partial critique of the course of study undertaken by PE students, O'Brien et al. (2007) suggested that the attitudes of physical educators could be improved by courses of academic study focusing more on improving people's health and wellbeing, rather than physical appearance and elite performance. The fitness practitioners in the present study came from educational sources that focused more on preparing students to help improve the general health and wellbeing of people, rather than focusing on elite performance. Consequently, a differential educational focus, greater age and Body Mass Index (BMI) may have contributed to fitness practitioners being better equipped than PE students to understand the challenges faced by overweight and obese people when trying to lose weight. This may explain the lower AFA of fitness practitioners as opposed to the PE students. The small increase in scores on the AFA Dislike subscale as more years were worked as fitness practitioners could be attributable to frustration at the low effectiveness of weight-loss interventions, or simply a desire to help clients other than those pursuing weight loss. It should also be noted that the mean scores on this subscale were low, indicating that fitness practitioners tended to disagree somewhat strongly with the statements on this scale.

Implications

This study has two major implications. Firstly, it is clear that presenting the etiology of obesity as a disease may not reduce levels of obesity stigma amongst practitioners whose

vocation involves helping overweight and obese people. The findings also do not refute the concerns that have been raised by a variety of authors (Barber, 2018; Hoyt et al., 2014; 2017; Puhl and Liu, 2015), that the disease etiology may also increase obesity stigma. Perhaps this should not be surprising. Barber notes that certain diseases such as AIDS and leprosy are associated with much stigma. Obesity shares common (mis)perceptions with these diseases, namely that they are often perceived to be diseases of lifestyle for which the afflicted person has control over. As such, people are considered worthy of blame or stigmatisation as having such diseases are perceived to represent a shortcoming in the individual. Because experiencing obesity stigma is associated with weight gain and the maintenance of obesity (Jackson et al., 2014, Sutin and Terracciano, 2013), then presenting obesity as a disease may not only increase obesity stigma, through this mechanism it may also contribute to further increasing the prevalence of obesity.

The second implication of this study concerns the food addiction etiology. When compared to the disease etiology, the food addiction etiology may be more effective at reducing obesity stigma amongst practitioners whose vocation involves helping overweight and obese people. And when compared to the traditional etiology, the food addiction etiology may be more effective at increasing support for the regulation of foods and drinks that are high in fat and sugar.

Because practitioners in the food addiction group had the lowest mean scores on the AFA Willpower subscale, this etiology may be the most effective at challenging the belief that bodyweight is easily controllable, and excess weight is attributable to a lack of willpower. As noted by Alperin et al. (2014), and O'Brien et al. (2013), this belief underlies obesity stigma. As well as reducing obesity stigma, the food addiction etiology may enable a framework of existing techniques to be identified and used to improve the effectiveness of weight-loss interventions.

Because weight-loss interventions based on a traditional obesity etiology tend to lack clinical effectiveness and suffer from heterogeneity issues (Podina and Fodor, 2018, Booth et al, 2014), it is reasonable to assume that these interventions have significant flaws. As Yoo (2013) noted, interventions that focus exclusively on diet and exercise ignore the crucial societal, biological, and environmental contributors to obesity. Currently, a food environment exists where manufactured foods high in added sugar, fat and salt are disproportionately advertised and promoted through the media (Obesity Health Alliance, 2017), and in supermarkets (Obesity Health Alliance, 2018). Because this disproportionate advertising and promotion results in people consuming more unhealthy foods and drinks (Boyland et al., 2016), techniques such as ‘stimulus control’ appear relevant for weight-loss interventions. When foods and drinks are manufactured to maximise the physiological pleasure they provide (Moss, 2013), and to exploit the same neural reward pathways as addictive drugs (Kenny and Johnson, 2010), techniques such as ‘craving management’ appear relevant. When such foods and drinks are widely available, central to many social activities, and provide a source of pleasure to many, then techniques such as ‘problem solving’ and ‘activity scheduling’ appear relevant to help people find healthier sources of pleasure and support.

According to Mitcheson (2010), stimulus control, craving management, problem solving, and activity scheduling are the most commonly used behavioural techniques for substance abuse interventions. It is notable that these techniques were either not used, or sparsely used, in the interventions included in the meta-analyses of Podina and Fodor (2018), and Booth et al (2014). Formulating weight-loss interventions based on commonly used behavioural techniques for substance abuse would enable obesity to continue being addressed from a behavioural perspective. This would be more likely to help address the escalating prevalence of obesity as nurses, mental health workers, community health workers, dietitians, physical educators and fitness practitioners could all be trained on how to

incorporate these techniques into weight-loss interventions. It would also alleviate a concern associated with the disease etiology of obesity: that treatments would become increasingly medicalised, and thus limited to those that can afford the treatments or who are deemed urgent enough to receive them via a resource-limited public health system.

Including techniques used in substance abuse interventions may also help to better align interventions with the needs of those trying to lose weight. As interviewed by Thomas et al. (2008), a common observation of people who have struggled with traditional weight-loss interventions is that they are required to make significant, unsustainable deviations from their established behaviours. When Thomas et al. (2008) asked people about the components of interventions that might work, they highlighted support over numerous instructions, affordability, a long-term orientation, help to develop personalised plans, and empowering people to make lifestyle changes. The need for interventions to dispel the myths that overweight and obese people are lazy and unmotivated to change was also highlighted, as people noted that the stigma associated with obesity makes it extremely difficult to actually seek help. As well as reducing obesity stigma, a food addiction model that uses techniques from substance abuse interventions appears to be more conducive to the collaborative, supportive approach recommended by those who have already tried to lose weight, with limited success. Using techniques from substance abuse interventions would require practitioners to develop an understanding of an individual's lifestyle in order to develop a plan with the person to address the specific social, cultural and environmental factors that influence their weight. This approach would contrast with traditional weight-loss interventions that require people to accommodate themselves to the prescribed and often inflexible demands of a specific diet and/or exercise regime.

Limitations and Future Research

There were several limitations with this study. Firstly, the sample of participants was limited to fitness practitioners. The role of the fitness practitioner is significantly different to the roles of others who often work to help overweight and obese people, such as doctors, nurses and community and mental health professionals. As such, it would be wise not to generalise the responses of the fitness practitioners in this study to other vocations. Fitness practitioners often work as independent contractors in fitness centres that are private businesses. The financial viability of such businesses is dependent upon establishing and servicing a sufficient client base. Where such businesses involve helping people to lose weight, then escalating rates of overweight and obesity may be viewed favourably as an opportunity to grow a business. In contrast, vocations that rely predominantly on public funding, such as doctors, nurses, community and mental health workers, may view overweight and obese people less favourably, especially if they are perceived to be placing additional stress on resources with limited public funds. As such, it would be valuable to examine whether the food addiction and disease etiologies of obesity have a significant effect on the AFA and resource allocation of these practitioners, who may already work with disease and addiction and therefore be more sensitive (or insensitive) to these etiologies.

The study also highlighted differences in the sample of fitness practitioners when compared to the physical education (PE) students in O'Brien et al's. (2007) study. PE students were young, and engaged in a broad, four-year degree qualification. In contrast, the fitness practitioners in this study were significantly older, and sourced primarily from a private training provider delivering certificate-level vocationally oriented qualifications of less than one year duration. Because of the significant variability in qualifications that can be undertaken by fitness practitioners, it may be that the results of this study do not generalise to all fitness practitioners. Future studies could compare the effects of presenting different

obesity etiologies on the AFA, allocation of personal training (PT) sessions and support for obesity-related policy initiatives, of fitness practitioners whose educational background varies across a range of certificate and degree-level qualifications. Such studies would be useful in determining what type of educational courses are best at combatting the AFA that may develop or be reinforced through education. Additionally, future studies could try different ways of manipulating the way the obesity etiology is presented. This study relied on a short news article. While manipulation checks tested whether participants understood the etiologies, they did not test whether participants believed the message in the article or took it seriously. Gathering such information may help to improve the validity of future studies. Additionally, using mediums such as video may help participants to understand obesity etiologies that they may not be familiar with and are reasonably complex, such as the food addiction etiology with its neurological underpinnings.

A major methodological limitation in the present study involved the design of the PT session allocation measure. The uniform responses of the different obesity etiology groups that favoured the obese clients suggest that reading about obesity may have primed participants to respond in a socially desirable way. According to Paulhus (1991), socially desirable responding refers to the tendency of study participants to respond in a way that will be viewed favourably by others, or in a way that participants feel they are expected to respond. Directing participants to read a short article about obesity, and then presenting them with a task requiring them to allocate PT sessions to clients whose major distinguishing difference was their BMI, may simply have been too obvious. It may have been too easy for participants to realise that the study was about obesity, and that the right thing to do would be to allocate more help to the obese clients. In future studies, when comparing the effect of different obesity etiologies on measures such as an allocation of time to help, it may be better to make the measure overt, but play on the underlying beliefs of participants concerning

obesity, and the controllability of bodyweight. For example, participants could be directed to allocate PT sessions to the clients they believe would be most likely to be successful.

Participants could then choose from an obese client who had tried multiple times to lose weight, or a client whose attempt to run a marathon is constantly thwarted by repetitive injuries. In such a scenario, participants might be more likely to discriminate against the obese client whose lack of prior success might be attributed to ‘controllable’ laziness, and favour the runner whose prior lack of success might be attributed to ‘uncontrollable’ bad luck.

Another methodological limitation involved the shortened questionnaire used to measure the participant’s social dominance orientation (SDO). The correlational analysis suggested that SDO was positively associated with AFA, and negatively associated with the allocation of PT sessions and support for obesity-related policy initiatives targeting the food environment. In general, the correlations were weak, and the reliability of the shortened SDO measure was poor, which limited the ability to infer much from the results. The ANCOVA also suggested that SDO may have had a significant impact on the allocation of PT sessions measure. Future studies may benefit from using the full SDO questionnaire to gain a clearer understanding of the influence that SDO has on AFA, allocation of PT sessions, and support for obesity-related policy initiatives. This could provide useful insights for education providers regarding the need to challenge the belief that some groups are superior to others.

Concluding Remarks

In conclusion, the present study found that presenting the etiology of obesity as a food addiction produced significantly lower AFA amongst fitness practitioners on an AFA Willpower subscale, than when obesity was presented as a disease. When exposed to the food addiction etiology of obesity, practitioners tended to disagree with statements that attributed blame to overweight and obese people, and linked their weight to a lack of willpower. In

contrast, practitioners who were exposed to the disease etiology of obesity, tended to agree with such statements. Because obesity stigma (as predicted by AFA) has a profoundly negative effect on the people who experience it, a food addiction model of obesity appears more likely to reduce obesity stigma than a disease etiology. Based on the results of this study it appears that the disease model of obesity, as promoted by prominent medical associations and obesity societies, may actually be more harmful than helpful with regard to reducing obesity stigma and the prevalence of obesity.

The present study also found widespread agreement amongst fitness practitioners for policies aimed at regulating the food environment, and increasing funding for active obesity treatments such as psychological therapies, and personal training. In contrast, widespread disagreement was found amongst practitioners for an increase in funding for passive obesity treatments such as bariatric surgery. While this pattern of agreement and disagreement was consistent across the experimental groups, practitioners who were exposed to a food addiction etiology exhibited significantly more support for active obesity treatments than practitioners in a control group. Practitioners exposed to a food addiction etiology also exhibited more support than those exposed to a traditional obesity etiology for a policy aimed at regulating foods high in added sugar and fat in the same way that tobacco is regulated. Consequently, the food addiction etiology of obesity may also be more effective than other obesity etiologies at gaining the support of practitioners for population-based policies that could have a significant impact in reducing the prevalence of obesity.

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Appendix A

Advertisement template used to recruit participants via email or Facebook

You are invited to take part in a study being conducted by Dan Speirs,
Postgraduate Student at the University of Canterbury.

Research Title:

How well do fitness practitioners understand their clients?

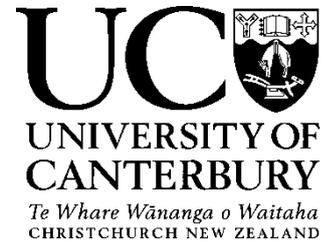
Background:

Dan is interested in finding out how well fitness practitioners understand their clients, and what their clients really want and need from them. If you choose to participate in this study, your answers and all the information you provide will be completely confidential. The study will take approximately 20 minutes to complete. The results of the study will show how well fitness practitioners understand their clients. Upon completion of the study, you will be able to enter a lucky draw to win one of twelve Rebel Sport vouchers ranging in value from \$50 to \$250.

[Find out more about the study by clicking here](#)

*NB. The study will close on the 31st October 2019.

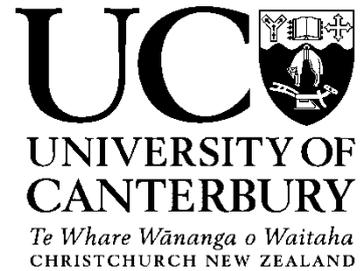
If you have any queries about the study, please contact Dan Speirs directly at; dps78@uclive.ac.nz.



Appendix B

College of Science

School of Psychology, Speech and Hearing
Tel: +64 3 364 2902, Fax: + 64 364 2181
Email: office@psyc.canterbury.ac.nz, primary researcher: Dan Speirs:
dps78@uclive.ac.nz



INFORMATION SHEET

UNDERSTANDING YOUR CLIENTS

You are invited to participate in a research study conducted by University of Canterbury researchers, Dan Speirs, Associate Professor Roeline Kuijer, and Dr Kumar Yogeeswaran. Please read the information below which outlines what is involved in this research.

PURPOSE OF THE STUDY

The purpose of this project is to investigate how well fitness practitioners understand their clients. The entire study will take approximately 20 minutes to complete and will involve this single session only, where you will complete an online questionnaire.

PROCEDURE

If you choose to participate in this study, you will be asked to provide general information about yourself. Following this, you will read a short passage and answer a series of questions related to that passage. After the questionnaire has been completed, you will be invited to enter a prize draw to win one of 12 Rebel Sport vouchers.

POTENTIAL RISKS AND DISCOMFORTS

There are no known risks associated with this research. Participation in this study is voluntary and your responses will be anonymous. In other words, your identity will never be revealed and your data will be reported in a manner that makes it impossible for others to identify your responses.

POTENTIAL BENEFITS TO PARTICIPANTS AND ORGANISATIONS

It is expected that this research will contribute to improving education for aspiring fitness practitioners as well as helping existing practitioners to better cater to their client's needs and wants. Participants who complete the study will be eligible to win one of twelve Rebel Sport vouchers. There are two \$250 vouchers, and ten \$50 vouchers.

ANONYMITY

The researchers are very mindful of the need to protect participants' interests. Any information that you provide will be anonymous. We will not ask for any identifying information in the questionnaire. Only the principal researcher and named supervisors will have access to the raw data. Under no circumstances will any of the data you supply be disclosed to a third party in any way that could reveal who the source was. The survey data will be stored on password-protected computers in secured locations in the School of Psychology, Speech and Hearing. A link to enter the prize draw is provided at the end of the questionnaire. Any contact information provided for the draw is kept separate from your questionnaire responses to ensure anonymity.

PARTICIPATION AND WITHDRAWAL

Participation is entirely voluntary. If you volunteer to take part in this study, you may withdraw at any time without consequence of any kind. Withdrawal is possible up until the questionnaire is submitted, after which time withdrawal is no longer possible (as your individual responses cannot be identified). You will be asked to give consent at the end of the questionnaire (after debriefing). You can withdraw at any time simply by closing your browser without submitting the questionnaire.

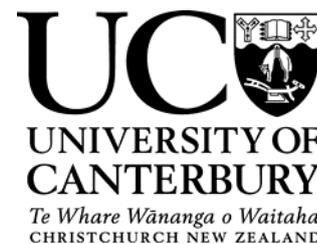
The project is being carried out as a requirement for a Master of Science degree in Psychology by Dan Speirs (dps78@uclive.ac.nz) under the supervision of Associate Professor Roeline Kuijer (roeline.kuijer@canterbury.ac.nz) and Dr Kumar Yogeeswaran (kumar.yogeeswaran@canterbury.ac.nz). They can be contacted via email and will be pleased to discuss any questions or concerns you may have.

This project has been reviewed and approved by the University of Canterbury Human Ethics Committee, Private Bag 4800, Christchurch; email human-ethics@canterbury.ac.nz. Any inquiries or complaints can be addressed to The Chair, Human Ethics Committee, University of Canterbury, Private Bag 4800, Christchurch, 8140.

Appendix C

Study Measures for Qualtrics Questionnaires

Pre-manipulation measures



What is your gender?

- Male
- Female
- Other

What is your age? _____

Which ethnic group do you belong to (more than one answer is possible)?

- NZ European
- NZ Māori
- Samoan
- Cook Island Māori
- Tongan
- Niuean
- Chinese
- Indian
- Other (please specify) _____

Which of the following best describes your current situation?

- I am studying towards a tertiary level fitness/exercise qualification
- I have achieved a tertiary level fitness/exercise qualification

For approximately how many years have you been a fitness practitioner? (NB. Fitness practitioner is an inclusive term that describes people who work to improve the health and fitness of others, in either a part-time, or full-time, paid or voluntary capacity. This definition includes roles such as; Personal Trainer, fitness instructor, group fitness instructor, gym instructor, and exercise consultant.)

- Less than 1yr
- 1-2yrs
- 2-3yrs
- 3-4yrs
- 4-5yrs
- 5-6yrs
- 6-7yrs
- 7-8yrs
- 8-9yrs
- 9-10yrs
- More than 10yrs

On average, how many hours do you currently spend working as a fitness practitioner (per week)?

- 0hrs
- 1-10hrs
- 11-20hrs
- 21-30hrs
- 31-40hrs
- More than 40hrs

What is your approximate height (in centimetres)? _____

What is your approximate weight (in kilograms)? _____

The Body Mass Index (BMI) has a number of categories. Which of the categories do you feel provides the best descriptor of your current bodyweight?

- BMI below 18.5 ‘Underweight’
- BMI 18.5 – 25.9 ‘Healthy weight’
- BMI 25 – 29.9 ‘Overweight’
- BMI over 30 ‘Obese’

Social Dominance Orientation Questionnaire (Pratto et al., 2014)

There are many kinds of groups in the world: gender groups, ethnic and religious groups, nationalities, political factions, professional groups, sporting groups. How much do you support the ideas about groups in general? Rate your level of support on a 10 point Likert scale from 1 (Extremely Oppose) to 10 (Extremely Favour) indicate your response to the following:

1. In setting priorities, we must consider all groups.
2. We should not push for group equality.
3. Group equality should be our ideal.
4. Superior groups should dominate inferior groups.

Self-Identity Scale Questionnaire (Luhtanen and Crocker, 1992)

This identity scale assess the extent to which a specific identity is central to one’s self-concept, and is scored on a seven-point Likert scale (1 = strongly disagree to 7 = strongly agree). When adapted to fitness practitioners the scale reads:

1. Overall, being a fitness practitioner has very little to do with how I feel about myself.
2. Being a fitness practitioner is an important reflection of who I am.
3. Being a fitness practitioner is unimportant to my sense of what kind of a person I am.
4. In general, identifying as a fitness practitioner is an important part of my self-image.

Manipulations and manipulation checks

1. Obesity as a food addiction (adapted from Latner et al., 2014)

Food addiction as a causal model of obesity.

Jana D. Brown, Ross M. Palti, Tom T. Brown, Kathryn S. McDonald

HIGHLIGHTS

- High-fat, high-sugar foods activate the same neural receptors in the brain as addictive drugs such as cocaine.
- Intense cravings compel people to seek and consume progressively more high-fat, high sugar foods despite negative consequences.
- People feel physical and emotional withdrawal symptoms when food is not consumed.

Leading scientists have discovered that obesity is often the result of a physiological food addiction. The physiological process of food addiction is similar to that of drug addiction. Some people are addicted to food. For them, food activates the same neural receptors in the brain that are activated by drugs such as cocaine. The person then experiences uncontrollable,

compulsive food cravings. These cravings are so intense that they overshadow the motivation to engage in other activities. The person is compelled to seek and consume foods, especially high-fat, high-sugar foods, even in the face of negative consequences to their health and quality of life. Despite repeated attempts to stop overeating, food over-consumption is uncontrollable. Over

time, more and more food is needed to satisfy the person’s cravings, and the person feels physical and emotional withdrawal symptoms if the food is not consumed. This can lead to obesity, particularly in individuals who are predisposed to changes in brain structure and function as a result of the repeated effect of compulsive eating on brain neurotransmitter activity.

Manipulation checks

The article you just read states that:

- The physiological process underlying food addiction is similar to that of drug addiction
- Intense cravings compel people to seek and consume high-fat, high sugar foods despite negative consequences
- Cravings for high-fat, high sugar foods can be so intense that they overshadow the motivation to engage in other activities
- All of the above
- None of the above

According to the addiction model of obesity:

- The physiological processes underlying food addiction have no similarities to those underlying addiction to substances such as cocaine
- Progressively more (high-fat, high sugar) food is required to satisfy a person's cravings, which can produce withdrawal symptoms if the food is not consumed
- Cravings for high-fat, high sugar foods are easy to control

2. Obesity from a traditional perspective (adapted from Latner et al., 2014)

A causal model of obesity.

Jane D. Brown, Ross M. Pihl, Tom T. Brown, Kalvin S. McDonald.

HIGHLIGHTS

- Obesity results from a combination of genetic factors and deliberate lifestyle choices.
- Weight maintenance requires calories consumed to be balanced by calories expended.
- Choosing to consume too many high fat, high sugar foods and/or doing too little exercise can produce an energy imbalance which leads to obesity in those who are susceptible.

Leading scientists have discovered that obesity often results from a combination of genetic factors and deliberate lifestyle choices about food and physical activity. Maintaining weight requires a homeostasis, or balance, between the calories that the body takes in and those burned off by

metabolic processes and physical activity. Some people consume too many calories by eating high-fat, high-sugar foods repeatedly over time. Similarly, some people engage in too little physical activity due to their activity and lifestyle choices. Choosing to consume too many high-fat, high-sugar foods, and

choosing to do too little exercise, can lead to an imbalance in the individual's homeostasis (energy balance). This can lead to obesity, particularly in individuals with a low resting metabolic rate and a genetic predisposition towards obesity.

Manipulation checks

The article you just read states that:

- Obesity can result from choosing to consume too many high-fat, high-sugar foods and choosing to do too little exercise
- The calories that the body takes in must be balanced with those it burns off in order to maintain body weight
- Deliberate lifestyle choices and genetic factors combine to produce obesity
- All of the above
- None of the above

According to this causal model of obesity:

- Obesity is accidental and has nothing to do with the choices people make

- Choosing to consume too many high-fat, high-sugar foods and choosing not to exercise are direct contributors to obesity
- Obesity is primarily due to faulty genetics

3. Obesity as a disease (from an editorial in ‘The Lancet’, June, 2017)

Should obesity be officially recognised as a disease?

Jane D. Brown, Rose M. Pali, Tom T. Bowe, Kelvin S. McDonald.

HIGHLIGHTS

- Prominent medical associations and many countries have concluded that obesity is a disease.
- Obesity fits the definition of a chronic, relapsing, progressive disease where a disease agent adversely affects a host.
- High energy foods are the primary disease agent, causing a disease state to be produced in those with genetic susceptibility.

Leading scientists have recently concluded that obesity is actually a disease. Indeed, obesity was officially recognised as a disease by the American Medical Association (AMA) in 2013, with the Canadian Medical Association following suit in 2015. Portugal has officially recognised obesity as a disease since 2004, and

many other countries have followed their lead. The World Obesity Federation (WOF) argue that obesity fits the definition of a chronic, relapsing, progressive disease. From an epidemiological perspective a disease is caused by an agent that adversely affects a host. In the case of obesity, it is argued that foods with high energy density

(high fat, high sugar) act as the primary agent, alongside other environmental factors such as low physical activity. When the disease causing agents exist in abundance, they interact with the genetic susceptibility of the host to produce a disease state that causes organ damage.

Manipulation checks

The article you just read states that:

- Obesity fits the definition of a chronic, relapsing, progressive disease, caused by an agent that adversely affects a host
- Obesity is recognised as a disease by many countries, and leading medical associations
- Foods with high energy density act as the primary disease agent, and interact with the genetic susceptibility of the host to produce a disease state
- All of the above
- None of the above

According to the disease model of obesity:

- There is very little support for the idea that obesity should be recognised as a disease
- A disease state is produced when an abundance of disease causing agents interact with the genetic susceptibility of the host
- Obesity is primarily due to faulty genetics

4. Control group – sales tactics for fitness practitioners (from education provider course materials)

Sales tactics for fitness practitioners.

Jane D. Brown, Ross M. Pahi, Tom T. Bova, Kalrin S. McDonald.

HIGHLIGHTS

- Incentives, experiential, solution-based, and alternatives are the main tactics used to recommend the services of fitness practitioners.
- Each of the tactics has strengths and weaknesses concerning their effectiveness.

There are four main tactics used by fitness practitioners to recommend their services to potential clients. Each tactic has strengths and weaknesses. The four main tactics are; incentives, experiential, solution-based, or alternatives. The incentive approach involves offering an incentive to buy such as a gift. Incentives such as discounts aren't

recommended as they tend to de-value your service, however providing gifts for 'clients only' can act as useful incentives. The experiential tactic is the 'try before you buy' approach where you offer the experience of training with no strings attached. This reduces the feeling of being a 'used car salesperson' and lets you focus on your strengths – delivering enjoyable sessions. A solution-

based approach is the 'full service' model where you take care of every aspect of the clients training. This will of course require a thorough consultation, and the ability to adapt your offer to suit what the client can commit to. The alternative tactic involves presenting two options, normally the full service option along with another option that requires less commitment.

Manipulation checks

The article you just read states that:

- Each sales tactic has its strengths and weaknesses
- The main sales tactics for fitness practitioners are; solution-based, incentives, experiential, and alternatives
- Discounting isn't recommended as it de-values your service
- All of the above
- None of the above

According to this causal model of obesity:

- Incentives
- Experiential
- Alternatives

Post-manipulation measures

Resource Allocation Task (based on Tajfel's (1970) Minimal Group Paradigm)

You have four Personal Training (PT) clients who are training for a specific event. Your gym has agreed to fund blocks of; 9, 7, 5, and 3 PT sessions. Allocate these blocks to the different clients.

*NB – you cannot allocate the same block of sessions to more than one client.

Mary (General Practitioner (GP), 51 years old, BMI 34)	9 / 7 / 5 / 3
Jane (University Professor, 46 years old, BMI 23)	9 / 7 / 5 / 3
Trudy (Critical Care (ICU) Nurse, 44 years old, BMI 22)	9 / 7 / 5 / 3
Emma (High School Principal, 49 years old, BMI 35)	9 / 7 / 5 / 3

Explicit Anti-fat Attitudes Questionnaire (Crandall, 1994)

Rate your agreement with the following statements on a nine point Likert scale (1 = very strongly agree to 9 = very strongly disagree)

Dislike subscale

1. I really don't like fat people much.
2. I don't have many friends that are fat.
3. I tend to think that people who are overweight are a little untrustworthy.
4. Although some fat people are surely smart, in general, I think they tend not to be quite as bright as normal weight people.
5. I have a hard time taking fat people too seriously.
6. Fat people make me somewhat uncomfortable.
7. If I were an employer looking to hire, I might avoid hiring a fat person.

Fear of Fat subscale

8. I feel disgusted with myself when I gain weight.
9. One of the worst things that could happen to me would be if I gained 25 pounds.
10. I worry about becoming fat.

Willpower subscale

11. People who weigh too much could lose at least some part of their weight through a little exercise.
12. Some people are fat because they have no willpower.
13. Fat people tend to be fat pretty much through their own fault.

Support for Obesity-Related Policy Initiatives (based on Schulte, Tuttle, and Gearhardt, 2016)

Rate your agreement with the following statements on a six point Likert scale (0 = strongly disagree to 5 = strongly agree)

1. The government should treat foods and drinks that are high in added fat and sugar the same way it treats tobacco – ban all advertising, and require plain packaging for all products.
2. The government should use taxpayer dollars to subsidise fresh fruit and vegetables to make them cheaper.
3. The government should use taxpayer dollars to subsidise the services of fitness practitioners for people who are classified as obese.
4. The government should use taxpayer dollars to subsidise psychological treatments for eating-related afflictions.
5. The government should impose a tax on foods and drinks that are high in added fat and sugar.
6. The government should use taxpayer dollars to run a public service campaign that informs people about the health risks associated with foods and drinks that are high in added fat and sugar.
7. The government should use taxpayer dollars to increase the funding available for medical treatments for obesity such as bariatric surgery and drug-based treatments.

Appendix D

DEBRIEF (please read then continue to complete)

Thank you for participating in a study examining how well fitness practitioners understand their clients. Though we were generally interested in this topic, we had other interests that we were unable to tell you about until now. Specifically, we want to understand the views of fitness practitioners towards obesity.

The reason we withheld this information from you is because it may have influenced your answers to make them more socially desirable. We wanted to access your attitudes as fitness practitioners when they were not influenced by what you thought was the socially appropriate answer. Furthermore, sometimes participants try to confirm the experimenter's hypothesis, when they know that hypothesis in advance. In order to ensure that you were not unconsciously influenced to do this, we withheld this information from you.

You may be curious about the hypotheses of this study. There were three, specifically we thought that:

1. Potentially discriminatory attitudes would be lower when obesity was presented as a disease or a food addiction, as opposed to when it was presented as a caloric imbalance, as it typically is presented. The reason for this hypothesis is that obesity, when presented as a caloric imbalance (consuming too much food and/or not exercising enough) is considered to be more controllable than obesity as a disease or an addiction. Research in this area shows that people tend to blame others for their misfortune when they feel that people have a high degree of control over the factors that lead to their misfortune (exercise and diet).
2. Regardless of how obesity was presented, fitness practitioners who had been working for more years than others would show less of a reduction in discriminatory attitudes. The reason for this is the environment where we spend a lot of our time tends to reinforce our beliefs. So if we spend a lot of time in an environment where the established belief is that people with obesity are obese because they lack the self-control to exercise regularly and eat healthily, then these underlying beliefs will be strengthened and less likely to change.
3. Fitness practitioners would allocate more time to helping people with obesity when obesity was presented as a food addiction as opposed to a disease, or a traditional (caloric imbalance) presentation. The reason for this is that people may think that an investment of their time to help someone with an addiction may be worthwhile because an addiction is more 'treatable' than a disease. I.e. I may feel sorry for a person with a disease but I might not invest my time to help them because I might think that there's very little I can do to help. In comparison, we expect little time to be allocated to help people with obesity when we attribute their obesity to being attributable to a lack of control over what the person eats, or whether they exercise or not. We're more likely to think – 'why would I invest my time to helping someone who shows no signs of wanting to help themselves'?

The study divided you into one of four groups. You will have either read a short passage that explained obesity as a disease, a food addiction, a caloric imbalance, or you may have been part of the control group. If you were part of the control group, you would have read about something completely unrelated to obesity – sales tactics for fitness practitioners. The control group is very important as it allows us to measure the responses of the three other groups against the control group.

As you are well aware, the prevalence of obesity continues to increase. Obesity is associated with a significant loss in quality of life, and actual years of life for many people. Unfortunately, weight-based stigmatisation has been highlighted as a significant problem in many health-related professions. One of the main manifestations of this stigmatisation is that health practitioners tend to spend less time helping, and provide less education, to obese people as opposed to thinner people. One of the

main reasons underlying this is thought to be a belief that bodyweight is easily controllable, and that people with obesity are lazy and lack the willpower to help themselves.

Increasingly, research is showing that bodyweight is less controllable than many of us think. Obesity was recently classified as a disease by the American Medical Association (AMA), and many countries have also classified it as a disease so that more people can receive help with treatments. An unfortunate consequence of this however is that the disease classification has also resulted in people thinking that they have less control over bodyweight, and therefore that there is actually little point in trying to lose weight, or to try and help people to lose weight.

A new line of research is particularly interesting however. This research considers obesity as a food addiction, where the neurological pathways in the brain that underlie chemical addictions to substances such as cocaine and nicotine are activated in a similar way by foods that are loaded with extra sugar, salt and fat. And a disproportionate amount of advertising and promotion of these 'high incentive' foods triggers the consumption which produces an addictive response that demands further consumption. Further research in this area may help us to better understand the challenges people with obesity face, as well as helping us to identify more constructive ways to help.

Hopefully this de-brief has helped you to understand the study, and may have answered some of the questions you may have had. If you are interested in learning more about the study or hearing about the results of the study, please feel free to contact Dan Speirs (dps78@uclive.ac.nz), or Associate Professor Roeline Kuijer (roeline.kuijer@canterbury.ac.nz), or Dr Kumar Yogeewaran (kumar.yogeewaran@canterbury.ac.nz).

Thank you again for your participation!

Consent

- Yes, I consent to having my data used in this study. I understand that by submitting the questionnaire, my responses can no longer be withdrawn.
- No, I do not consent to having my data used in this study and do not want my responses recorded.