FEAR AND SELF-LOATHING: INTERNALISED WEIGHT STIGMA AND MALADAPTIVE COPING IN HIGHER-WEIGHT INDIVIDUALS

By

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A thesis submitted to the

University of Birmingham

For the degree of

DOCTOR OF PHILOSOPHY

School of Psychology

University of Birmingham

October 2017

ABSTRACT

This thesis extends current research linking internalised weight stigma and health and wellbeing in higher-weight individuals in a series of quantitative cross-sectional, longitudinal, and experimental studies. Chapter 1 reviews the association between weight stigma and maladaptive eating. Chapter 1 also introduces a social identity framework for predicting whether societal weight stigma is internalised or resisted. Chapter 2 presents findings of an experimental manipulation providing the first quantitative data on the role of internalised weight stigma in driving objectively measured eating behaviour in both higher-weight and normative-weight individuals. Participants tended to eat less when exposed to a weight-stigma prime versus a neutral prime, and the effect was amplified at higher levels of internalised weight stigma. In Chapter 3, results of a cross-sectional study of an international sample of non-treatment seeking higher-weight individuals are presented. Bifactor analysis of the related constructs of internalised weight stigma, body image, and global self-esteem indicated that while internalised weight stigma did mediate the relationship between experienced stigma and disordered eating, shared variance explained a considerable proportion of this indirect relationship. Additionally, while the prevalence of experienced and IWS varied by region internationally, the relationship between self-stigma and problematic eating behaviour was widely consistent world-wide. Chapter 4 presents cross-sectional data from a student sample and an international adult sample. In both samples, both weight-related self-stigma and fear of stigma had downstream effects on addictive-like eating behaviour. Additionally, cross-lagged analysis of follow-up data from the student sample found that fear of stigma predicted worsening eating pathology over time.

Chapter 5 reports cross-sectional data from a large international sample of non-treatment-seeking higher-weight adults, indicating that weight stigma resistance is associated with improved psychological wellbeing. Decision tree analysis suggested that while stigma resisters frequently identify strongly with the group "Fat", perceived illegitimacy of societal weight stigma may define resisters even in the absence of such group identity.

Chapter 6 provides a reflection on the experimental work in this thesis, and discusses implications for future research and health interventions. Fear of stigma from others appears to be a more potent driver of maladaptive coping in higher-weight individuals than self-devaluation *per se*. Given a climate in which fat stigma is endemic and prejudice-reducing interventions have been largely unsuccessful to date, altering individual response to societal stigma may be a suitable target amenable to future health promotion interventions. Initial findings suggest that a social justice-based approach targeting the perceived legitimacy of societal weight stigma may increase stigma resistance and improve psychological wellbeing, regardless of individuals' current beliefs and feelings about their weight.

ACKNOWLEDGMENTS

I would first like to thank Professor Suzanne Higgs for her untiring support, encouragement, and excellent advice over the course of this PhD. I have learned so much from you. Thank you for putting up with me!

I am very grateful to the University of Birmingham for the doctoral development grant that allowed me to accidentally found an international conference just a few months into my PhD. Being involved in the Weight Stigma Conference has opened so many doors to me, brought me into contact with many incredible scholars, practitioners, and advocates, broadened my vocabulary ("kyriarchy"), and given me an opportunity to make a difference in the field. One of the most heart-warming benefits has also been to discover just how many people are working on this issue, both in the UK and overseas, bringing the weight stigma world closer together. I am also very grateful to have been awarded a Universitas 21 Fellowship, which let me spend a month at the University of Connecticut, seeing how things are done on the other side of the pond. And what real snow looks like.

I'd like to thank: Professor Robert Carels, for laying the groundwork for much of the work I have done here, and for his enthusiastic support of my future endeavours; Professor Colin Leach, for hosting me at UConn even though he knew nothing about me, for being incredibly generous with his time and his ideas, and for finally solving my colinearity problem by introducing me to bifactor analysis; Dr Sean Phelan for the opportunity to work on the CHANGES study and for moral and professional support; all the weight stigma researchers who have been so generous with their time and expertise; and members of the SEMNET listserv for preservation of sanity, such as it is.

Thanks also to members of the Eating Behaviour Research Unit for support, commiseration, and lots of cake, and in particular, a huge thank you to Jason Thomas who has continued to be a great mentor even after leaving UoB.

I couldn't have done this without my amazing support network, both within the size acceptance movement and the online PhD support community. To Kerry, Emma, Bryoni, Sigrún, Janell, Rachel, Jeff, Nancy, Caitlin, Masoumeh, and the PhD OWLs. Here's to martinis at breakfast and rainbows in the storm.

And I *really* couldn't have done it without the support of my Mum, Bernice Cohen. She may still not understand exactly what it is that I do, but she has made it possible. Thank you so much.

Finally, to my husband Roger, who deserves this PhD as much as I do. There are no words. I love you.

DISSEMINATION

The contents of this thesis have been presented at the following conferences: The British Feeding and Drinking Group (2013, 2014), Association for Size Diversity and Health (2013), American Public Health Association (2014), Weight Stigma Conference (2014, 2015, 2016), Society for Personality and Social Psychology (2016).

Sections of the following paper are included in Chapter 4 of the present thesis. The full paper, as published, is included as Appendix F.

Meadows, A., Nolan, L., Higgs, S. (2017). Self-perceived food addiction: Prevalence, predictors, and prognosis. *Appetite, 114*, 282–298.

http://doi.org/ 10.1016/j.appet.2017.03.051

Angela Meadows was responsible for designing the study, collecting data, planning and conducting analyses, and writing the manuscript. Professor Suzanne Higgs provided guidance with the study design, was involved in discussions of the analyses, and was responsible for reading and revising drafts of the manuscript. Professor Laurence J. Nolan provided comments on a final draft of the manuscript.

Additional published works by the author relevant to the thesis but not forming part of it

Meadows, A., & Daníelsdóttir, S. (2016). What's in a word? On weight stigma and terminology. *Frontiers in Psychology*, *7*, 1527. http://doi.org/10.3389/fpsyg.2016.01527

Meadows, A., Daníelsdóttir, S., Calogero, R., & O'Reilly, C. (2017). Why fat suits do not advance the scientific study of weight stigma. *Obesity*, *25,* 275. http://doi.org/10.1002/oby.21742

Meadows, A., Higgs, S., Burke, S. E., Dovidio, J. F., van Ryn, M., & Phelan, S. M. (2017). Social dominance orientation, dispositional empathy, and need for cognitive closure moderate the impact of empathy-skills training, but not patient contact, on medical students' negative attitudes toward higher-weight patients. *Frontiers in Psychology, 8*, 504. http://doi.org /10.3389/fpsyg.2017.00504

Mensinger, J. L., & Meadows, A. (2017). Internalized weight stigma mediates and moderates physical activity outcomes during a healthy living program for women with high body mass index. *Psychology of Sport and Exercise*, *30*, 64–72. http://doi.org/10.1016/j.psychsport.2017.01.010

Statement of contributions by others to the thesis as a whole

Professor Suzanne Higgs contributed to the conception and design of the studies within the thesis, interpretation of research data, and revision of the thesis.

Ms Kerry Beake provided assistance with formatting of Figures 5.3 – 5.6 in Chapter 5.

A NOTE ON TERMINOLOGY

The word “fat” is used in this thesis as a value-neutral descriptor, in line with the preferences of organisations that advocate for fat rights. This usage “reclaims” the word and strips it of its acquired pejorative overtones, signalling that fatness is neither unacceptable nor inferior.

The term “higher-weight” is preferred over “overweight” or “obese,” as these latter medicalise body weight, and mark heavier bodies as “diseased,” even in the absence of any other biological perturbations. Additionally, in the context of stigma, derogation of higher-weight bodies does not begin at a particular BMI marker, but rather occurs on a continuum of body weight, and may even begin within what is considered the “normal weight” range by BMI status, particularly when women are the targets (Nickson et al., 2016). Where specific BMI categories apply to participants in published studies, these will be specified as appropriate.

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List of abbreviations

AFAQ	Anti-Fat Attitudes Questionnaire
ANOVA	Analysis of variance
ANCOVA	Analysis of covariance
BED	Binge eating disorder
BES	Binge Eating Scale
BIS-15	Barratt Impulsiveness Scale-15
BMI	Body mass index
BN	Bulimia nervosa
CES-D	Center for Epidemiological Studies–Depression scale
CFA	Confirmatory factor analysis
CFI	Comparative Fit Index
CHAID	Chi-squared automatic interaction detection
DEBQ	Dutch Eating Behavior Questionnaire
DSM-5	Diagnostic and Statistical Manual of the American Psychiatric Association, 5th edition
EAH	Eating in the absence of hunger
EAT-26	Eating Attitudes Test-26
EDDS	Eating Disorders Diagnostic Scale
EFA	Exploratory factor analysis
EM	Expectation maximisation
EMA	Ecological momentary assessment

ESES	Eating Self-Efficacy Scale
EWS-3	Experienced Weight Stigma, three-item questionnaire
FCQ-T	Food Cravings Questionnaire–Trait
MBSRQ	Multidimensional Body-Self Relations Questionnaire
MCAR	Missing completely at random
ML	Maximum likelihood
NCS	Need for Cognition Scale
NFA	Non-food addict
RMSEA	Root mean square error of approximation
RS	Restraint Scale
RSE	Rosenberg Self-Esteem scale
SCQ	Stigma Consciousness Questionnaire
SPFA	Self-Perceived Food Addiction
SRMR	Standardised root mean squared residual
SSI	Stigmatizing Situations Inventory
VAS	Visual analogue scale
WBIS	Weight Bias Internalization Scale
WBIS-M	Modified Weight Bias Internalization Scale
WEB-SG	Weight- and Body-related Shame and Guilt scale
WSSQ	Weight Self-Stigma Questionnaire
YFAS	Yale Food Addiction Scale

CHAPTER 1. General introduction

1.1. Stigma, prejudice, and discrimination

The word “stigma” originated with the Ancient Greeks, and referred to a visible mark, cut or burned into the body of an individual, such as a slave, criminal, or traitor, to indicate his “damaged” status, signalling that the bearer of the mark might best be avoided by more morally upstanding citizens (Goffman, 1963). Whether consciously or unconsciously, we categorise individuals that we encounter in our daily lives based on their attributes and social grouping, and these categories form a heuristic that dictates how our initial interactions might proceed (Allport, 1954; Tajfel, 1969).

By Goffman’s (1963) definition, having a stigmatised identity indicates membership in a societally devalued group. Prejudice, on the other hand, refers to the negative attitudes and beliefs about a group (Allport, 1954; Eagly & Chaiken, 1993). While holding prejudicial attitudes towards a group requires knowledge of the negative stereotypes or attributes associated with the group, the reverse is not necessarily true (Devine, 1989). For example, I may be aware that fat people are devalued in society, i.e., stigmatised, but if I do not myself engage in any negative judgment toward the group, then I am not prejudiced toward fat people. Prejudicial attitudes toward a group may also be explicit – manifested overtly, and reflecting conscious negative attitudes, or implicit – representing automatic, unintended, and often unconscious attitudes or feelings about a group, sometimes called “implicit bias” (Dovidio, Kawakami, Johnson, Johnson, & Howard, 1997; Fazio, 1990).

Discrimination, in its modern sense, refers specifically to actual manifestations of prejudice (Krieger, 1999). Again, I may hold prejudicial attitudes toward a group, but make efforts not to act on that prejudice or treat members of the group unfairly. Thus, while being stigmatised depends only on societal norms, prejudice and discrimination require actualisation of negative judgment or behaviours toward the stigmatised target.

A third, but important, source of stigma is intrapersonal, i.e., originating within the target. Intrapersonal stigma incorporates two forms of self-originating stigma: internalised stigma and anticipated stigma. Internalised stigma occurs when members of a marginalised group passively accept the devalued status of their group and devalues themselves as a result, acquiescing to their "lesser" identity. It is a well-recognised phenomenon among numerous stigmatised identities, including sexual minorities (Herek, Gillis, & Cogan, 2009), women (Downing & Roush, 1985), people with mental illness (Corrigan & Watson, 2002), and ethnic minorities (Pyke & Dang, 2003). Anticipated stigma, or fear of being stigmatised, is also self-originating, and is often incorporated into the definition of self-stigma; however, while it does require that individuals be aware of their devalued status in society, sometimes called stigma consciousness (Pinel, 1999), it does not necessarily require that the targets endorse that devalued status (Link, Wells, Phelan, & Yang, 2015). Anticipated stigma may originate in internalised stigma – that is, if you devalue yourself, or feel guilt or shame about your weight, you may expect others to do the same; and/or, it may result from previous negative events, where expectations are based on prior experience. Thus, internalised stigma (self-devaluation) and fear of stigma (anticipated other-devaluation) will be clearly distinguished in the present text.

1.2. Experienced weight stigma

1.2.1. Definition and prevalence

Experienced weight stigma can be broadly defined as exposure to negative attitudes, behaviours, or structural indignities that befall higher-weight individuals because of their weight or size. In this sense, the term "weight stigma" follows the conceptualisation of Link and Phelan (2001) in their influential paper, whereby "stigma" is an overarching concept that encompasses all of the separate components described in Section 1.1 – being labelled with a group identity, stereotyping, devaluation, and discrimination.

Stigmatising attitudes include endorsement of stereotypes of higher-weight people, for example, that they are greedy, lazy, or unintelligent (Allon, 1982). Stigmatising behaviours can range from social exclusion to rude or presumptuous comments, from staring or pointing to overt discrimination, or even verbal and physical attacks (Myers & Rosen, 1999). Stigmatising experiences may further include structural or environmental forms of stigma, that do not directly involve another individual, such as going to a theatre and not fitting into the seats, stores not carrying plus-size clothing, or displaying them only on slim models, or going to a doctor and having a blood pressure cuff not fit around your arm (Allon, 1982; Lewis et al., 2011; Merrill & Grassley, 2008).

Higher-weight individuals report experiencing weight stigma in practically every domain of daily living, including at work, in education, healthcare, and interpersonal relationships (Puhl & Heuer, 2009). Additionally, although early cross-cultural studies suggested differences in anti-fat attitudes between countries (Crandall et al., 2001), negative attitudes toward higher-weight bodies are becoming the norm worldwide, even in countries where fat was previously admired (Brewis, Wutich, Falletta-Cowden, & Rodriguez-Soto, 2011), and weight stigma is now prevalent in both developed and developing countries (Hackman, Maupin, & Brewis, 2016; Puhl & Suh, 2015).

Studies using questionnaire measures of experienced weight stigma find that, overall, most people indicate having experienced some form of stigma at least once in their lifetimes (Friedman et al., 2005; Myers & Rosen, 1999), with some studies reporting certain types of stigma occurring as often as weekly (Vartanian & Novak, 2011). Even so, retrospective studies that rely on recall over a lifetime likely underestimate the prevalence of weight stigma. In confirmation, a US experience-sampling study in which 50 higher-weight women completed a daily diary each day for seven days, indicating whether any of the 50 items of the weight-specific Stigmatizing Situations Inventory had occurred to them that day, resulted in over 1000 incidents being recorded, or approximately three incidents per person per day over the seven days (Seacat, Dougal, & Roy, 2016).

Studies that have explored ethnic and racial differences in prevalence of experienced weight stigma have produced conflicting results. Two studies found no difference in experienced weight stigma by racial or ethnic group (Himmelstein, Puhl, Quinn, &

Gorber, 2017; van den Berg, Neumark-Sztainer, Eisenberg, & Haines, 2008). However, these studies used very brief measures of experienced weight stigma – three items and one item, respectively. In a large cohort study that used a situational-prompt measure of experienced weight stigma, clear differences by race were observed (Dutton et al., 2014). Participants were asked if they had ever "experienced discrimination, been prevented from doing something, or been hassled or made to feel inferior" because of their weight in any of seven situations, including work, education, healthcare, and in public settings. More White women than Black women reporting experiences of weight stigma; in contrast, prevalence was higher in Black men than in White men, although men experienced significantly less weight stigma than women, regardless of race. It seems likely that these more detailed, situational prompts may produce more reliable findings, and be better able to capture true variance in stigma experiences (see Section 1.2.2).

Weight stigma also appears to be on the increase (Andreyeva, Puhl, & Brownell, 2008; Kyle, Thomas, Ivanescu, Nadglowski, & Puhl, 2015). For example, based on two waves of data from the National Survey of Midlife Development in the United States (MIDUS), the prevalence of weight/height discrimination (measured together) increased from 7% in 1995-1996 to 12% in 2004-2006, and was observed across all demographic categories, excepting the oldest age group (65-74 years) (Andreyeva et al., 2008). In the UK, data from the 2008-2009 wave of the English Longitudinal Study of Ageing indicated that, overall, 4.6% of community-based adults aged 50 or over had experienced weight stigma (Jackson, Steptoe, Beeken, Croker, & Wardle, 2015), and in a nationally representative, weight-diverse sample of women from the Guatemala

National Maternal-Infant Health Survey, also from 2008-2009, 10.9% had experienced weight-related teasing (Hackman et al., 2016).

More recently, a multi-national survey found that 43% of weight-diverse community-recruited panel subjects in the US and 33% in Iceland had experienced weight-related victimisation, and the figure was 59% for members of the Canadian Obesity Network; in the same study, student samples from the US, Iceland, and Australia reported experienced weight stigma prevalence between 50% and 60% (Puhl et al., 2015). In the Middle East, 44% of female undergraduates sampled from three universities in the United Arab Emirates reported weight-related teasing or harassment (O'Hara, Tahboub-Schulte, & Thomas, 2016). In another large study of US adults, data collected at several time points between February 2013 and September 2015 indicated that while understanding of the complex causal influences on body weight increased over that time, social acceptance of higher-weight individuals nevertheless decreased, particularly in education, employment and interpersonal relationship contexts. Very similar figures were obtained for samples in the UK, Germany, Italy, and Sweden (Kyle et al., 2017).

Prevalence figures measured across the weight spectrum disguise a strong gradient in stigma experiences: the frequency of experienced weight stigma increases markedly with increasing body weight, with most studies reporting 40-60% prevalence for BMI above 40kg/m^2 (Spahlhotz, Baer, König, Riedel-Heller, & Luck-Sikorski, 2015). Further, most forms of weight stigma occur more frequently in women, and are prevalent at lower body weights than in men (Andreyeva et al., 2008; Hatzenbuehler, Keyes, & Hasin, 2009).

1.2.2. Measuring experienced weight stigma

As noted above, one difficulty when attempting to explore the impact of experienced weight stigma is that, when considered retrospectively, it may be difficult to remember specific instances that have occurred, sometimes many years previously. An individual is likely to remember being physically attacked, for example, but people making assumptions about your lifestyle based solely on your weight might not stand out. Yet, for most people, their lifetime exposure to stigma will consist primarily of these "lesser" but more pervasive incidents. While often appearing superficially trivial or harmless (King et al., 2011; Rowe, 1990; Sue et al., 2007), these events act as a cumulative stressor over time (King, Shapiro, Hebl, Singletary, & Turner, 2006; Magallares, Benito de Valle, Irles, & Jauregui-Lobera, 2014; Munro, 2016).

Another issue is that discrimination, especially more subtle forms of discrimination, may not be recognised as such by the victim, being written off as deserved, well meaning, simple truths, or just innocent statements, especially when originating from children (Lewis et al., 2011; Lozano-Sufrategui, Carless, Pringle, Sparkes, & McKenna, 2016). While overt discrimination is blatant and intentional, and generally readily identifiable, even by un-involved third parties, subtle discrimination tends to be embedded within normal everyday life, for example, insensitive comments, overhearing (or being told) fat jokes, rudeness in interpersonal interactions, being ignored, having people not sit next to you or peer inquisitively into your supermarket trolley, and viewing stigmatising representations of higher-weight bodies in both news and entertainment media (Ata & Thompson, 2010; Heuer, McClure, & Puhl, 2011; Lewis et al., 2011). Because subtle discrimination is often ambiguous, targets may be uncertain whether discrimination has actually occurred (Barrett & Swim, 1998; Crocker, Major, & Steele, 1998). If they do attribute such an event to discrimination, it is also more likely than in the case of overt discrimination that an outside observer would dismiss the claimant as being incorrect, overly sensitive, or simply lacking a sense of humour (Feagin, 1991; Hinze, 2004; B. A. Quinn, 2000; Yosso, Smith, Ceja, & Solórzano, 2009).

The Stigmatizing Situations Inventory (SSI; Myers & Rosen, 1999) attempts to address issues of recall and attribution by prompting individuals with a list of 50 specific situations, across eleven different domains (family, strangers, employment, doctors, etc.), to indicate how often they have ever experienced each type of stigma. However, when levels of experienced weight stigma assessed *a priori* with the SSI are compared with reports of stigma measured in real-time using ecological momentary assessment, participants significantly under-estimated their exposure based on the questionnaire measure (Vartanian, Pinkus, & Smyth, 2016). Nevertheless, the SSI remains the most comprehensive measure for use in cross-sectional studies.

Studies using questionnaire measures of experienced weight stigma find that, overall, most people indicate having experienced some form of stigma at least once in their lifetimes (Friedman et al., 2005; Myers & Rosen, 1999), with some studies reporting certain types of stigma occurring as often as weekly (Vartanian & Novak, 2011). Even so, retrospective studies that rely on recall over a lifetime likely underestimate the prevalence of weight stigma. In confirmation, a US experience-sampling study in which 50 higher-weight women completed a daily diary each day for seven days, indicating whether any of the 50 items of the weight-specific Stigmatizing Situations

Inventory had occurred to them that day, resulted in over 1000 incidents being recorded, or approximately three incidents per person per day over the seven days (Seacat, Dougal, & Roy, 2016).

In the present studies, two different measures of experienced weight stigma are used. The SSI was used in both Study 1 and Study 2. However, following high initial rates of attrition in Study 1, this measure was replaced with a brief three-item questionnaire to reduce participant burden. Issues pertaining to interpretation of findings from the two measures are discussed in Chapter 2.

1.3. Internalised weight stigma

1.3.1. Definition and prevalence

In addition to being stigmatised by others, some individuals internalise society's anti-fat attitudes and stereotypes – that is, they devalue themselves because of their weight, with concomitant detriment to their self-worth and social identity (Hunger, Major, Blodorn, & Miller, 2015). Internalised weight stigma is most commonly defined as not just awareness, or even endorsement, of negative stereotypes, but also as applying those negative attributes to yourself, *and* subsequently devaluing yourself because of it. This last step is important. As a fat person, I may be aware that many people consider fat people to be lazy; I may or may not agree that this is usually true (I don't), and I may even happily admit that I, myself, am indeed both fat and lazy. But if I do not judge myself morally for this purported deficit, leaving my self-worth unaffected, then I do not hold internalised weight stigma beliefs.

Internalised weight stigma is related to, but distinct from, the constructs of body image, self-esteem, and attitudes towards other high-weight individuals (Carels et al., 2013; Carels & Musher-Eizenman, 2010; Durso & Latner, 2008). For example, while internalised weight stigma does include a component of negative appearance evaluation, this is specific to facets of body image related to weight. Additionally, there is a strong element of self-blame involved in internalised weight stigma. For example, while one might have poor body image related to a specific body part, such as height, or a disliked facial feature, this is unlikely to be tainted by a belief that one is to blame for that aspect of one's appearance. Similarly, self-esteem that is specific to the domain of weight does not preclude higher self-worth in other domains, and vice versa. Finally, internalised weight stigma is a self-directed attitude, whereas anti-fat attitudes generally pertain to evaluations of fat others. Unusually amongst marginalised groups (Crandall, Tsang, Harvey, & Britt, 2000; Dasgupta, 2004; Tajfel & Turner, 1979), there appears to be little protective ingroup bias among higher-weight individuals; that is, fat people are as likely to hold negative explicit and implicit anti-fat attitudes as are slimmer people (Crandall & Biernat, 1990; Crandall, 1994; Rudman, Fienberg, & Fairchild, 2002; Schwartz, Vartanian, Nosek, & Brownell, 2006; S. S. Wang, Brownell, & Wadden, 2004), although negative attitudes toward other higher-weight individuals are not necessarily reflected in one's views of oneself (Carels et al., 2011). In fact, it appears that many fat people do not self-identify as fat – perhaps envisioning themselves as thin people in merely temporarily fat bodies (Kyrölä & Harjunen, 2017; Murray, 2005; D. M. Quinn & Crocker, 1998).

Unlike experienced weight stigma, internalised weight stigma often does not differ between genders (Barber, Palmese, Reutenauer, Grilo, & Tek, 2011; Burmeister, Hinman, Koball, Hoffmann, & Carels, 2013; Carels et al., 2011; Durso & Latner, 2008; Roberto et al., 2012; Schulte, 2016; Schvey & White, 2015), although, a few studies have found small but statistically significant genders differences (e.g., Boswell & White, 2015; Pearl, White, & Grilo, 2014), with women having slightly higher levels of internalised weight stigma than men.

Based on an analysis I conducted of 31 samples across 30 studies using the Weight Bias Internalization Scale (WBIS; Durso & Latner, 2008), the most frequently used questionnaire for measuring internalised weight stigma, levels tend to be higher in treatment-seeking samples than in community samples (Figure 1.1).[1] Only 33.3% of studies conducted in treatment-seeking populations recorded a mean WBIS score at or below the neutral midpoint on the scale, compared with 71.4% in non-treatment-seeking populations. Additionally, the relationship between BMI and internalised weight stigma appears to be more variable in non-treatment seeking samples (r = .38) than in treatment-seeking samples (r = .73).

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[1] See Appendix A for included studies.

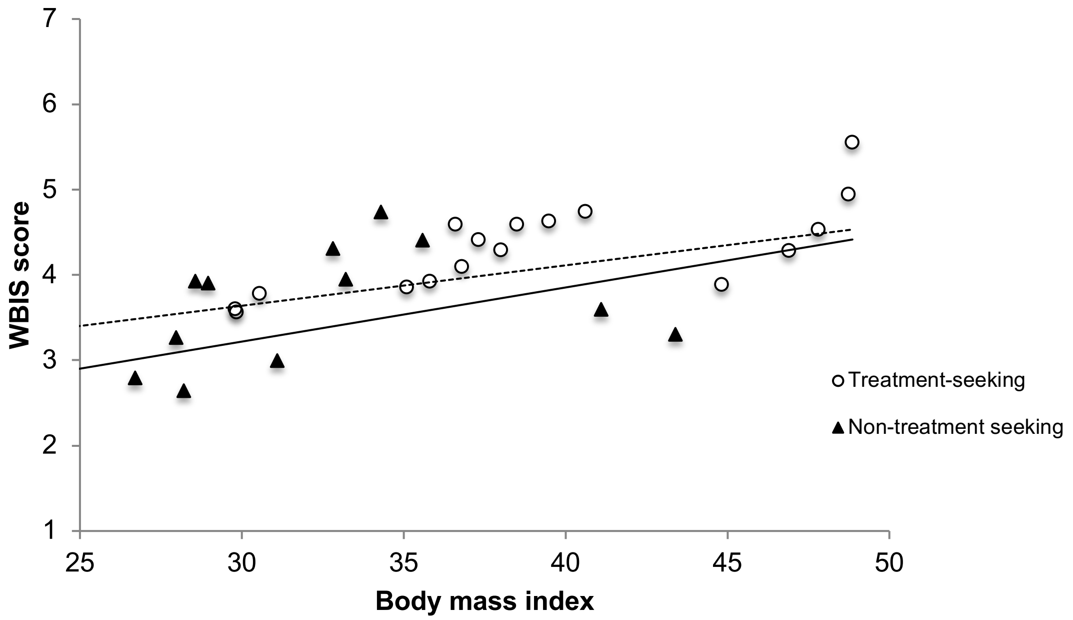

Figure 1.1. Relationship between body mass index and internalised weight stigma by treatment-seeking status. Data are for 31 samples across 30 studies. Dashed and solid lines are trendlines for treatment-seeking and non-treatment seeking samples, respectively.

The majority of studies of internalised weight stigma have been conducted in the US, although a small, but growing, number of studies have recently emerged from countries in Europe (e.g., Duarte et al., 2017; Hübner et al., 2015; Magallares et al., 2017; Palmeira, Pinto-Gouveia, Cunha, & Carvalho, 2017) and the Middle East (Farhangi, Emam-Alizadeh, Hamedi, & Jahangiry, 2017; O'Hara et al., 2016; Schulte, 2016). Some studies of internalised weight stigma that have explored race/ethnicity as a potential covariate have reported no difference between groups (e.g., Meadows, Nolan, & Higgs, 2017; Schvey, Sbrocco, et al., 2016). However, there is some evidence from US samples that internalised weight stigma may be lower in African-American participants than in non-Hispanic White and Latino/Latina participants (Eisenberg, Street, & Persky, 2017; Himmelstein et al., 2017; Pearl et al., 2017).

1.3.2. Measuring internalised weight stigma

The major research issue pertaining to the measurement of internalised weight stigma is one of operationalisation – that is, how the construct is defined. To date, three validated measures of internalised weight stigma have been published, all using slightly different conceptualisations of the construct. Although not formally depicted as a measure of internalised weight stigma, the Weight- and Body-Related Shame and Guilt Scale (WEB-SG; Conradt et al., 2007), assesses feelings of shame at one's size and guilt at failing to engage in supposed weight-changing behaviours. However, most of the six items on the Shame subscale refer specifically to anticipated rejection by others, for example, "When I am in a situation where others can see my body (e.g., pool, changing room), I feel ashamed." A typical item on the Guilt subscale is, "When I can't get a grip on my weight, I blame myself." Lewis (1971; cited in Tangney, Miller, Flicker, & Barlow, 1996) proposed that the related emotions of shame and guilt differ primarily in the role of the self: whereas guilt represents a state of negative affect relating to, for example, a specific deviant behaviour (e.g., lying, stealing), with the behaviour being the focus of judgment, shame represents a more trait-level attribution to negative self-worth, whereby moral transgressions are transmitted into a global devalued self. Thus, shame, rather than guilt, should be more aligned with the conceptualisation of internalised weight stigma as a self-devaluation status. Although both subscales explained additional variance in scores on body self-acceptance, depressive symptoms, and self-esteem, beyond that accounted for by shame and guilt related specifically to eating (Conradt et al., 2007), a study involving a weight-diverse sample of Canadian young adults found that the Shame, but not Guilt, subscale, mediated the relationship between objective measurements of weight status (BMI, skinfolds, and waist circumference) and global self-esteem (Pila, Sabiston, Brunet, Castonguay, & O'Loughlin, 2015).

A second validated measure of internalised weight stigma is the Weight Self-Stigma Questionnaire (WSSQ; Lillis, Luoma, Levin, & Hayes, 2010). The WSSQ comprises two subscales, which differentiate between self-devaluation and fear of being stigmatised by others. The Self-Devaluation subscale assesses guilt, shame, and self-blame with respect to body weight, and includes items such as, "I feel guilty because of my weight problems," and "I became overweight because I'm a weak person." The Fear of Enacted Stigma subscale assesses worries about being stigmatised by others because of weight, for example, "Others are ashamed to be around me because of my weight," and "Others will think I lack self-control because of my weight problems." It should be noted, then, that although the authors of the scale denoted this subscale as "fear of stigma," the subscale could also be characterised as anticipation or expectation of weight stigma, and overlaps considerably with the Shame subscale of the WEB-SG.
It could be argued that devaluing oneself because of one's weight may lead to expectations that others will do the same, but it is not a necessary pre-requisite (Link, Wells, Phelan, & Yang, 2015; see also, Chapter 4). Nevertheless, Almenara and colleagues (2017) reported that self-devaluation, but not fear of stigma, was associated with recent dietary restraint and eating and weight concerns in higher-weight women. Thus, while these measures are clearly telling us *something* about the relationship between weight-related self-beliefs and health and behavioural

outcomes, interpretation of these findings is constrained by the lack of clear agreement on the theoretical underpinnings of the construct.

The third validated measure of internalised weight stigma is the Weight Bias Internalization Scale (WBIS; Durso & Latner, 2008). The WBIS was developed from an original pool of 19 items encompassing several potential aspects of weight-related self-stigma, including appearance-related attitudes, social status, fear of being stigmatised by others, affective impact of weight status, desire for change, and weight stigma awareness and perceived legitimacy. Item selection for the final scale was guided by statistical techniques based upon a hypothesised unidimensional construct, producing a final scale comprising eleven items. These items mostly assess attitudes related to appearance, fear of stigma, affect, and desire for change. Notably, all items pertaining to self-blame, stigma awareness, and perceived legitimacy, and several of the items pertaining to self-worth, were excluded from the final scale. It is unclear whether an *a priori* assumption of multi-dimensionality would have produced different results. As the WBIS is the most widely used measure of internalised weight stigma, for the sake of brevity, subsequent descriptions of studies of internalised weight stigma can be assumed to have utilised the WBIS, unless otherwise stated.

A modified version of the WBIS (WBIS-M; Pearl & Puhl, 2014) allows internalised weight stigma to be assessed in samples whose BMI does not place them in the "overweight" or "obese" category. Wording was changed from, for example, "Because I am overweight …" to "Because of my weight…". The measure had good internal reliability and correlated as expected with measures of body image, self-esteem, and disordered eating. Measurement invariance – that is, is the WBIS-M capturing the same construct across the weight spectrum – has not been tested.

The present studies used the WSSQ (Studies 3 and 4), and the standard 11-item version (Study 2), modified 11-item version (Study 1), and original 19-item version (Study 5) of the WBIS. Instrument choice was directed by study aims, and further discussion is included in the relevant chapters.

1.4. Weight stigma and health

The wider stigma literature provides a wealth of evidence suggesting that exposure to prejudice and ill-treatment is linked with a wide range of structural and health inequalities across numerous stigmatised identities, through a variety of direct and indirect pathways (for reviews, see Hatzenbuehler, Phelan, & Link, 2013; Pascoe & Smart Richman, 2009). Similarly, numerous links between weight stigma and health are now being elucidated. Experienced weight stigma has been linked with higher levels of cortisol and inflammatory markers (Jackson, Kirschbaum, & Steptoe, 2016; Sutin, Stephan, Luchetti, & Terracciano, 2014; Tomiyama et al., 2014), and impaired glucose metabolism (Tsenkova, Carr, Schoeller, & Ryff, 2011), with experimental (Major, Eliezer, & Rieck, 2012; Schvey, Puhl, & Brownell, 2014) and longitudinal (Vadiveloo & Mattei, 2017) studies supporting a causal relationship. Recently, internalised weight stigma has also been linked with metabolic pathology (Pearl et al., 2017). Experienced weight stigma and weight-related bullying have also been linked with overt disease prevalence, including arteriosclerosis, diabetes, minor cardiac conditions (Udo, Purcell, & Grilo, 2016), with elevated blood pressure and reduce self-rated health over time (Rosenthal et al., 2015), and with higher mortality risk (Sutin, Stephan, & Terracciano, 2015), even after controlling for likely confounding factors.

Additionally, both experienced (Carr & Friedman, 2005; Hatzenbuehler et al., 2009; Jackson, Beeken, & Wardle, 2015; Magallares, Luna, Garriga, Botella-Carretero, & Morales, 2016; Schmitt, Branscombe, Postmes, & Garcia, 2014), and internalised (Almenara et al., 2017; Hilbert, Braehler, Haeuser, & Zenger, 2014; Lillis et al., 2010; Roberto et al., 2012; Rudolph & Hilbert, 2015) weight stigma predict psychological ill health and reduced wellbeing and quality of life.

1.5. Weight stigma and eating behaviour

Both experienced and internalised weight stigma have been linked with engagement in a range of maladaptive coping strategies, including disordered eating behaviour (Durso, Latner, & Hayashi, 2012; Lillis et al., 2011; Neumark-Sztainer et al., 2002; Puhl & Brownell, 2006; Puhl, Moss-Racusin, & Schwartz, 2007), avoidance of exercise (Mensinger & Meadows, 2017; Pearl et al., 2015; Vartanian & Novak, 2011; Vartanian & Shaprow, 2008; Wott & Carels, 2010), social isolation and experiential avoidance (Conradt et al., 2008; Lewis et al., 2011; Pila, Solomon-Krakus, Egelton, & Sabiston, 2017; Puhl & Brownell, 2006; B. E. Robinson & Bacon, 1996), and substance abuse and other high-risk behaviours (Almeida, Savoy, & Boxer, 2011; Bucchianeri et al., 2014; Hatzenbuehler et al., 2009; Sutin & Terracciano, 2017). However, the bulk of the literature pertains to the relationship between weight stigma and eating behaviour.

1.5.1. Experienced weight stigma and eating behaviour

Despite the difficulties in reliably measuring experienced weight stigma, studies have consistently found associations between experiences of weight stigma and problematic eating behaviour in both adults and children (for reviews, see Menzel et al., 2010; Nolan & Eshleman, 2016; Vartanian & Porter, 2016). Studies in population-based samples have linked experienced weight stigma with general overeating (Himmelstein et al., 2017; Puhl & Luedicke, 2012; Sutin et al., 2016); emotional and externally cued eating (Goldfield et al., 2010; Lampard, MacLehose, Eisenberg, Neumark-Sztainer, & Davison, 2014), secretive eating (Lewis et al., 2011); unhealthy or extreme weight control behaviours (Eisenberg, Berge, Fulkerson, & Neumark-Sztainer, 2012; Neumark-Sztainer et al., 2002); and clinically relevant eating pathology (Durso, Latner, & Hayashi, 2012; Piran & Thompson, 2008), over and above the effects of other forms of teasing (Rojo-Moreno et al., 2013).[2] Even stronger effects have emerged in treatment-seeking adults or those recruited from "obesity-related" discussion groups and social media (see Section 1.5.1 for a further discussion of this form of recruitment) (Almeida et al., 2011; Friedman, Ashmore, & Applegate, 2008; Libbey, Story, Neumark-Sztainer, & Boutelle, 2008; Puhl & Brownell, 2006; Schmalz & Colistra, 2016; Schvey, Barmine, Bates, & Sbrocco, 2016; Wott & Carels, 2010). Experiences of weight stigma have additionally been linked to binge and binge/purge behaviours (Durso et al., 2012), and clinical diagnosis of eating disorders (Friedman et al., 2008) in these groups.

A number of studies in population-based samples have used experimental designs to explore the relationship between various forms of weight stigma and behavioural intentions. For example, reading stigmatising “health promotion” messages has been linked with greater high-sugar and high-energy food selection when presented with an array of options compared with reading neutral messages (Tomiyama & Mann, 2013). Additionally, two studies have used a stereotype threat paradigm to assess the impact of weight-relevant stereotypes on eating behaviours or intentions. Stereotype threat refers to situations where members of a marginalised group, when primed to think of negative stereotypes associated with their group, tend to engage in behaviours that reinforce the negative stereotypes (Schmader, 2010). A study in a community sample of 100 higher-weight women who were currently exercising at least once per week found that the women who were primed to think about their weight in the context of health behaviours saw significant reductions in exercise and healthy dietary intentions and self-efficacy compared with women in the control condition (Seacat & Mickelson, 2009). Using a similar experimental design, 176 weight-diverse adults were randomised to either a stereotype threat or non-threat condition, and then asked to select options from a restaurant menu. Higher-weight individuals in the threat condition ordered more calories than did lower-weight participants; no effect was observed in the no-threat condition (Brochu & Dovidio, 2014).

A recent study in 84 self-classified “overweight” students (actual BMI range 19.4–60.1) found that participants who reported higher levels of prior weight stigma experiences chose more high-calorie foods on a menu-selection task when

[2] Note, all findings are reported controlled for BMI.

randomised to read about employment discrimination against higher-weight individuals than those who read about discrimination against a non-self-relevant outgroup (Inuit Canadians)(Araiza & Wellman, 2017). While these findings were consistent with those from the stereotype threat studies, the participants were neither fasted nor fed, and the results were not apparently controlled for hunger. As participants were randomised to the experimental conditions, it is probable that this oversight would not have influenced results, but it cannot be ascertained with certainty – randomisation failure occurred on the measure of previous stigma experiences, such that individuals in the control condition reported significantly more previous weight stigma experience than those in the stigma condition.

To date, only three studies have explored the impact of exposure to weight-related stigmatising material on objectively measured energy intake (Major, Hunger, Bunyan, & Miller, 2014; Schvey, Puhl, & Brownell, 2011; Shentow-Bewsh, Keating, & Mills, 2016), with conflicting results. These studies will be discussed in more detail in Chapter 2.

1.5.2. Internalised weight stigma and eating behaviour

The majority of studies that have assessed internalised weight stigma have been cross-sectional, which makes it impossible to elucidate the relationship between internalised weight stigma and disordered eating beyond saying they are strongly associated with each other. In population-based studies, internalised weight stigma predicted both binge and binge/purge behaviours after controlling for BMI and depressive symptoms in 656 higher-weight adults (Schvey, Roberto, & White, 2013), and both self-devaluation and fear of stigma were associated with eating pathology in a school-based study of 156 higher-weight adolescents. Internalised weight stigma has also been linked with binge eating, “food addiction,” reduced eating self-efficacy, dietary restraint, emotional and externally cued eating, and eating in the absence of hunger in treatment-seeking adults (Baldofski et al., 2016; Burmeister & Carels, 2014; Burmeister et al., 2013; Carels et al., 2010). Using the WSSQ, both self-devaluation and fear of being stigmatised by others are associated with binge eating (Palmeira, Pinto-Gouveia, & Cunha, 2016) and dietary disinhibition (Lillis et al., 2010) in treatment-seeking samples, although the relationship with dietary restraint appears to be weaker (Almenara et al., 2017; Lillis et al., 2010). Within clinical eating disorder samples, internalised weight stigma has been shown to explain additional variance in eating pathology, even after controlling for depression, self-esteem, and other potential confounds (Durso, Latner, White, et al., 2012).

Internalised weight stigma has also been linked with disordered eating patterns and eating pathology in population-based lean (Schvey & White, 2015), and weight-diverse (Durso, Latner, & Hayashi, 2012; Pearl & Puhl, 2014) samples, and in student samples (O’Brien et al., 2016; O’Hara et al., 2016; J. B. Webb & Hardin, 2016). For example, in a US population-based study of 197 lean individuals, every one-point increase in scores on the original 19-item version of the WBIS was associated with a two-fold increase in meeting the diagnostic criteria for binge eating disorder (BED) and nearly a three-fold increased likelihood of meeting diagnostic criteria for binge/purge behaviours, after controlling for BMI and depression (Schvey & White, 2015).

Internalised weight stigma also appears to be an important mediator of the effects of experienced weight stigma. In a large, predominantly "normal-weight" Australian student sample, internalised weight stigma mediated the relationship between a history of weight-related teasing and current emotional, disinhibited, and loss-of-control eating (O'Brien et al., 2016). In a sample of 238 higher-weight adults recruited through a combination of weight-related and non-weight-specific websites and convenience sampling strategies, internalised weight stigma mediated the relationship between interpersonal forms of weight discrimination and a composite measure of cognitive and behavioural eating pathology (Durso, Latner, & Hayashi, 2012). Internalised weight stigma also mediated the relationship between participants' own explicit anti-fat attitudes or internalisation of societal appearance norms and eating pathology in a predominantly normal-weight Emirati student sample (O'Hara et al., 2016).

A small number of health interventions that specifically target internalised weight stigma have now been conducted, and have demonstrated significant improvements in quality of life and psychological outcomes (Berman, Morton, & Hegel, 2016; Palmeira, Pinto-Gouveia, & Cunha, 2017; Pearl, Hopkins, Berkowitz, & Wadden, 2016). Two of these studies assessed eating-related treatment outcomes. In one, an eight-week cognitive behavioural therapy intervention to reduce internalised weight stigma in higher-weight individuals resulted in improved eating-related self-efficacy as well as other psychological improvement compared with a no-treatment control (Pearl et al., 2016). In the other, a 12-week mindfulness and acceptance- and compassion-based intervention in higher-weight women receiving behavioural weight-loss treatment resulted in lower levels of emotional and uncontrolled eating post-treatment, whereas no significant changes were observed in a treatment-as-usual control group (Palmeira, Pinto-Gouveia, & Cunha, 2017).

Studies 1 to 4 in this thesis focus on the relationship between weight stigma and various forms of maladaptive eating behaviours, including objectively measured eating in the absence of hunger (Study 1, Chapter 2), self-reported disordered eating (e.g., emotional, external eating) and eating disordered cognitions and behaviours (Study 2, Chapter 3), and "food addiction" (Studies 3 and 4, Chapter 4). The literature pertaining to weight stigma and (i) objectively measured food intake, and (ii) "food addiction" will be discussed in more detail in the relevant chapters.

1.6. Limitations of existing research on weight stigma and eating behaviour

1.6.1. Weight

While early studies in higher-weight populations found little impact of BMI on levels of internalised weight stigma (Latner, Barile, Durso, & O'Brien, 2014; Pearl & Puhl, 2014; Pearl, Puhl, & Dovidio, 2015), the development of the WBIS-M (Pearl & Puhl, 2014) allowed for testing of this construct in leaner as well as higher-weight individuals, and evidenced a strong positive association between internalised weight stigma and BMI across the weight range (Koball et al., 2016; Pearl & Puhl, 2014; J. B. Webb & Hardin, 2016).

While weight-related teasing does occur across the weight spectrum, the vast majority of experienced weight stigma is targeted at higher-weight individuals. Thus, a major limitation of the current literature is that a surprising amount of it measures a construct that is largely experienced by a marginalised group – higher-weight people – in members of the privileged majority. This is problematic for several reasons. First, even if unintentional, this practice serves to silence the voices of the marginalised group; the proliferation of weight stigma research conducted in "normal-weight" individuals could even be considered another form of structural oppression that reinforces rather than alleviates the marginalised status of the target population (Meadows, Daníelsdóttir, Calogero, & O'Reilly, 2017). There are also scientific reasons that may limit the interpretability of findings from research in "normal-weight" samples. Weight-related stigmatising experiences in Western society do not occur in a vacuum, but rather within a pervasively hostile anti-fat environment in which higher-weight individuals occupy a recognised subordinate status, complicated by aspects of blame and shame, with consequent implications for the inter- and intrapersonal dynamics of such interactions (Barlösius & Philipps, 2015; Fiske, 2010). Attributing negative treatment to prejudice is likely to be more onerous when it targets a stable, genuinely disadvantaged identity (Schmitt & Branscombe, 2002); the lived experience of a fat joke addressed at a very fat young girl, for example, may well not be equivalent to one addressed to a slim girl with body image issues. As such, research aiming to elucidate the pathways via which weight-related stigma impacts on such outcomes should be conducted in populations that are the primary target of such discrimination and prejudice, or at least in weight-diverse populations where any differences across the weight range may be explored.

When weight-diverse samples are used, it should not be taken for granted that measures of stigma are capturing the same qualitative experiences in higher-weight and normative-weight participants. Studies that have independently assessed the effects of weight-related teasing across different weight groups have produced conflicting results: while all studies consistently report significantly higher frequency of weight-related teasing in heavier participants, some (e.g., Goldfield et al., 2010; Puhl & Luedicke, 2012) have found no difference in affective responses to victimisation by weight status, whereas others (e.g., Quick, McWilliams, & Byrd-Bredbenner, 2013) found that heavier individuals reported greater distress as a result of weight-based victimisation than did slimmer individuals. Likewise, even where stigma is shown to be associated with eating behaviour across the weight spectrum, the equivalence of underlying mechanisms should not be assumed.

Another limitation in the current weight stigma and eating behaviour literature is that studies that do involve higher-weight participants are almost exclusively limited to treatment-seeking participants[3] and/or individuals recruited from forums related to "obesity" and health; thus, these populations, by definition, are likely unhappy with their weight status for a number of reasons. This is, of course, an important

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[3] It is worth noting that enrolment in weight-loss management programmes is not a guarantee of high-weight status. For example, one study reported that 19% of individuals they had recruited from a weight management programme had a BMI below 25, with the lowest being 19.5 kg/m^2 (Schmalz & Colistra, 2016). One has to wonder about the moral rectitude of the people running these programmes! Additionally, while some studies have reported that self-perceived weight status is a more reliable driver of psychological and behavioural outcomes than objective weight status (e.g., Major et al., 2014; Minor, Ali, & Rizzo, 2016), and one study found that WBIS scores were higher in self-perceived than objectively "overweight" participants (Lee & Dedrick, 2016), research that is also concerned with the experience of being stigmatised by others should perhaps consider excluding individuals whose self-image is at odds with their publically perceived weight status.

population to study – the impact of weight stigma on treatment-seeking individuals is likely to be a prominent factor in their current psychological distress. However, treatment-seeking individuals are likely to differ from population-based samples on numerous domains, including health and wellbeing (Myers & Rothblum, 2010; Wirth, Blake, Hebert, Sui, & Blair, 2014), self-acceptance (McKinley, 2004), internalised weight stigma (Lillis et al., 2010), and engagement in healthy and unhealthy behaviours (Blake et al., 2013). As such, the generalisability of these findings to other high-weight individuals is questionable. As an example, a review of studies examining the impact of "obesity" on the psychological wellbeing of higher-weight children and adolescents, found that treatment-seeking populations exhibited poorer psychological wellbeing than those recruited from the general community. The authors noted that while higher-weight children from population-based samples did endorse moderate body dissatisfaction, few were depressed or suffered low self-esteem (Wardle & Cooke, 2005).

1.6.2. Gender

Gender diversity is another limitation in the current literature. Many cross-sectional studies and all three experimental studies on the relationship between experienced weight stigma and eating behaviour have been conducted in all or predominantly female samples. Although women are more frequently targets of experienced weight stigma, men are not immune from this phenomenon (Hebl & Turchin, 2005), particularly at higher weights (Hatzenbuehler et al., 2009), and only small gender differences are observed for several forms of eating pathology (Rhys Jones & Morgan, 2010; Striegel-Moore et al., 2009). Additionally, even studies that report gender differences in internalised weight stigma, which tend to report slightly higher levels in women, nevertheless find relatively high levels in men (see Section 1.3.1). More importantly, evidence from a study in a population-based sample of 644 higher-weight adults that specifically explored gender differences suggested that internalised weight stigma may interact with other variables differently in men and women (Boswell & White, 2015). The relationship between internalised weight stigma and BMI in women was much weaker than in men (rs = .14 and .38, respectively, Z = -2.34, p = .02), suggesting that internalised weight stigma is more of a constant in higher-weight women, but tends to become more relevant in men at higher BMI levels. Internalised weight stigma was also more strongly associated with dietary restraint in women than in men, whereas it was more strongly related with objective and subjective binge eating episodes in men than in women. The association with depressive symptoms was also significantly higher in women, although it was nevertheless a moderately strong relationship in men (rs = .61 and .45, respectively, Z = 2.02, p = .04). No gender differences emerged in the relationships between internalised weight stigma and age of first "overweight," weight cycling history, purging behaviours, eating, shape, or weight concerns, or global eating pathology.

1.6.3. Race and ethnicity

Despite the potential for cross-cultural research afforded by the Internet, online studies of weight stigma and eating behaviour have been conducted in predominantly White, Western populations, although this is beginning to change. Having said that, many studies use race/ethnicity as only a descriptive variable, without considering how it relates to other measures of interest. Little is currently known about any ethnic or cultural differences in the relationship between weight stigma and eating behaviour. A study in 100 Australian Caucasian females and 48 Hong Kong Chinese females, aged 17 to 28, found different associations between weight-related teasing, body dissatisfaction, and eating disturbance between the two groups (Sheffield, Tse, & Sofronoff, 2005). Models were constructed including BMI, ever having dieting, internalisation of, and pressure to conform to, the thin ideal, self-esteem, and experience of weight-based teasing as predictors of body dissatisfaction, and body dissatisfaction as a mediator between these predictors and a measure of eating disturbance (bulimia and drive for thinness). In the full model, self-esteem was the only significant predictor of body dissatisfaction, and body dissatisfaction and ever having dieted predicted eating disturbance in the Australian sample. In the Hong Kong sample, body dissatisfaction did not significantly predict eating disturbance, whereas self-esteem and weight-related teasing experience directly predicted problematic eating (Sheffield et al., 2005). Findings such as these highlight the importance of not only exploring the impacts of stigma in more diverse samples, but also considering different mechanistic pathways to determine how these effects are transmitted in different demographic groups.

A recent US study in a nationally representative sample of 2378 adults (65% identified as White, 16% Latino/Hispanic, 13% Black/African America, 6% Asian or Pacific Islander) found differences in the use of weight stigma coping strategies by both race and gender. Black women were less likely and Hispanic women more likely to engage in disordered eating behaviour as a coping strategy in response to weight stigma compared with White women. In contrast, Black men were more likely than

White men to use eating as a coping strategy (Himmelstein et al., 2017). This is also one of very few studies, along with analyses from the Project EAT cohort (e.g., Neumark-Sztainer et al., 2002; van den Berg et al., 2008) to consider the intersectional effects of weight stigma.

Most people do not fit neatly into a single box, based solely on their size, gender, ethnicity, age, socioeconomic status, sexuality, or other singular identity. In reality, there is a non-additive effect of the multiple identities that we all possess, which may overlap in complex ways in terms of exposure to oppression and inequality (Bauer, 2014; Crenshaw, 1989). Exploring cultural and ethnic differences in weight stigma serves not only to document the extent of the problem within the wider social context, but also enables consideration of intersectional effects, more accurately mirroring the lived experience of individuals in marginalised groups.

1.6.4. Study design and pragmatism

As with much psychology research, there is a glut of cross-sectional research using entirely self-report measures within the weight stigma literature, for obvious pragmatic reasons. For similar reasons, much of this research is conducted in undergraduate psychology students, who may be atypical in many ways compared with the wider population (Henrich, Heine, & Norenzayan, 2010). In and of itself, these are not necessarily problematic, and without such studies, we would know a lot less than we do today. However, attempts should be made to confirm findings using more objective measures and in more representative samples, and to utilise experimental designs that allow for determination of causal mechanisms.

1.6.5. Overlapping constructs

One final limitation of existing studies on internalised weight stigma and eating behaviour, in particular (but not limited to) those using the WBIS, is that of overlap with measures of body image and global self-esteem.[4] Indeed, initial construct validity of the WBIS was partly demonstrated by correlation with measures of self-esteem (r = -.68) and body image (r = -.74), and these relationships were not weakened after controlling for BMI (Durso & Latner, 2008). Subsequent studies have also reported very high correlations between these constructs (Carels et al., 2010; Ciupitu-Plath, Wiegand, & Babitsch, 2017; Durso et al., 2012; Durso, Latner, & Ciao, 2016; Pearl & Puhl, 2014; Pearl & Dovidio, 2015). One study conducted in a treatment-seeking bariatric sample reported a lower correlation between scores on the WBIS and appearance evaluation (r = .36, p < .01) (Hübner et al., 2016); however, this surgical sample had very high mean scores on the WBIS and very low mean scores on the measure of body image, so it is possible that there may not have been sufficient variance within the sample to discern the true association. A study that used a more specific measure of body image – satisfaction with various body areas – reported only moderate correlation with the WBIS (Burmeister et al., 2013), suggesting that the WBIS is most strongly correlated with measures of global body image.

[4] However, correlations between the WSSQ and measures of body image and global self-esteem tend to be moderate in strength (Almenara et al., 2017; Hübner et al., 2016; Maïano, Aimé, Lepage, & Morin, 2017), suggesting that the issue of construct overlap is more severe for the WBIS.

Internalised weight stigma, body image, and global self-esteem are all self-directed judgments. Given the previously highly identified correlations between these constructs, it is possible that part of this commonality is due to an underlying self-judgment factor. While a person with low self-esteem or poor body image will not necessarily be high in internalised weight stigma, an individual high in internalised weight stigma will likely also have low self-esteem and poor body image. The impact of these constructs on health behaviour may well be due to the shared variance between them, i.e., an individual who tends to judge themself negatively across numerous domains may engage in fewer health behaviours or more unhealthy behaviours than one who tends to judge themselves more positively.

As the developers of the WBIS noted, despite the overlap, these constructs may have different real-world implications (Durso & Latner, 2008). However, these very high correlations are a cause for concern, and raise the question of how much additional variation in individual behaviours or health outcomes are explained by internalised weight stigma, above and beyond that attributable to the lower levels of global self-esteem and body satisfaction manifested by individuals who are high in internalised weight stigma. Both self-esteem (Mann, Hosman, Schaalma, & de Vries, 2004; Sani et al., 2016) and body image (Mond et al., 2013; Stice & Shaw, 2002) are important predictors of mental and physical health and wellbeing, and a range of health behaviours, including disordered eating, exercise, and substance abuse. It could therefore be hypothesised that low self-esteem, poor body image, and high internalised weight stigma are markers of a unifying underlying factor of negative self-judgment, and that it is this common factor that explains the majority of the variance in outcomes associated with these constructs.

Few studies of internalised weight stigma and eating behaviour have controlled for these variables. One exception is a study conducted in 100 treatment-seeking "obese" patients with binge eating disorder (Durso, Latner, White, et al., 2012). Controlling for depressive symptoms, endorsement of anti-fat stereotypes, and global self-esteem, the WBIS explained an additional 9% of variance in total scores on the Eating Disorder Examination Questionnaire, although the majority of the difference was accounted for by the weight- and shape-concern subscales, that is, appearance-related constructs. Thus, it is unclear whether or to what extent internalised weight stigma is a useful construct in explaining maladaptive eating behaviours, beyond its underlying associations with body image and self-esteem.

1.6.6. Addressing limitations in weight stigma and eating behaviour research

Four of the studies contained in this thesis explore the relationship between weight stigma and eating behaviour. In Study 1 (Chapter 2), I use an experimental paradigm to test the mediational and moderational role of internalised weight stigma on the relationship between stigma exposure and an objective measure of non-physiological eating behaviour. Participants include both higher-weight and "normal-weight" individuals, allowing for any differences between the groups to be assessed. In Study 2 (Chapter 3), I test the relationship between experienced and internalised weight stigma on self-report measures of eating behaviour in an international, multicultural sample of higher-weight men and women, recruited through a variety of weight-positive, weight-negative, and weight-neutral website and social media groups. I also use bifactor analysis, a form of confirmatory factor analysis, to address the issue of construct overlap with body image and global self-esteem. In Studies 3 and 4 (Chapter 4) I initially conduct a study of weight-related self-devaluation and fear of being stigmatised and "food addiction" in a student sample, with a follow-up phase to test the utility of self-stigma variables in predicting future eating pathology. I then replicate the cross-sectional data in an international, weight-diverse, non-student sample.

1.7. Stigma resistance

1.7.1. Stigma response and the continuum of self-worth

Early researchers of social stigma believed that membership in a stigmatised group would inevitably be accompanied by internalisation of society's negative attitudes and reduced global self-esteem (e.g., Allport, 1954; Goffman, 1963; Tajfel & Tajfel, 1978), whether because you see yourself through others' judging eyes (Shrauger & Schoeneman, 1979) or because of real societal disadvantage (Hatzenbuehler et al., 2013). However, a wealth of empirical evidence among a wide range of traditionally stigmatised populations, including ethnic or sexual minority groups and individuals with physical or mental impairments, has failed to provide strong support for this hypothesis, with some studies even reporting higher self-esteem in the stigmatised group compared with the non-stigmatised majority (for reviews, see Corrigan & Watson, 2002; Crocker & Major, 1989), indicating that these individuals have not internalised their socially designated inferior status. Two meta-analyses of studies exploring the relationship between perceived discrimination and psychological wellbeing confirmed an overall negative impact on measures of psychological wellbeing using both correlational and experimental data; however, the effect sizes were not large (Schmitt et al., 2014), and it is likely that these small to modest effect sizes mask significant variability among members of stigmatised groups (Thoits, 2011).

In an attempt to explain what Corrigan and Watson (2002) termed the "paradox of self-stigma," they proposed a model whereby the self-esteem of members of a stigmatised group would diverge, based upon a number of factors (see Section 1.7.2), to produce two possible terminal outcomes. At one end, would be those who had internalised their devalued status, with subsequent damage to their global self-esteem. At the other end were those who refused to accept their devalued status, and expressed "righteous anger" (Corrigan & Watson, 2002, p. 38); these individuals would have unmarred, or even elevated, self-esteem as a result of membership of the stigmatised group, even when faced with overt discrimination. In between these two extremes are people who *adapt* to societal stigma through a variety of means. In the terminology of the original social identity theorists, these strategies, which protect self-esteem by altering the self-perceived value of group membership, are known as "social creativity," and may include, for example: setting themselves apart from "typical" members of the stigmatised group (Burkley & Blanton, 2008); limiting potential stigmatising interactions; re-framing group attributes in a more positive light, such as the Black is Beautiful movement of the 1960s (Camp, 2015), or creating a new and valued social identity by "reclaiming" derogatory terms used by others to describe your group, a strategy that has been successfully applied by the LGBTQ

movement (Brontsema, 2004); downward comparisons within the group or with an "inferior" marginalised outgroup, rather than with the societally "superior" group – thus preserving one's own self-esteem at the expense of others; or disengaging from stigma-relevant domains (Crocker & Major, 1989; Tajfel, 1974; Thoits, 2011).
In contrast, "social change" strategies have the potential to alter not just the self-perceived value of the group, but to change the *actual* status of the group.

Thoits (2011) classified both social creativity and social change strategies as forms of stigma resistance, but distinguished between what she called "deflection resistance," encompassing social creativity strategies, and "challenging resistance," representing social change strategies. This characterisation serves to acknowledge that deflection strategies are indeed a form of agentic resistance, and do not necessarily equate to "inaction," or victimhood; in some circumstances, even maintaining the status quo may require considerable intrapsychic resources (Inzlicht, McKay, & Aronson, 2006; Leach, 2017). Thoits noted that deflecting-style resistance, or social creativity, may leave self-esteem intact, but would be unlikely to result in further augmentation of self-worth. In contrast, she noted that challenging-style resistance provides the opportunity for enhancing self-esteem, either by successfully changing people's attitudes or behaviours toward the group, or simply as a result of empowerment and agency deriving from the *sense* of taking action.

Although Thoits goes on to describe challenging resistance in terms of *actions*, her original distinction between the two forms of resistance is one between "pushing back" against a harmful force (challenging) and "blocking" an external force so that it cannot harm oneself (deflecting) (2011, p. 11). Corrigan and Watson's noninternalisation outcome was conceptualised as "righteous anger" – in other words, an internal state rather than a behaviour. Combining Corrigan and Watson's self-stigma paradox model with Thoits' resistance classification, stigma resistance may be conceptualised as the antithesis of internalisation – a combination of attitudes, beliefs, and behaviours that *oppose* the societally designated devalued status. As stigma internalisation has been linked with a range of inferior health and wellbeing outcomes, then stigma resistance should be associated with a number of health benefits, in addition to improved self-esteem. Thus, development of this style of coping may provide a useful target for interventions aimed at reducing some of the harms associated with belonging to a stigmatised group (Corrigan, Kosyluk, & Rüsch, 2013; Rüsch et al., 2014).

Evidence from cross-sectional studies in marginalised groups including Black Americans (Outten, Schmitt, Garcia, & Branscombe, 2009), gay men (Bachmann & Simon, 2014), and individuals living with HIV/AIDS (Molero, Fuster, Jetten, & Moriano, 2011) supports a positive association between resistance strategies and health and wellbeing; conversely, hiding a stigmatised status tended to be negatively associated with wellbeing outcomes. In a recent experimental study, 93 ethnically diverse young women were sent information on sexism in the media, politics, and academia over three consecutive days (Foster, 2015). They were then asked to either "tweet" publically or privately (to the experimenters only) about the information they had received, on a different topic, or not at all. Those who used social media to publicly highlight, criticise, or mobilise regarding these examples of sexism displayed less negative affect and better psychological wellbeing over time compared with three control groups. However, activism for social change was not predictive of personal self-esteem in an international sample of individuals with a range of physical, psychiatric, learning, sensory, or other disabilities; nevertheless, concealing the disability, where this was possible, was a strong negative predictor of self-esteem. Both taking pride in the group identity and denying or minimising the disability were also positively associated with self-esteem, controlling for concealability and duration of the condition, highlighting the complexity of the relationship between stigma response and self-worth (Nario-Redmond, Noel, & Fern, 2013). Selection bias resulting from recruitment techniques may also have played a role in the different results observed in some of these studies – for example, recruiting from gay pride and advocacy groups (Bachmann & Simon, 2014) is likely to attract individuals with a relatively positive relationship to their ingroup, whereas recruiting from a college disability service may not (Nario-Redmond et al., 2013; sample 1). However, the study by Nario-Redmond and colleagues included two samples, the second of which involved purposive recruitment strategies likely to attract participants with a range of views about disability, and the results did not differ from the sample recruited solely at a disability service.

1.7.2. Predictors of stigma response: A social identity framework

Social categorisation involves the conceptual clustering of individuals within a society into entitative groups, based on their attributes, attitudes, beliefs, or behaviours, in a way that is meaningful for members of that society (Tajfel, 1974; Tajfel & Turner, 1979). According to Social Identity Theory, an individual's social identity is that part of his or her self-concept that derives from these group memberships. The relative status of these identities are therefore socially defined by the value given to the groups within the social structure.

The theory further states that individuals will act to maximise their self-worth. This means that individuals will maintain a social group membership only as long as it confers some benefit to them in terms of their social identity. When group membership fails to confer a positive social identity, for example, if the group is societally devalued, individuals will mostly prefer to dis-identify with the lower-status ingroup and engage in individual upward mobility (Ellemers, Wilke, & van Knippenberg, 1993; Tajfel, 1974; Wright, Taylor, & Moghaddam, 1990), that is, try to leave the group. In some circumstances, an individual may not be able to leave a devalued group – that is, the group's boundaries are considered impermeable. A typical example would be race. Although Black Americans are highly stigmatised (Clark, Anderson, Clark, & Williams, 1999), one cannot change one's race by sheer force of will. In other circumstances, choosing to leave behind one's group, even if it were possible, may conflict with an individual's core value system, for example loyalty, or the importance of prioritising group cohesion over individual gain (Branscombe & Ellemers, 1998; Tajfel, 1974; Wright & Lubensky, 2009).

When group boundaries are objectively or subjectively impermeable, members of the devalued group can engage in a number of individual or group-based identity-enhancement strategies to maximise their self-worth within the current status structure (Branscombe & Ellemers, 1998; Crocker & Major, 1989; Tajfel & Turner, 1979), as outlined in Section 1.7.1. In this situation, the individual's perceived assessment of the legitimacy of the status inequality is likely to determine how they respond. If the status quo is seen as fair and just, the most likely outcome is acceptance and internalisation (Corrigan & Watson, 2002; Tajfel, 1974; Martin, 1986; cited in Wright, 1997). System Justification Theory explains that some of the most disadvantaged groups make sense of their low status in the current social order by endorsing the negative stereotypes against their ingroup, exhibiting strong out-group preference, and high levels of internalised self-devaluation (Jost & Banaji, 1994; Jost, Banaji, & Nosek, 2004). Alternatively, where the discrimination is considered unfair, responses will vary based upon their likelihood of success. If the current status quo appears to be stable and unlikely to change, individuals can maximise self-worth by engaging in social creativity strategies to change the perceived value of their group, but if the situation is unstable, people may be more likely to foment social change (Branscombe & Ellemers, 1998; Tajfel, 1974; Tajfel & Turner, 1979; Wright, 1997).

Finally, how strongly one identifies with other members of the group is critical in determining whether to pursue individual strategies likely to maximise personal self-worth, or collective strategies likely to improve the status of the group as a whole (Ellemers, Spears, & Doosje, 1997; Ellemers et al., 1993; Tajfel & Turner, 1979; Turner, 1985), as well as the impact of the societally devalued status on one's self-worth and psychological wellbeing (Ellemers, Spears, & Doosje, 2002; McCoy & Major, 2003; Schmitt et al., 2014). Complicating matters further, salience and strength of group identity may also depend on a number of factors, including perception of discrimination (Branscombe, Schmitt, & Harvey, 1999; Jetten, Branscombe, Schmitt, & Spears, 2001), whether group boundaries are perceived to be permeable (Ellemers, van Knippenberg, De Vries, & Wilke, 1988; Ellemers et al., 1993), or the status quo is deemed to be stable (Bettencourt, Charlton, Dorr, & Hume, 2001; Ellemers et al., 1993).

Based on a social identity theory framework, Corrigan and Watson's (2002) paradox model of self-stigma provides a useful rubric for predicting where on the continuum between internalisation and resistance an individual may fall (see Figure 1.2). Situated within a mental health stigma framework, their model predicts that perceived legitimacy and group identification would determine which path an individual would take in a given contextual circumstance, with perceived legitimacy being the sole predictor of internalisation, and group identification separating out those who perceive societal stigma as illegitimate into either being indifferent (low group identity) or resisting the stigma (high group identity). Note, they did not consider group permeability effects in their model.

1.7.3. Stigma resistance in higher-weight individuals

While the harmful effects of internalising weight stigma are well recognised, little work has explored stigma resistance in higher-weight populations. Qualitative research among the Fat Acceptance community, a collective term for individuals who engage in fat-rights advocacy, suggests that "coming out as fat" – admitting and asserting membership of the group "Fat" – is associated with a sense of empowerment and improved psychological and physical wellbeing (Dickins, Thomas, King, Lewis, & Holland, 2011; Lewis et al., 2011; Saguy & Ward, 2011).

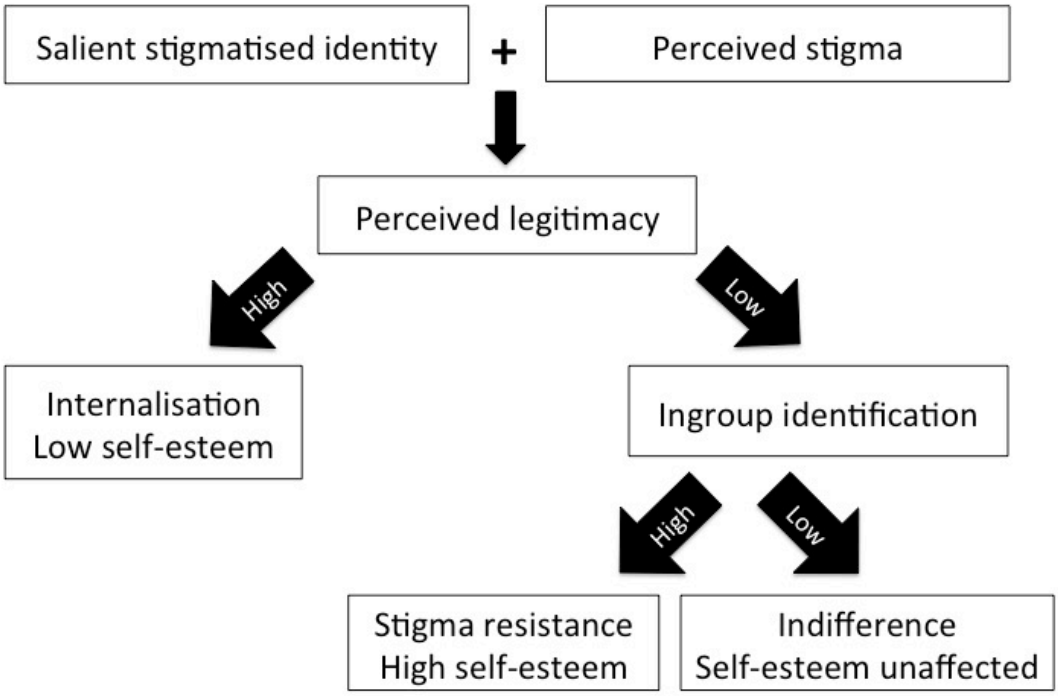

Figure 1.2. Paradox model of self-stigma (adapted from Corrigan & Watson, 2002)

While it may seem incongruous to use this phrase in terms of an identity that is clearly visible, as noted above, heavier individuals often have notoriously low group identity, seeing themselves as not “truly” fat, or as distinct from others in the group “Fat.” In this context, “coming out” as fat involves accepting, acknowledging, and even celebrating their status as fat beings, rather than as works in progress, and the term is widely used among members of the fat acceptance community and fat activism groups (Saguy & Ward, 2011). Limited support for these findings comes from a quantitative, cross-sectional study of 128 higher-weight women recruited from the subscription list of Radiance magazine, whose mission statement was to support and empower large women (McKinley, 2004). Participants who endorsed stigma resistance had higher body esteem, lower body shame, and better scores on several, although not all, dimensions of psychological wellbeing, including autonomy, self-acceptance, and personal growth, than did those who endorsed a more fatalistic acceptance of body size.

As noted in Section 1.7.2, how individuals respond to derogation based on a stigmatised identity will be influenced to some extent by whether leaving the stigmatised group is a viable option. In the case of the group "Fat," many individuals who believe that weight is largely under individual control are likely to pursue the goal of becoming "Not-Fat" through diet, exercise, or medical means. In contrast, people who have repeated failed attempts at weight loss may conclude that significant permanent weight-loss is unlikely to occur (Bombak & Monaghan, 2016), making group boundaries largely impermeable. Under conditions of boundary impermeability, alternative strategies to maintain self-esteem are needed. Following Thoits (2011), Table 1.1 provides examples of how these responses lie on a continuum from internalisation at one end, to social change behaviours at the other. The choice of strategy used by an individual will depend to a large extent on group identification, perceived legitimacy of weight stigma, and perceptions regarding the stability of the status quo.

Based on predictions from social identity theory, Lindly and colleagues (2014) looked at group identification and ingroup affiliation, but not perceived legitimacy of weight stigma, as predictors of collective and global self-esteem, body image, and a number of individual and collective coping strategies in 50 higher-weight women recruited from fat advocacy organisation (*n* = 25), weight-loss organisations (*n* = 13), and undergraduate psychology courses (*n* = 12). They reported that while global self-esteem was strongly negatively correlated with weight-loss support, suggesting internalised weight-negativity, and positively with the social creativity strategy of body affirmation, e.g., reframing fat as "big is beautiful," it was not significantly correlated with social change activism tendencies ($r = .19$, $p > .05$).

Table 1.1. *Continuum of Potential Responses to Weight Stigma*

Type	Characteristic	Example
Internalisation	Agree with and endorse negative stereotype as applying to themselves.	"I'm so fat – I don't understand how anyone could love me."
Deflection	May (or may not) agree with and endorse negative stereotypes but do not see as self-relevant.	"Yes, fat people are lazy, but I'm not. I'm starting a new diet and I'm going to lose the weight. I'm not like them."
Avoidance	Hide concealable identity where possible; avoid potentially stigmatising situations and/or people that may be prejudiced.	Not exercising so as not to be seen sweating, puffing, and panting and risk being labelled with stereotypes that fat people are lazy and unhealthy.
Self-restoration	Engage in self-serving strategies such as comparisons only within the marginalised ingroup rather than with the outgroup; disinvesting from the stigma-relevant domain.	"I may be fat, but at least I'm not as fat as that person." "I don't care about fashion anyway – I'm more interested in intellectual pursuits."
Challenging	Reject the negative stereotypes in their entirety, both as applied to themselves and others; challenge the status quo.	"There is nothing wrong with being fat and what you are doing is discriminatory. I'm going to lodge a complaint."

However, the sample was small, and skewed toward those already involved in some form of social activism, and it is possible that this study was not powered to detect an effect on this measure. Ingroup identification, i.e., identifying as fat, was only moderately correlated with self-esteem. However, belief that weight-loss is simply a matter of willpower, i.e., that the boundaries of the group "Fat" are permeable, was strongly negatively associated with fat identification, perceptions of discrimination, and support for social change. Further, when group identification, and all three stigma response options (support for weight loss, social creativity, social change) were included in a model with BMI and childhood weight status, only body affirmation remained a significant predictor of global self-esteem.

While the study by Lindly and colleagues (2014) did not provide strong support for a social identity model of weight stigma resistance and self-esteem, the study had a number of limitations in that respect, in addition to the limited sample size. First, beliefs about the legitimacy of weight stigma are an important predictor in the social identity model but were not assessed. Additionally, internalised weight stigma was not measured (although collective self-esteem was assessed and could be considered a rough proxy for internalisation, this construct is dependent upon the individual's level of identification with the collective, and does not necessarily reflect the extent to which their own personal worth is affected). Third, the majority of measures used were developed for the study and are not psychometrically validated. In particular, the measures of group identification and group affiliation were not well delineated in terms of recognised components of group identification (e.g., Leach et al., 2008). The measure of social change used was also limited in breadth, with three of the five items pertaining to the need for and/or membership of fat rights organisations, a particularly politicised form of resistance (Stürmer, Simon, Loewy, & Jorger, 2003), and did not really capture a sense of anger or reactance. Finally, interactions between the predictors of stigma response were not considered, meaning that this study did not fully test the inter-relationship between these variables hypothesised by Corrigan and Watson.

To date, nobody has tested a true continuum model of stigma resistance – with internalisation at one end and resistance at the other – in a high-weight population. Study 5 in the present work (Chapter 5) reports on assessment of a stigma resistance model of self-esteem in response to perceived weight discrimination in a diverse sample of higher-weight adults. This model builds on the framework of Corrigan and Watson's (2002) self-stigma continuum, but incorporates perceptions of barrier permeability – in this case, beliefs about the likely success of weight-loss efforts, and conceptualises the original "righteous anger" group following Thoits' (2011) conceptualisation of stigma resistance – that is, pushing back against societal devaluation, whether internally or by engaging in overt challenging behaviours. The model attempts to predict how an individual will respond to weight stigma and how this will impact on their psychological wellbeing. Additionally, as part of this study, I will revisit the WBIS, using the original 19-item pool to explore alternative factor structures and conceptualisations of internalised weight stigma.

Finally, Chapter 6 concludes the thesis. The main results from the individual studies are summarised, and overarching themes that span the thesis chapters are discussed. Implications for the health and wellbeing of higher-weight individuals are also considered, and current limitations of the research and future directions addressed.

1.8. Aims of the thesis

This thesis aims to extend current research on the link between weight stigma, in particular, internalised weight stigma, and the health and wellbeing of higher-weight individuals, whilst addressing some of the limitations of existing studies.
The experimental work in this thesis is aimed at: (1) elucidating the independent and complementary roles played by experienced and internalised weight stigma in patterns of maladaptive eating behaviours; (2) exploring the unique and overlapping contributions of internalised weight stigma, body image, and global self-esteem in explaining this relationship; and (3) testing a model of stigma resistance as a response to perceived discrimination, considering the individual and moderating effects of group identification, perceived legitimacy of weight stigma, and perceived permeability of group boundaries.

A quantitative approach was chosen for several reasons. First, the first two aims relate to questions arising from previous quantitative research, where certain aspects of identified relationships required further specification. The studies included here build on and extend this research using similar methodologies. The third aim expands on research in the mental health stigma domain, applying a process-oriented predictive model to the field of weight-based stigma. In order to elucidate these processes, statistical techniques were required to identify the relative strengths and order effects of potential predictors of stigma resistance. Additionally, some qualitative data exists to suggest that stigma resistance may contribute to psychological wellbeing in higher-weight individuals. The quantitative approach used in this thesis allows for this relationship to be formalised. In all studies, the quantitative approach allows for more rapid collection of data across larger sample sizes, thus enabling determination of statistical significance and relative effect sizes.

The findings from this thesis will provide useful insights for improving the validity of future weight stigma research, targeting interventions designed to improve internalised weight stigma among higher-weight individuals, and provide a foundation for future work on stigma resistance.

CHAPTER 2. Study 1. Experienced and internalised weight stigma and eating in the absence of hunger: An experimental manipulation

2.1. Introduction

As noted in Chapter 1, few studies have explored the impact of weight stigma on actual, rather than self-reported energy intake. In a lab-based study of 34 "overweight" and 39 "normal-weight" females, fasted subjects watched either a weight-stigmatising or a neutral video, before being given access to a large amount of snack food (Schvey, Puhl, & Brownell, 2011). The "overweight" women in the stigma condition ate over three times as many calories as those who watched the neutral video, and significantly more than "normal-weight" women in either video condition. In another study, Major and colleagues randomised 93 fasted female university students to read a sham news article about how either weight or smoking status could negatively impact on employment prospects, which was partly explained by greater healthcare insurance costs for higher-weight or smoking employees, who were deemed more likely to suffer ill health (Major, Hunger, Bunyan, & Miller, 2014). After reading the article, the women had to describe and discuss it whilst being videotaped. On subsequent exposure to snack foods, women in the stigma condition who perceived themselves to be "overweight" consumed more calories than those in the neutral condition. No significant effect was seen for women who did not perceive themselves to be "overweight." The authors proposed that this effect was driven by social identity threat, which occurs when an individual is reminded or made aware that a group they belong to is socially devalued (Major & O'Brien, 2005; Steele, Spencer, & Aronson, 2002). Coping with such threats to one's social identity can involve a range of strategies, including suppression of negative emotions or attempts to present oneself more positively (Miller & Kaiser, 2001), all of which require effortful self-control, and which have been demonstrated to deplete the cognitive resources required for subsequent self-control, for example, when presented with highly palatable but "unhealthy" snack foods (Baumeister, DeWall, Ciarocco, & Twenge, 2005; Mead, Alquist, & Baumeister, 2010). However, one possible limitation of the study by Major et al (2014) is that any effects of the vignette on intake resulting from weight-related social identity threat may have been confounded with non-identity-related stress arising from more pragmatic concerns around actual or potential health or employment problems.

A more recently published study randomised 120 weight-diverse female undergraduates to either a weight-stigma condition or one of two control conditions (Shentow-Bewsh et al., 2016). In the weight-stigma condition, participants read a sham newspaper article about the "obesity epidemic" that portrayed the burden to individuals and the economy of higher-weight peoples' poor choices, repeated several negative stereotypes about higher-weight individuals, and gave first-person accounts of interpersonal stigma experiences. A second sham article described the harms of too much sun-exposure. In the third condition, participants completed a neutral word-search task. Participants subsequently completed a taste-rating task of sweets and chocolates and were encouraged to eat freely. Lower-weight participants tended to eat the least in the neutral condition, slightly more in the sun-exposure condition, and the most in the weight-stigma condition, although the effects were small and not statistically significant. In contrast, higher-weight participants tended to eat more than lower-weight participants in both the sun-exposure and neutral condition, but did not differ in energy intake from their lower-BMI counterparts after reading the "anti-obesity" article, suggesting that exposure to this stigmatising prime was causing them to moderate their food intake. One possible explanation is that higher-weight participants were engaging in impression-management behaviour – that is, eating in such a way as to produce a more positive impression on others (Vartanian, Herman, & Polivy, 2007; Vartanian, 2015b). The salience of the stigmatised identity in the weight-stigma prime condition may have prompted heavier individuals, whether consciously or unconsciously, to engage in stereotype-relevant self-presentation techniques (Neel, Neufeld, & Neuberg, 2013), in this case, moderating their snack intake in order to counter stereotypes that higher-weight individuals are greedy and lacking in self-control (Allon, 1982; Lewis et al., 2010; Puhl, Schwartz, & Brownell, 2005).

Importantly, none of these studies explored the role of internalised weight stigma in the response to weight-based stigma or identity threat. As outlined in Chapter 1, a considerable body of evidence now links internalised weight stigma with patterns of disordered eating behaviour and cognitions in diverse populations, both independently, and as a mediator of the relationship between experienced weight stigma and maladaptive eating. Thus, an understanding of the impact of internalised weight stigma on objective eating behaviour may be of importance in developing effective individual and public health interventions aimed at tempering non-physiological energy intake.

To date, no studies have explored whether internalised weight stigma also acts as a moderator of the relationship between experienced weight stigma and eating behaviour. It is entirely possible that a construct such as internalised weight stigma may be both a mediator and a moderator of the relationship between stigma experience and downstream cognitive, affective, and behavioural outcomes (Karazsia, van Dulmen, Wong, & Crowther, 2013). As a mediator, exposure to a discriminatory event, for example, could have a negative impact on an individual's self-worth, causing an increase in internalised weight stigma. This internalised weight stigma might then drive maladaptive eating behaviours. However, it is entirely possible that exposure to societal weight stigma may have differential effects depending upon the degree to which an individual has previously internalised weight stigma. Thus, the deleterious effect of experienced stigma may be particularly pronounced in a person who believes that stigma is deserved and appropriate, whereas an individual with low internalised weight stigma may discount a stigmatising experience as simply an indicator of prejudice in the perpetrator, with no detrimental impact on their own self-worth, and a consequently reduced or even null effect of the stigma on eating behaviour compared with high internalisers. It is also possible that prior experiences of weight stigma may moderate how individuals respond to a salient weight stigmatising experience, and this relationship may also depend on levels of internalised weight stigma.

As noted above, the studies by Major, Schvey, and colleagues both used fasted subjects. The findings from these studies likely represent the phenomenon of eating more than needed to satisfy hunger when exposed to weight-related stigmatising situations, and may have more ecological validity for predicting excessive intake at meal times. The study by Shentow-Bewsh and colleagues (2016) did not use fasted or fed subjects, but participants were more hungry than full. However, people frequently eat when they are not hungry. An alternative measure of non-physiological energy intake is the Eating in the Absence of Hunger (EAH) paradigm, which is perhaps more comparable with the concept of hedonic eating. EAH studies are usually conducted in two stages: participants are first allowed to eat until sated, before being told that a short break is required prior to the second part of the study. During this break, participants are given access to either a second meal or a large amount of highly palatable snack foods, with energy intake at this point being the outcome of interest (Fisher & Birch, 2002). In a number of stress-manipulation studies conducted using the EAH paradigm, participants consumed an *ad libitum* meal and were then randomised to complete either a simple or an unsolvable maths puzzle, intended to increase stress and anxiety, prior to the break period (Lemmens, Rutters, Born, & Westerterp-Plantenga, 2011; Rutters et al., 2009). These studies found that stress increased subsequent EAH in both "normal weight" and "overweight" adults, particularly those with higher levels of disinhibited eating; however, the effect was significantly amplified in "overweight" participants (Lemmens et al., 2011).

In contrast to many of the experimental studies on weight stigma and eating behaviour, these EAH studies included both male and female participants, and no differences in EAH energy intake between men and women were observed. However, it has been demonstrated that eating behaviour in restrained and emotional eaters is differentially affected by general cognitive demand compared with an ego-threatening stressor (Wallis & Hetherington, 2004). Thus, it is possible that while a cognitive task such an unsolvable maths puzzle accompanied by background noise and irritating music (Lemmens et al., 2011) might not impact energy intake differentially by gender, a weight-stigmatising situation may represent a more ego-threatening stimulus to individuals who are more invested in weight- and appearance-related domains. As females tend to be more invested in weight- and appearance-related self-worth than males (Clabaugh, Karpinski, & Griffin, 2008; Crocker, Luhtanen, Cooper, & Bouvrette, 2003), a weight-related stressor may produce gender differences in energy intake.

Thus, the purpose of the present study was to use an EAH paradigm to test the effects of weight stigma on non-physiological eating behaviour in a weight-diverse sample of adult men and women.

A number of hypotheses were proffered. First, internalised weight stigma would mediate the effect of prior experienced weight stigma on objectively measured eating behaviour (H1). Second, higher-weight individuals in the stigma condition would eat more snack foods than those in the control condition or than lower-weight participants in either condition (H2). Additionally, based on experimental findings suggesting that internalised weight stigma is a more potent driver of cognitive and affective outcomes than is experienced weight stigma (Pearl & Puhl, 2016), it was predicted that levels of internalised weight stigma would be a more important moderator of the impact of a stigmatising prime than prior levels of experienced weight stigma, and that, when included in the model together, only internalised weight stigma would be a statistically significantly moderator (H3; see Figure 2.1).

Finally, we investigated whether any interaction observed between condition and experienced or internalised weight stigma would be moderated by participants' weight status – that is, would this relationship differ for individuals with higher-weight versus normative BMI (see Figure 2.1).

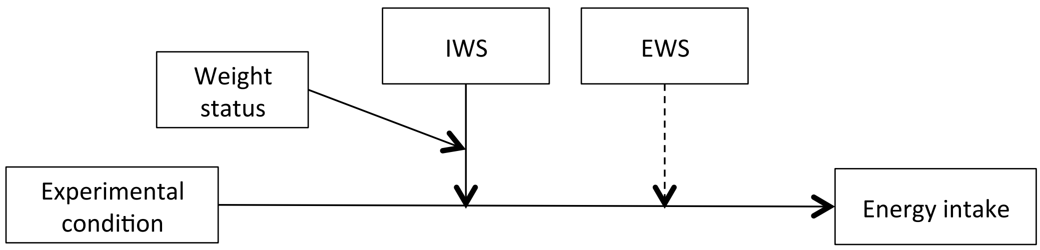

Figure 2.1. Moderated moderation model showing proposed three-way interaction between stigma salience, internalised weight stigma, and participant weight status on eating in the absence of hunger. Dashed line represents hypothesised non-significant pathway. EWS = experienced weight stigma; IWS = internalised weight stigma.

Two opposing but plausible outcomes could be predicted for the three-way relationship between condition, internalised weight stigma, and weight status on energy intake. First, it was possible that levels of internalised weight stigma would capture most of the variance associated with being higher-weight and exposed to stigma, in which case, we would expect a significant interaction between vignette and internalised weight stigma involving greater energy intake in individuals with higher internalised weight stigma who read the stigma vignette, but no significant three-way interaction between condition, internalised weight stigma, and BMI. Alternatively, higher-weight individuals with elevated internalised weight stigma may be both more aware and more ashamed of their stigmatised status, and engage in impressions management. If this were the case, we would predict a significant three-way interaction between condition, internalised weight stigma, and BMI such that high-BMI, high-internalisation participants would eat less in the stigma condition compared with the control condition. Thus, the moderated moderation analysis was considered exploratory, and no *a priori* hypothesis was proposed.

2.2. Methods

2.2.1. Sample

Community and student participants were recruited for a study on "the effects of hunger and satiety on information processing" using a mix of social media, an online classified advertisement website, a free UK portal for the recruitment of research participants, the university website and departmental noticeboards, a database held by the School of Psychology of individuals who had previously expressed an interest in participating in research, and from the School's Research Participation Scheme. Eligibility requirements were age 18–69 years, a never-smoker, no food allergies, and no eating disorder diagnosis. Additionally, to ensure recruitment across the BMI spectrum, some advertisements were targeted to recruit higher-weight participants, with the additional eligibility requirement that individuals self-classify as being "overweight". The social media channels included groups related to dieting, fitness, healthy living, plus-size fashion, body image, size acceptance, and general interest groups linked to the local area. The use of these different sites was intended to attract a diverse range of higher-weight participants whose feelings about their size might vary between being more positive or negative.

Participants recruited through the School of Psychology Research Participation Scheme received course credit for taking part in the study. Other participants were entered into a prize draw to win a £30 gift voucher and paid £5 for their time.
The study was approved by the University of Birmingham Ethical Review Committee, and informed consent was obtained from all participants.

2.2.2. Procedure

The study was conducted in two stages, with the first stage completed online, and the second stage taking place in the laboratory (see Figure 2.2). All computer-based portions of the study were conducted using the Qualtrics survey platform (Qualtrics.com). For the online phase, after providing explicit consent, participants completed an initial screening and package of questionnaires, described below. The screening confirmed that participants were never-smokers, had no food allergies, and had not been diagnosed with an eating disorder. Any participants who did not pass the screening were thanked for their time and exited from the study.

On completion of the online portion of the study, participants were emailed and informed that they had been randomised to attend the lab session "full", and were provided a link to an online poll with timeslots available in the morning and afternoon. They were asked to choose a slot as close as possible to the time they usually finished eating either breakfast or lunch.

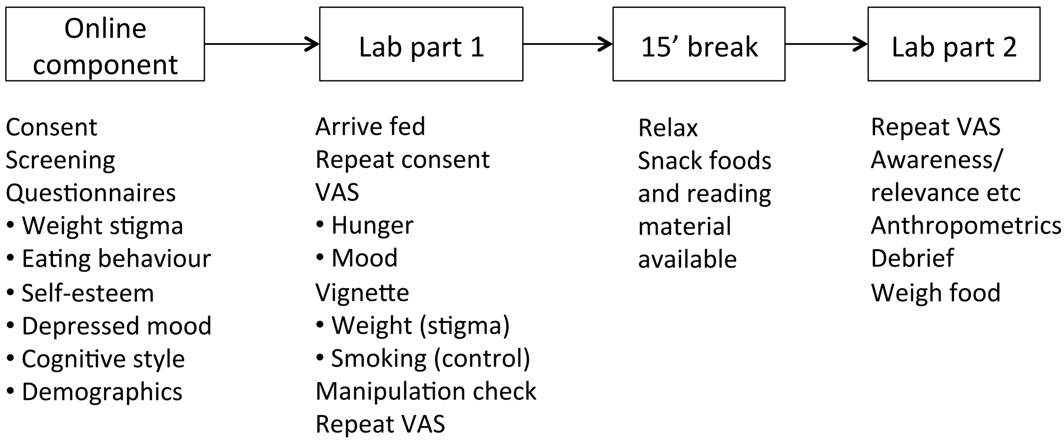

Figure 2.2. Schematic overview of study design

On arrival at the laboratory, consent forms and allergy checks were repeated. Participants were asked to confirm that they had recently eaten a meal; those who had not (n = 16) were not excluded, but this information was noted and explored as a possible covariate. Participants were then led to a private room with a computer monitor, and a separate table, chair, some magazines, and a selection of pre-weighed sweet and savoury snack foods. Magazines were selected that did not contain any content or advertising relating to food, weight, or health. Participants were informed, “I’ll return in about 20 minutes. We’ve got some magazines in case you finish early. Help yourself to snacks – there’s plenty.” Participants were then left alone to complete the questions on the computer. First they were prompted to enter their unique ID code and reminded that this maintained the anonymity of their responses. Participants were then presented with five visual analogue scales (VAS) related to hunger (Hungry, Full, Thirsty, Desire to eat, Amount they could eat) and five related to mood (Anxious, Relaxed, Happy, Drowsy, Alert). Scales were anchored at 0 and 100 and participants dragged a marker along the scale to indicate their current state. They were then randomised to read either a weight stigma or control vignette, both written in the style of a newspaper article, describing the potential detrimental effects of either “obesity” or “smoking” on romantic relationships. This approach was taken to focus the threat at the level of interpersonal relationships, removing potential confounding effects of structural or institutional stigma. The experimental vignette described findings from scientific studies suggesting that being “obese” had a negative impact on perceived desirability as a dating partner. The description of the studies was taken from a review of research on weight stigma and interpersonal relationships (Puhl & Heuer, 2009). The article was completed by a fabricated “quote” from a fictional person belonging to a genuine UK-based relationship counselling charity. The quote related how “obesity” created interpersonal problems within existing relationships, even when the matter was not overtly discussed, thus ensuring the vignette was pertinent to individuals regardless of their current relationship status. The control vignette was identical with the exception that all words pertaining to weight were replaced with words pertaining to smoking. The vignettes used are included in Appendix B.

After reading the vignette, participants indicated whether they found the article easy to understand, interesting, and relevant to themselves. They were asked to briefly summarise the article, and then to provide any additional details they remembered. These questions served to support the cover story, to ensure the details of the vignette were processed and recalled, and also acted as a participation check. Participants then repeated the hunger and mood VAS scales, and were shown a completion screen asking them to await the return of the researcher. Using the Qualtrics platform, the exact time of completion of each survey could be tracked. All participants were left for 15 minutes[5] after completing the survey, after which, the researcher returned and informed the participants that there were a few more questions to complete at the computer. Participants repeated the hunger and mood ratings, and finally, were probed for suspicion as to the true purpose of the study, if and when they had realised that we were interested in their snack consumption, and whether they thought the newspaper article had influenced what they ate. Finally, participants were debriefed, and anthropometric data collected. Height was measured using a stadiometer. Weight and percentage body fat were measured using a Tanita T5896 (Tanita Corporation, Tokyo). Measured height and weight were used to calculate BMI.

2.2.3. Measures

The following measures were completed in the online portion of the study. No forced responses were stipulated.

2.2.3.1. Experienced weight stigma

Experienced weight stigma was initially assessed using the Stigmatising Situations Inventory (SSI; Myers & Rosen, 1999), which measures experiences of weight stigma across 11 domains, namely: nasty comments from family, from children, or from others; people making negative assumptions; being stared at; being avoided or excluded; having loved ones embarrassed by their size; physical barriers in daily life;

[5] Other EAH studies have used intervals of 10–30 minutes.

inappropriate comments from doctors; employment discrimination; and being physically attacked. The SSI has excellent internal reliability in clinical and non-clinical samples, good convergent validity, and predicts global self-esteem, depressive symptoms, and body image after controlling for demographic variables and BMI (Friedman, Reichmann, Costanzo, Zelli, Ashmore, & Musante, 2005; Myers & Rosen, 1999). Frequency of experiences was rated on a four-point scale: 0 (*never*), 1 (*once in your life*), 2 (*more than once in your life*), and 3 (*multiple times*). This scoring method has previously been shown to be easier for participants to use than the original 10-point frequency scale and to have high internal reliability (Puhl & Brownell, 2006). However, initial reports of online survey access indicated high rates of attrition, with few participants completing the online portion of the study. In order to reduce participant burden, a decision was made to replace the 50-item SSI by a three-item measure that has been used in a number of studies in recent years (e.g., Himmelstein, Puhl, Quinn, & Gorber, 2017; Pearl & Puhl, 2016; Pearl, Puhl, & Brownell, 2012; Puhl, Heuer, & Sarda, 2011). Specifically, these questions ask whether participants have ever been teased, treated unfairly, or discriminated against because of their weight. Each question receives a yes or no response, giving a possible range of 0–3. For the sake of brevity, and to distinguish this measure of experienced weight stigma from the SSI, the name EWS-3 will be used in the present study. The EWS-3 has not been psychometrically validated, but has been shown to correlate positively with internalised weight stigma (Himmelstein et al., 2017) and support for anti-weight discrimination policies (Puhl et al., 2011; Puhl, Himmelstein, Gorin, & Suh, 2017). Kuder-Richardson's α in the present study was .67 (see Section 2.3.3 for further discussion).

2.2.3.2. Internalised weight stigma

Internalised weight stigma was assessed using the modified version of the 11-item Weight Bias Internalization Scale (WBIS-M; Durso & Latner, 2008; Pearl & Puhl, 2014), which assesses the extent to which participants devalue themselves because of their weight. While the original WBIS used the wording "because I am overweight", the modified version replaces this with "because of my weight", thus facilitating the use of the scale across the weight range. A sample item is: "Because of my weight, I don't understand how anyone attractive would want to date me." Items are scored from 1 (*strongly disagree*) to 7 (*strongly agree*), with a mean score calculated for the full scale. Higher scores indicate greater internalised weight stigma. The WBIS-M had strong internal reliability in a weight-diverse sample, and was correlated strongly correlated with body dissatisfaction, and moderately correlated with disordered eating and psychopathology, controlling for BMI (Pearl & Puhl, 2014). It has been used in US and Australian samples (O'Brien et al., 2016; Pearl & Puhl, 2014). Cronbach's α in the present sample was .94.

2.2.3.3. Eating behaviour

Two measures were used to assess eating habits. The Dutch Eating Behaviour Questionnaire (DEBQ; van Strien, Frijters, Bergers, & Defares, 1986) comprises three subscales that look at habitual eating patterns: dietary restraint, emotional eating, and external eating – eating in response to external cues rather than bodily hunger signals. Items are scored on a 5-point Likert scale measuring frequency of the different styles of eating behaviours, ranging from 0 (*never*) to 5 (*very often*). The individual subscales are scored separately. Higher scores indicate more frequent disordered eating. The subscales of the DEBQ have good to excellent internal reliability in "obese" and "non-obese" men and women (van Strien et al., 1986), and has been validated in UK non-clinical samples of men and women and dieting and eating disordered women (Wardle, 1987). Although the factor structures are gender-invariant, women tend to score higher on the restraint and emotional subscales (Wardle, 1987). Cronbach's α for the DEBQ Restraint, External Eating, and Emotional Eating subscales were.93, .86, and .94, respectively.

The Eating Disorder Diagnostic Scale (EDDS; Stice, Telch, & Rizvi, 2000) was used to assess cognitions and behaviours consistent with eating pathology. Items are summed to produce a composite symptom count that can be used as a measure of overall eating pathology, with higher scores indicating more problematic cognitions and behaviours (Stice, Fisher, & Martinez, 2004). The EDDS has good internal consistency in both clinical and non-clinical female samples, high test-retest reliability, excellent concordance with interview diagnoses of disordered eating, and good convergent validity with self-report measures of disordered eating behaviour and general psychopathology (Stice et al., 2000, 2004). While not formally validated in adult males, the EDDS also had strong internal reliability in a sample of male U. S. veterans, and scores were uniquely predicted by military trauma, controlling for other potential confounds (Hall, Bartlett, Iverson, & Mitchell, 2017). Questions relating to height and weight were omitted from the original 22-item scale, as this information was collected elsewhere. Thus, the final questionnaire included 20 questions. Cronbach's α in the present sample was .81.

Additionally, current dieting behaviour was assessed with a single item. Participants indicated whether they were currently dieting for weight loss, watching their food intake so as to maintain their current weight and prevent weight gain, or not dieting.

2.2.3.4. Depressive symptoms

As depressed mood may influence food intake, depressive symptomatology was assessed with the Center for Epidemiological Studies Depression Scale (CES-D) (Radloff, 1977). This is a 20-item measure that assesses the frequency of affective and behavioural symptoms of depression over the previous week. Items are scored on a 4-point rating scale from 0 (*rarely or none of the time*) to 3 (*most or all of the time*), and a sum score is calculated for the whole scale. Higher scores indicate more depressive symptoms. The CES-D has high internal consistency, adequate test-retest reliability, and similar reliability, validity, and factor structure across demographic categories. Although not designed for clinical diagnosis, it has good discriminant validity between clinical and non-clinical populations, and correlates moderately with severity ratings in clinical patients (Radloff, 1977). Cronbach's α in the present sample was .91.

2.2.3.5. Self-esteem

Global self-esteem was measured with the Rosenberg Self-Esteem (RSE) scale (Rosenberg, 1965). The RSE is the most widely used measure of global self-esteem and has good internal and test-retest reliability and convergent, discriminant, and predictive validity (Donnellan, Trzesniewski, & Robins, 2015). The RSE correlates negatively with measures of experienced and internalised weight stigma and disordered eating cognitions and behaviours (Durso & Latner, 2008; Friedman et al., 2005; Griffiths et al., 1999). Items are scored on a 4-point Likert scale ranging from 0 (*strongly disagree*) to 3 (*strongly agree*). The maximum possible score is 30, and higher scores are indicative of higher self-esteem. Cronbach's α in the present sample was .89.

2.2.3.6. Need for cognition

Finally, to support the cover story and help disguise the actual focus of the study, subjects completed the 18-item Need for Cognition Scale (NCS), which assesses an individual's tendency to engage in and enjoy effortful cognitive endeavours (Cacioppo, Petty, & Feng Kao, 1984). Items are scored from -4 (*very strong disagreement*) to +4 (*very strong agreement*), with higher scores indicating greater need for cognition. The scale has good reliability and convergent validity (Cacioppo et al., 1984; Tolentino, Curry, & Leak, 1990). Cronbach's α in the present sample was .88.

2.2.3.7. Anthropometrics and demographics

Participants self-classified their weight on a 5-point scale: "Underweight," "Normal weight," "A little overweight," "Moderately overweight," or "Very overweight." Self-classified weight status was dichotomised into self-classified "overweight" (those who indicated they were a little, moderately, or very "overweight") and self-classified "not overweight" (those who indicated they were "underweight" or "normal weight").

Demographic data comprising age, gender, ethnicity, education level, and profession were collected.

2.2.4. Eating in the absence of hunger paradigm

Prior to each participant's arrival, six identical small bowls were heaped full of a selection of three savoury and three sweet snack foods.[6] In total, the six bowls of snack foods provided approximately 4500 kilocalories and 200g of fat. The bowls were weighed before and after the experimental session to determine the amount eaten. The number of grams of each type of snack food was converted into kilocalories, and summed to provide total energy intake.

2.2.5. Data analysis

All analyses were conducted using the SPSS for Mac Statistical Software package, version 23.0 unless otherwise stated.

2.2.5.1. Power analysis

Prior to the start of the study, a power analysis was conducted with G*Power 3.1 (Faul, Erdfelder, Lang, & Buchner, 2007), based upon the original study hypotheses, that levels of internalised weight stigma would be the predominant moderator of the relationship between experimental condition and energy intake, and that this effect might be influenced by weight status – a possible three-way interaction. Based on a 2 (high versus low BMI) × 2 (high versus low internalised weight stigma) × 2 (experimental condition) analysis of covariance (ANCOVA), a sample of 128 participants would yield 80% power to detect a medium effect size (f^2 = .25) of

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[6] Cheese crackers (Jacob's Mini Cheddars, 80g, 516 kcalories (kcals) and 29.5g fat/100g), crisps (salt & vinegar Pringles, 80g, 512 kcals and 32g fat/100g), pretzels (Penn State sour cream & chive pretzels, 80g, 443 kcals and 12.9g fat/100g), chocolate (Mars M & Ms, 380g, 485 kcals and 20.4g fat/100g), biscuits (ASDA Chosen by You milk chocolate oatie crumbles, 180g, 497 kcals and 22.7g fat/100g, and sweet popcorn (Butterkist toffee popcorn, 80g, 414 kcals and 8.4g fat/100g).

the three-way interaction on energy intake (α = .05). However, initial analyses indicated unequal group sizes in terms of weight status and high versus low internalised weight stigma (see Discussion). While ANCOVA is fairly robust to violations of assumptions (Faul et al., 2007), statistical power would be reduced. Thus, recruitment was extended, and the final sample size represented a 28% increase above the initial calculation.

2.2.5.2. Handling of missing data

Missing data analysis was conducted on questionnaire responses. Four participants each had one data point missing, one participant skipped the entire RSE questionnaire and one skipped the DEBQ-Restraint and External subscales. Additionally, 14 participants (8.5%) did not have data for body fat percentage. All of these cases were due to practical considerations; no participants declined to be weighed and measured. Analysis of all study variables against outcome measures indicated that values were missing completely at random, Little's MCAR test $\chi^2(63) = 66.2$, $p = .37$, therefore subsequent analyses were conducted with missing values excluded pairwise.

2.2.5.3. Preliminary analyses

First, separate linear regression analyses were used to confirm that recruitment group (community versus student participants) was not a significant predictor of experienced or internalised weight stigma, or total energy intake, after controlling for age, gender, and BMI. All analyses were non-significant; thus, groups were combined in subsequent analyses.

The proposed factor structure for the VAS was confirmed using principal components analysis with varimax rotation. Examination of the scree plot indicated two distinct factors, accounting for 54.6% of the variance. All hunger and mood VAS items loaded > 0.5 onto their respective factors. Items with negative loading were inverted and a mean mood and hunger score was calculated for each time point.

To confirm successful randomisation, independent *t*-tests and χ^2 test were used to compare mean scores on questionnaire measures, distribution of demographic variables, and relevant baseline measures between the weight stigma and control conditions.

Independent *t*-tests, univariate ANOVAs, and univariate linear regressions were used to explore whether potential confounds were significant predictors of energy intake. Repeated-measures ANOVAs were used to test change in hunger levels, overall mood, happiness, and anxiety by experimental condition and objective and self-classified weight status. Bonferroni correction was used to account for violation of the assumption of sphericity.

2.2.5.4. Measurement invariance of WBIS-M

Measurement invariance of the WBIS-M across weight groups was tested with confirmatory factor analysis using Mplus v8 (Muthén & Muthén, 1998–2017). Configural (pattern) invariance was confirmed, indicating that the WBIS-M provides a valid measure irrespective of weight status. However, metric (weak) invariance was not confirmed, using either BMI category (≥ 25 or < 25 kg/m^2) or self-classified "overweight" status as the grouping variable.[7] That is, respondents in different weight groups do not appear to attribute the same meaning to the underlying internalised weight stigma construct. As the WBIS-M may not be measuring the same construct in higher-weight and normative-weight individuals, cross-group comparisons were not considered appropriate. Thus, subsequent analyses were performed separately for each weight group.

2.2.5.5. Mediation and moderation analyses

Mediation and moderation analyses were conducted using the PROCESS macro model 3 for SPSS (v. 2.13.1) (Hayes, 2013). The PROCESS macro utilises a robust, non-parametric bootstrap resampling procedure with replacement to produce an unstandardised regression coefficient, heteroscedasticity-consistent standard errors, and a bias-corrected and accelerated 95% confidence interval (CI) for each predictor, with 10,000 bootstrap samples utilised in the present analyses. First, mediation analyses were conducted to test the effects of prior experience and internalised weight stigma on EAH (H1). Total, direct, and indirect effects were calculated, and 95% bootstrap CIs derived. Bootstrap resampling does not make assumptions about normality in the sampling distribution and has better control of Type I error in determining significance of the indirect effect than do standard confidence intervals, which are based on critical values for an assumed normal distribution (MacKinnon, Lockwood, & Williams, 2004; Preacher & Hayes, 2004). Effects were considered statistically significant when zero was not included in the bootstrap 95% CI. Next, a

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[7] See Appendix C for data and further discussion.

simple moderation analysis was conducted to test whether the effect of experimental condition on energy intake was influenced by participants' weight status (H2). Finally, moderated moderation analyses were conducted to examine the potential moderating roles of experienced and internalised weight stigma, their interaction (H3), and the contribution of participants' weight status, on the relationship between experimental condition and energy intake. Experimental condition was dummy coded as 1 = Weight-stigma condition, 0 = Control condition. Continuous variables (experienced and internalised weight stigma) were mean-centred prior to computation of interaction terms. Two measures of participants' weight status were used: objective BMI category (coded ≥ 25 = 1, < 25 = 0) and self-classified "overweight" status (coded "overweight" = 1, "non-overweight" = 0). Gender and baseline hunger levels were entered as covariates in all models and standardised to ensure accurate values of the dependent variable on the interaction plots (Dawson, n.d.). Conditional effects were visualised graphically using simple slopes (Aiken & West, 1991). It is recommended that interaction effects be probed at meaningful values of the moderators (Hayes, 2013). Thus, for dichotomous variables (BMI category, self-classified "overweight"), slopes were tested at the two values of the moderator. For experienced weight stigma, slopes were tested at a value of zero (i.e., no prior experience) and one (some experience). For internalised weight stigma, slopes were tested at values of 2.5 and 5.5, representing the lower and upper quartiles of the range of the scale.

2.3. Results

2.3.1. Sample descriptives

Three hundred and twenty participants consented to take part in the study. Nineteen were screened out prior to beginning the survey (10 with food allergies, two smokers, and seven with a diagnosed eating disorder), and a further 12 exited the survey during the screening procedure. Of the 289 participants who began the online survey, 220 (76%) completed all questions and were invited to arrange a laboratory visit. Of these, 164 (75%) attended the lab-based phase of the study.

The sample was predominantly female (78.5%), and White (75.9%; Indian Asian/Asian British 8.9%, Black 3.8%, Chinese 3.2%, South-East Asian 1.9%, other ethnicity 2.5%, missing 3.8%), with a mean age of 26.0 years (*SD* 11.4, range 18–69). Three-quarters of the sample were students (75.9%),[8] and 29.1% had an undergraduate or advanced degree.

2.3.2. Preliminary analyses

Six participants failed the participation check – that is, they were unable to describe the contents of the vignette, indicating either lack of attention or lack of comprehension, and their data were excluded from further analyses, giving a final sample size of 158.

[8] Of the 120 participants who stated their profession as "Student," 86 (71.7%) were recruited through the School of Psychology; the remainder accessed the study via community recruitment advertisements.

Demographic variables did not differ by experimental condition. No differences were observed between experimental conditions in objective BMI, objective or self-classified "overweight," dieting status, self-esteem, internalised weight stigma, depressive mood, need for cognition, self-reported eating behaviour, or baseline hunger and mood (see Table 2.1).

Table 2.1. *Study Measures by Experimental Condition*

	Experimental condition		
Variable	Control *N* = 80	Weight stigma *N* = 78	*p*†
BMI (kg/m^2)	25.0 (5.1)	25.7 (6.9)	.46
BMI category			.64
< 25 kg/m^2	52.5%	56.4%	
≥ 25 kg/m^2	47.4%	43.6%	
Body fat %	27.7 (9.3)	29.4 (10.1)	.28
Self-classified 'overweight'	57.5%	50.0%	.22
Dieting status			.35
Weight-loss dieting	10.0%	16.7%	
Watching	47.5%	38.7%	
Not dieting	42.5%	44.9%	
Depressive symptoms	14.0 (9.6)	13.9 (10.2)	.46
Global self-esteem	19.1 (5.1)	19.6 (5.3)	.51
Internalised weight stigma	3.4 (1.5)	3.4 (1.4)	.95
Experienced weight stigma	50%	32.1%	.02‡
Dietary restraint	2.6 (0.9)	2.7 (0.9)	.52
External eating	3.3 (0.7)	3.2 (0.6)	.27
Emotional eating	2.7 (0.9)	2.6 (0.8)	.33
Eating pathology	19.9 (13.9)	19.0 (14.9)	.71
Need for cognition	0.8 (1.0)	0.7 (1.0)	.79
Baseline hunger	31.9 (17.2)	31.8 (16.5)	.97
Baseline mood	67.7 (16.3)	70.3 (12.6)	.26

Note. BMI = body mass index.
†Independent-sample *t*-tests or χ^2 tests for continuous and categorical variables, respectively, two-sided.
‡Cramér's *V* = .18.

Low baseline hunger levels confirmed the fed state. The percentage of participants who had previously experienced weight stigma was lower in the weight-stigma condition, with approximately one-third having prior stigma experiences, and two-thirds reporting no previous weight stigma experience. In the control condition, the breakdown was 50-50.

Energy intake did not differ by age, ethnicity, education, profession, time of experimental session, failure to eat prior to the session, dieting status, depressive symptoms, baseline mood, or reported ease of understanding, level of interest, relevance of the vignette, or awareness of true study intent. Statistical tests of energy intake by gender were non-significant; however, mean intake was noticeably different: male M = 201 kcals, SD = 225, female M = 136 kcals, SD = 151, $t(41.5) = 1.60$, $p = .12$, and lack of statistical significance may have been due to the much smaller sample size of male participants. Within gender groups, there was no difference in food consumption by experimental condition among male participants (M = 213 and 210 kcals in the control and weight-stigma conditions, respectively); however mean intake in female participants was 158 kcals in the control condition and 91 kcals in the weight-stigma condition, $t(57) = 1.7$, $p = .10$.[9] Although this difference was not statistically significant, a conservative approach was taken and gender was included as a covariate in subsequent regression analyses.

Participants did not differ by condition in how interesting or understandable they found the vignettes (both $p > .6$); however, more higher-weight participants in the weight-stigma condition reported that the vignette was personally relevant to them than did those in the control condition: 66.7% versus 33.3%, respectively, $\chi^2(1) = 12.9$, one-sided $p < .00$, Cramér's $V = .42$. No differences in vignette relevance were observed for normative-weight participants.

[9] It was not possible to test if this effect differed by weight status due to low numbers of low-BMI male participants (n = 2 in the control condition, and n = 0 in the weight-stigma condition).

Baseline hunger was a significant predictor of energy intake and was included as a statistical control in subsequent regression analyses. No changes in hunger were observed before and after reading the vignettes, but hunger decreased significantly after the food-available break period. Changes did not differ by vignette, weight status, or their interaction. No significant differences in overall mood, happiness, or anxiety were observed at any time point, and there were no differences by experimental condition, weight status, or their interaction. Repeating the analyses separately for those who ate or did not eat during the food-available period did not alter these findings. Overall, 27% of participants did not eat any of the snack foods, but this did not differ by experimental condition, weight status, or their interaction.

As the distribution of dependent variables was negatively skewed due to the number of participants who did not eat any of the snack foods, the presence of extreme values was assessed visually using boxplots. A single outlier (weight-stigma condition) was identified: a male participant consumed 1,003 total kcal, with the range of remaining values falling between zero and 658 kcal. A conservative approach was taken whereby this value was replaced with the next highest intake by a male participant in the weight-stigma condition (653 kcal) to bring it closer to the distribution. Replacement of this extreme value in the moderation analyses resulted in small changes in model fit and regression coefficients, but did not alter the pattern of results.

2.3.3. Experienced weight stigma measures

Of the 158 participants included in the final sample, only eight had completed the 50-item SSI measure of experienced weight stigma. The remainder completed the EWS-3. Depending on the measure used, notable differences were observed in the proportion of participants who reported prior experience of weight stigma. Using the three-item EWS-3, only 38.7% participants endorsed any item. In contrast, using the SSI, all but one (87.5%) endorsed previous weight stigma experiences. Further, correlations between other study variables and EWS-3 were much lower than with SSI scores. Additionally, internal reliability was low for the EWS-3 (Kuder-Richardson's α = .67). Despite the very low number of participants completing the SSI, Cronbach's α was .97. Given the low number of participants who had completed this measure, data from non-completers were revisited. Including data from study non-completers, a total of 22 participants had completed the SSI, and of these, 95% endorsed at least one prior experience of weight stigma.

Despite being used frequently, the EWS-3 appears to underestimate previous stigma experience, and findings using the two measures are unlikely to be comparable. As a result, and given that only eight participants in the final sample had completed the SSI, results for these two measures were not combined, and only participants completing the EWS-3 were included in subsequent analyses.[10]

2.3.4. Differences by BMI category

As moderation and mediation analyses were conducted by BMI category, study variables were compared by weight status. No differences were observed for self-esteem, depressive symptoms, or any measure of eating behaviour. However, mean WBIS-M scores were significantly higher in the high-BMI category than the low-BMI

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[10] A study is currently underway to more rigorously compare the validity of the EWS-3 and SSI.

category: $M = 4.03$, $SD = 1.39$ versus $M = 2.88$, $SD = 1.25$, respectively; $t(156) = 5.5$, $p < .001$; Cohen's $d = 0.87$. Likewise, experienced weight stigma was also higher in the high-BMI compared with the low-BMI category: $M = 0.88$, $SD = 0.99$ versus $M = 0.31$, $SD = 0.62$, respectively, $t(100.8) = 4.3$, $p < .001$, Cohen's $d = 0.69$. Over half of participants in the high-BMI category (56.9%) had experienced weight stigma, compared with only a quarter in the low-BMI category (24.7%). There was no difference in allocation to experimental condition by weight status.

2.3.5. Mediation analyses

Neither experienced nor internalised weight stigma was a significant predictor of total energy intake at either higher- or normative-BMI. Direct, indirect, and total effects were all non-significant. These findings held when self-classified "overweight" was used as the indicator of weight status. Thus, H1 was not supported. Restricting analyses to the control condition only, i.e., in the absence of a weight-stigma prime, more consistent with online studies exploring mediation effects, did not alter these findings.[11]

2.3.6. Moderation analyses

2.3.6.1. Weight status as moderator of experimental condition → energy intake

The model explained 21.4% of the variance in energy intake. With the exception of baseline hunger levels, no significant main or interaction effects were observed,

[11] Analysis of participants in the weight-stigma condition only produced a trend toward a small negative indirect effect of prior experienced stigma on calorie intake via internalised weight stigma in higher-weight participants, and a trend toward a small positive indirect effect in normative-weight participants. However, these effects did not reach statistical significance.

although there was a tendency for all participants to eat less in the weight-stigma condition. However, there was a marginal effect for vignette in the low-BMI category: B = -57, SE = 28, t = -2.0, p = .05, 95% CI (B) [-114, 0.08]. The effect of vignette in the high-BMI category was non-significant: B = -17, SE = 44, t = -0.3, p = .70, 95% CI (B) [-103, 70] (see Figure 2.3). A similar pattern was observed when weight status was defined by self-classified "overweight", however, the results were non-significant. Thus, H2 was not supported.

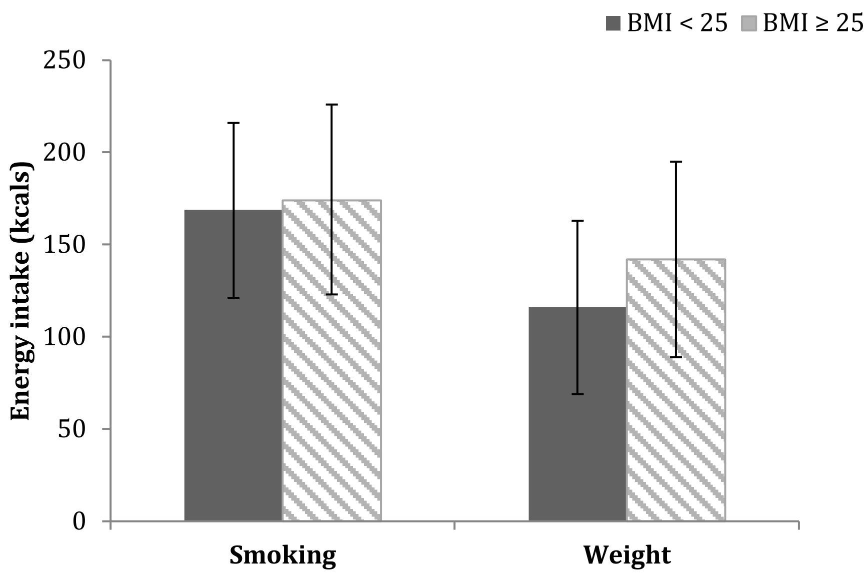

Figure 2.3. Total energy intake by experimental condition and BMI category. Error bars represent 95% confidence intervals. BMI = body mass index.

2.3.6.2. Experienced and internalised weight stigma as moderators of the relationship between experimental condition and energy intake

(i) *Low BMI*

The model explained 25.8% of the variance in total energy intake. Again, baseline hunger was the only statistically significant predictor of energy intake. Most individuals in this weight category tended to eat slightly less in the weight-stigma condition compared with the control condition, although a small increase was observed in individuals with high internalised weight stigma but no prior stigma experiences (see Figure 2.4). For a given level of experienced weight stigma, internalised weight stigma scores had little impact on relationship between experimental condition and energy intake. For individuals low in internalised weight stigma, presence or absence of prior experienced weight stigma also had little effect. The largest difference observed was between individuals high in internalised weight stigma who had or had not previously experienced weight stigma from others (slope difference t = 1.85, p = .07). However, despite their steeper gradients, these slopes

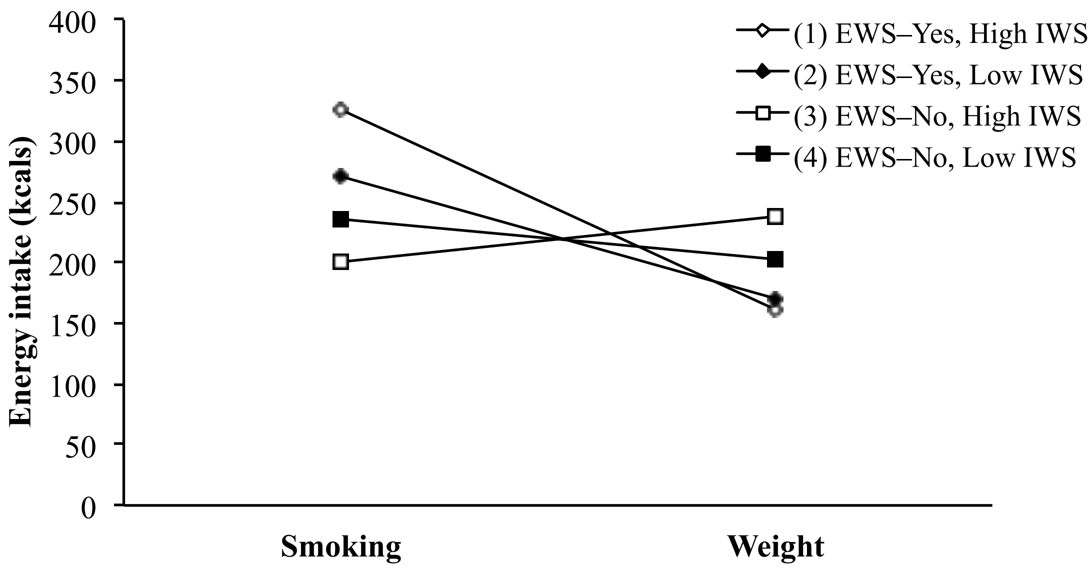

Figure 2.4. Impact of experimental condition on total energy intake by levels of experienced and internalised weight stigma in participants with BMI < 25 kg/m^2. N = 85. The upper and lower quartiles of the modified Weight Bias Internalization Scale scoring range were designated as high and low internalised weight stigma, respectively. EWS = experienced weight stigma; IWS = internalised weight stigma.

were not statistically significant, probably due to lower numbers of participants in this weight category who displayed high levels of internalised weight stigma – only 15/85 (17.6%) had scores above the neutral midpoint on the WBIS-M scale. Of these, only 5 had previously experienced weight stigma.

(ii) *High BMI*

The model explained 39.1% of the variance in total energy intake. That is, a model containing baseline hunger, gender, and levels of experienced and internalised weight stigma explained over 50% more of the variance in energy intake in higher-weight individuals than in normative-weight individuals (28.5%). With the exception of baseline hunger, no main or interaction effects significantly predicted energy intake.

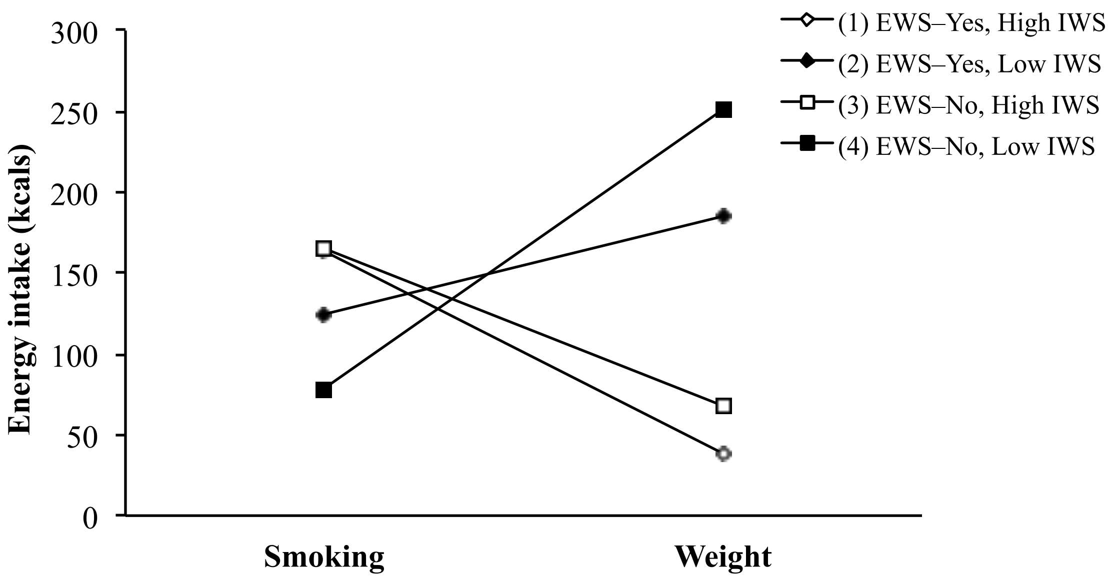

Figure 2.5. Impact of experimental condition on total energy intake by levels of experienced and internalised weight stigma in participants with BMI ≥ 25 kg/m^2. *N* = 65. The upper and lower quartiles of the modified Weight Bias Internalization Scale scoring range were designated as high and low internalised weight stigma, respectively. EWS = experienced weight stigma; IWS = internalised weight stigma.

There was a small trend for participants high in internalised weight stigma to eat less in the weight-stigma condition than in the control condition, and for participants low in internalised weight stigma to eat more (see Figure 2.5). For a given level of internalised weight stigma, prior experienced weight had little impact on the effect. None of these effects were statistically significant, and none of the slopes was significantly different from any other.

2.3.7. *Post hoc* analysis

Given the unexpected finding that internalised weight stigma did not mediate the relationship between prior experienced weight stigma and objectively measured eating behaviour, further mediation analyses were conducted to ensure that mediation *did* occur for self-report measures of eating behaviour collected during the online component of the present study. Controlling for gender and weight status, statistically significant indirect effects were observed for dietary restraint, emotional eating, and eating pathology, although not for external eating.

2.4. Discussion

This is the first study to explore the individual and combined impacts of both experienced and internalised weight stigma on objectively measured eating behaviour. A number of surprising findings emerged. First, the role of internalised weight stigma as a mediator of the relationship between experienced weight stigma and eating behaviour (H1), consistently reported in studies using self-report measures of non-physiological eating, was not replicated using the EAH paradigm. *Post-hoc* analyses of mediation effects in self-report measures of eating behaviour collected during the online component of the study confirmed that the absence of mediation in the present sample was specific to objectively measured eating behaviour. It is possible that cumulative experiences of self- or other-stigmatisation may impact on eating patterns overall, but that more immediate factors may influence eating in a given real-life situation.

In the present study, the fact that eating was being observed may have abrogated the impact of existing stigma scores often observed for more habitual eating patterns, and motivated higher-weight individuals to engage in impression-management behaviour. A systematic review of studies that have manipulated awareness of being observed, or that food consumption would be measured, found a consistent reduction in energy intake when participants were aware that their food intake was of interest, although insufficient data were available to test any differences by participants' weight status (E. Robinson, Hardman, Halford, & Jones, 2015). However, in the present study, participants were explicitly asked whether they had been aware that the aim of the study was to assess food intake. Indicating awareness was not associated with reduced energy intake, even when analysed by weight status and experimental condition. Another explanation is that the salience of the stigmatised identity in the weight-stigma condition may have prompted higher weight individuals to engage in stereotype-relevant self-presentation techniques – that is, to eat fewer snacks in order to counter negative anti-fat stereotypes related to greed and lack of self-control.

The hypothesis that, overall, higher-weight individuals would eat more in the weight-stigma condition (H2) was also not supported in the present study. Indeed, the majority of participants tended to eat less when exposed to a weight-specific prime than a neutral prime; this effect was marginally significant in the low-BMI category but did not reach significance in the high-BMI category, possibly due to lack of power. However, the sample size in the present study was 70% larger than that in the study by Major et al (2014), and more than twice the size of that in the study by Schvey et al (2011), both of which reported significantly increased consumption of snack foods in the weight-stigma condition among participants who were either objectively or subjectively "overweight."

There are a number of possible explanations for failure to replicate the effects observed in previous studies. First, the previous studies were limited to female participants, whereas the present study also included male participants. However, the proportion of male participants in the present study was low, and repeating the analysis without the male participants did not change the results. Additionally, both of the previous studies used fasted participants, whereas the present study required that participants eat a meal prior to attending the lab. It may simply be that it is easier to exert the self-control needed for effortful self-presentational behaviours when one is not hungry and the physiological drive to eat is less intense. Although a previous EAH study in a weight-diverse sample found that heavier individuals did eat more in a stress than in a control condition (Lemmens et al., 2011), our findings are consistent with the hypothesis that a weight-specific stressor may produce different results than a more generic, and less identity-threatening, form of stress, such as that used in the study by Lemmens and colleagues. Additionally, unlike previous EAH studies, condition-gender interactions were observed in the present study, with women, but not men, eating over 40% less in the weight-stigma condition than in the control condition. Although these differences were not statistically significant, this is likely due to the low number of male participants in the sample. Again, this difference from previous EAH studies is consistent with the hypothesis that, unlike a general stressor, a weight-specific prime may differentially impact men and women as being more identity-relevant in female than male participants. Unfortunately, it was not possible to ascertain whether this effect varied by weight status due to the small number of male participants, and future studies should aim to recruit a more even balance of participants across gender and weight categories in order to answer this question.

It is more likely that differences in the experimental paradigms and stigma manipulations may explain why the present study did not find the same increased food consumption among higher-weight participants in the weight-stigma condition as observed in previous studies. In the study by Major and colleagues (2014), on which the present study was based, significantly greater energy intake was observed in women with higher self-perceived weight in the weight-related stress condition, and a small decrease in the stress condition in those who perceived themselves to be lower weight, although this did not reach statistical significance. The procedure used in that study involved reading a vignette on the negative impacts of being either "overweight" or a smoker on job prospects. However, participants were also then given two minutes to prepare before being filmed for five minutes discussing what they had read. In addition to the potential confounding effects of non-identity-related stressors invoked by the vignette, it is also possible that the added stress of being filmed may have been sufficient to undermine the self-control necessary to engage in self-presentation behaviour, and thus explain the increased intake in self-perceived higher-weight individuals.

The tendency for normative-weight individuals to eat less in the weight-stigma condition compared with the control condition in both the present study and the study by Major et al may also be a form of impression management – to clearly distinguish themselves from the stigmatised fat others depicted in the weight-relevant stigma prime. Another possibility is that it represents participants' fear of fat.
On being made aware of the negative interpersonal consequences experienced by higher-weight individuals, slimmer participants may be motivated to ensure that this fate does not befall them and so restrict their snack intake. In the study by Major et al, it is possible that the tendency of lower-weight individuals to reduce food intake in response to a weight-related stressor may actually have been attenuated to some extent by being observed – that is, being videotaped may have *reduced* impression-management motivation in slimmer participants. In a previous study utilising a dating paradigm, slimmer women suffered less anxiety, stress, self-consciousness, increased self-esteem, lower expectation of social rejection, and performed better on a test of cognitive processing, when they thought they were going to be evaluated on video by a member of the opposite sex, compared with when they thought they were going to be evaluated on audio tape; this effect was reversed in higher-weight women (Blodorn, Major, Hunger, & Miller, 2016).

In comparison, the study by Schvey et al (2011) used a weight-stigmatising versus a neutral video manipulation in "normal weight" and "overweight" women.
All participants who viewed the stigmatising video ate more than those who viewed

the neutral video, although the effect was much stronger among higher-weight women. The video used in the stigma condition in that study was more overtly stigmatising than the primes used in the present study and that by Major and colleagues. It included clips from popular television shows and films depicting, for example, weight-related harassment, in interpersonal relationship and at work, and heavier women suffering "pratfalls." It is possible that exposure to such blatant prejudicial content might have detrimental effects in individuals across the weight range. Little work has been done on the impact on normative-weight individuals of observing weight-related stigma. One study looking at responses to weight-related humour in a weight-diverse sample of 500 adults found that distaste of video clips displaying anti-fat humour was independent of participants' own BMI or anti-fat attitudes (Burmeister & Carels, 2015). Further, evidence from the wider stigma literature suggests that simply being in an environment more hostile or uncivil toward a marginalised group may have negative psychological and physiological impacts on members of the non-marginalised group (Y. Lee, Muennig, Kawachi, & Hatzenbuehler, 2015; Miner-Rubino & Cortina, 2004; Silverschanz, Cortina, Konik, & Magley, 2008), a phenomenon known as the bystander effect, particularly those who hold egalitarian beliefs (Schmader, Croft, Scarnier, Lickel, & Mendes, 2012). None of these studies have measured maladaptive eating behaviour as a response to witnessing prejudice.

It is therefore possible that the paradigm used in the present study may have delivered a level of weight-related stress that was sufficient to provoke impressions management in higher-weight individuals, but insufficient to overwhelm the cognitive control necessary to maintain this behaviour. In another study where the experimental manipulation in the stigma condition involved only reading a weight-relevant stigma vignette, as here, heavier individuals did appear to moderate their subsequent food intake in response to the stigmatising prime (Shentow-Bewsh et al., 2016). While the participants in that study didn't eat *less* in the stigma condition, the effect was measured at one standard deviation above and below the mean standardised square-root log-transformed BMI of the sample. Although it is difficult to interpret the actual levels of adiposity at those two points, only 30% of the sample had a BMI of at least 25 kg/m^2, with a mean of 24.1 and a median of 22.8. Thus, it seems likely that the weight range represented in the analysis was limited, and predominantly within a normative weight range. As the higher-BMI participants tended to eat more in the other two experimental conditions but not in the stigma condition, it is possible that assessing the relationship further along the BMI continuum may have produced a more distinctive negative effect.

Further support for the suggestion that reading the vignettes did not induce stress in the present study comes from the absence of significant changes in mood following exposure to the manipulation or the food-available break period. Evidence from cross-sectional studies suggests that reduced positive affect and/or increased negative affect may mediate some of the distal outcomes of stigma experiences (Gerke et al., 2013; Suisman, Slane, Burt, & Klump, 2008). Two recent studies that used ecological momentary assessment (EMA) to measure responses to weight stigma as they occur in real-time both reported significant reductions in positive affect following experiences of stigma (Carels, Rossi, Solar, & Selensky, 2017; Vartanian, Pinkus, & Smyth, 2016), and reductions in positive affect mediated the relationship between stigma experiences and motivation to engage in health behaviours at the end of the day (Vartanian et al., 2016). Future vignette-based studies should include pilot testing of the vignettes to ensure that the content was perceived as being stigmatising. Alternatively, a more interactive stress manipulation paradigm could be used, for example writing about one's own weight-related experiences or thoughts, in order to maximise experimental effects, although it could be argued that most instances of weight-related stigma occurring outside the laboratory are likely to be more subtle in nature. It may also be useful to assess a more stigma-relevant range of affective states, such as shame, frustration, and anger (Carels et al., 2017), than was done in the present study, to more precisely evaluate the impact of the stigma manipulation on participants' mood.

Interpretation of the findings of the present study regarding the respective impacts of prior experienced and internalised weight stigma on energy intake is constrained by small effect sizes and lack of statistical significance. As noted above, it is possible that more immediate contextual influences may supersede any potential moderating impact by the factors that shape habitual eating patterns over the longer term. It also seems likely, however, that effect sizes may have been weakened by measurement issues with both the WBIS-M and the EWS-3. In particular, the EWS-3 appears to be too crude a measure to capture the true variance in levels of experienced weight stigma needed to assess moderator effects. With respect to the effects of internalised weight stigma, the two BMI categories had to be analysed separately because the WBIS-M did not show metric invariance in this sample. The equivalence of stigma experiences, whether external or internal, in majority and marginalised groups is debatable (Meadows, Daníelsdóttir, Calogero, & O'Reilly, 2017; Schmitt & Branscombe, 2002), and the findings of the measurement invariance analysis conducted here highlight that it should not be assumed that these phenomena are measuring the same thing in individuals of different weights. Nevertheless, this would be unlikely to impact on findings *within* weight status groups.

Among higher-weight participants, there were opposing trends based on levels of internalised weight stigma. Unexpectedly, participants low in internalised weight stigma tended to eat more when exposed to the weight-stigma prime. As the WBIS-M focuses less on actual self-devaluation and more on how people with higher-weight bodies interact with other people (see also Chapter 5), it is possible that people who do not dwell on such issues normally may react in unhelpful ways when reminded that society considers their bodies to be problematic. There was also a trend toward reduced energy intake in the weight-stigma condition with higher levels of internalised weight stigma. This effect was consistent with greater impression-management motivation in individuals who feel high levels of guilt, shame, and self-devaluation based on their weight status. It is also possible that despite eating less during the study, participants in the weight-stigma condition may have engaged in a reactive episode of non-physiological eating after leaving the laboratory, and studies exploring the impact of experienced and internalised weight stigma on eating behaviour in a naturalistic setting could provide a more accurate picture of the relationship. A number of studies have used ecological assessments, such as EMA or daily diaries, to explore the relationship between experiences of weight stigma and self-stigmatising cognitions and eating-related outcomes in higher-weight individuals.

For example, experienced and internal weight stigma has been shown to negatively correlate with subsequent self-reported diet "healthiness" (Seacat et al., 2016) and reduced motivation to diet or lose weight (Vartanian, Pinkus, & Smyth, 2016). However, to date, there have been no studies reporting ecological assessment of the impact of weight stigma on actual eating behaviour. As cognitions and intentions do not necessarily translate into behaviour (T. Webb & Sheeran, 2006), future EMA studies should utilise more objective measures of eating behaviour.

The present study has a number of additional limitations. First, unlike previous studies using the EAH paradigm, participants were not fed to satiety in the lab but were asked to attend full. It is possible that participants were not sufficiently sated to obtain a true measure of non-physiological energy intake and that hunger may have been driving eating behaviour. However, baseline hunger levels confirmed the fed state in the majority of participants, and all analyses controlled for baseline hunger levels. Secondly, by using an interpersonal-relationship paradigm for the experimental manipulation, we aimed to eliminate the potential confounding that may have been present in the study by Major and colleagues (2014), in which the vignettes discussed both employment and health problems associated with being higher-weight. While all participants in the present study were required to be non-smokers, thus ensuring the control condition was non-personally relevant, it is not possible to rule out that some effects may have been driven by participants' own health concerns becoming salient on reading about smoking, a behaviour known to be highly relevant to health. Such an effect may have translated into control participants eating fewer snacks, and reduced the size of any differences due to experimental condition.

Imbalances also occurred in the combination of high and low weight status and high and low levels of internalised weight stigma, which may have led to increased uncertainty around the estimates of effect size and reduced statistical power, although this would not have accounted for the small effect sizes overall. From a methodological point of view, it is more difficult to recruit participants with high BMI and low internalised weight stigma, and low BMI but high internalised weight stigma than the reverse combinations, simply due to the relative prevalence of each in the general population. Online studies provide opportunities to strategically target individuals likely to endorse a broader array of weight-related attitudes, but a laboratory-based study is limited by geographical constraints. Further, the relative paucity of male participants made it impossible to test for gender differences in stigma response.

Finally, internalised weight stigma was assessed as a trait-level variable prior to the lab-based phase of the study. While it is reasonable to expect that existing levels of internalised weight stigma will moderate how an individual responds to a stigmatising prime, it would be of interest to test the effect of the prime on state levels of internalised weight stigma, as well as the mediational effect of the prime on EAH via state internalised weight stigma.

In conclusion, this is the first study to explore the combined role of external weight-related stigma and internalised weight stigma on objectively measured eating behaviour in response to a weight-relevant stigma prime. While the findings suggest a tendency for higher versus lower levels of internalised weight stigma to be associated with reduced energy intake in higher-weight individuals in the weight-stigma condition compared with a control condition, it is likely that this effect was a result of self-presentational motivation, and the possibility of a subsequent rebound effect on eating behaviour cannot be ruled out. In contrast, prior experienced weight stigma had little effect on EAH in this group, adding to the accumulating evidence against the idea that stigmatising higher-weight individuals “for their own good” may result in greater engagement in health behaviours and produce noticeable weight loss (e.g., Callahan, 2013). Thus, it would be premature to suggest that experienced or internalised weight stigma may have positive effects in a natural environment.

CHAPTER 3. Study 2: Internalised weight stigma, body image, and self-esteem as mediators of the relationship between experienced weight stigma and maladaptive eating behaviours: Unique contributors or overlapping constructs?

3.1. Introduction

The present study aims to address some of the limitations in existing research in the area of weight stigma and eating behaviour outlined in Chapter 1, by (a) using a culturally and ethnically diverse, non-treatment-seeking sample of higher-weight men and women; (b) using a purposive sampling strategy to recruit individuals likely to have diverse attitudes to body weight and weight-related stigma; (c) exploring the overlapping and unique roles of internalised weight stigma, body image, and self-esteem in the relationship between experienced weight stigma and eating behaviours.

3.2. Study 2 Methods

3.2.1. Sample

Adult participants (age 18 to 69) who self-identified as "overweight" or "fat" were recruited to complete an anonymous online survey on the "Life experiences of overweight individuals." Invitations to participate in the survey were posted on social media and Internet forums related to weight, weight-loss, health, nutrition, fitness, plus-size fashion, and the size acceptance movement, with no geographical limits. This purposive recruitment strategy was intended to provide a sample likely to have a range of views on the acceptability of societal weight stigma and both positive and negative emotions about their own body weight.

The survey was conducted using a dedicated survey platform (Qualtrics.com). After providing consent, a screening question asked participants for their height and weight, and BMI was automatically calculated. Individuals with a self-reported BMI below 25 kg/m^2 (n = 5) were excluded from the study and thanked for their time. Four hundred and thirty-one eligible participants began the study and 379 completed it (88% completion rate). Participants completed a series of questionnaires and provided demographic data. All participants were entered into a prize draw to win a £50 Amazon voucher (or local equivalent). The study was approved by the University of Birmingham Ethical Review Committee, and informed consent was obtained from all participants.

3.2.2. Measures

3.2.2.1. Experienced weight stigma

Experiences of weight stigma was assessed using the 50-item Stigmatizing Situations Inventory (SSI; Myers & Rosen, 1999). The SSI has excellent internal reliability in clinical and non-clinical samples, and in US and international populations; it is positively associated with psychological distress, body dissatisfaction, and disordered eating, and has good discriminant validity across weight and eating pathology categories (Brauhardt, Rudolph, & Hilbert, 2014; Myers & Rosen, 1999; Vartanian, 2015a). Participants rate the frequency with which they have experienced stigmatising events across 11 domains (see Chapter 2). Reliability statistics are presented in the results.

3.2.2.2. Internalised weight stigma

Internalised weight stigma was assessed with the 11-item Weight Bias Internalization Scale (WBIS; Durso & Latner, 2008). The WBIS has excellent internal reliability and good convergent and predictive validity in clinical and non-clinical samples of men and women (Durso & Latner, 2008; M. S. Lee & Dedrick, 2016), and has been validated in several European populations (Baldofski et al., 2015; Gomez & Baile, 2015; Hilbert et al., 2014; Innamorati et al., 2017).[12] Items are scored on a 7-point Likert scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). Higher scores indicate a greater degree of internalised weight stigma.

3.2.2.3. Explicit anti-fat attitudes

Explicit anti-fat attitudes, i.e., negative attitudes toward fat others, were measured using the 7-item Dislike subscale of the Anti-Fat Attitudes Questionnaire (AFAQ; Crandall, 1994). The Dislike subscale has good internal reliability and small to moderate associations with other measures of prejudicial attitudes and with conservative ideological beliefs; unlike other measures of negative attitudes among members of stigmatised groups, the AFAQ indicates little in-group bias among higher-weight individuals, who score similarly on the Dislike subscale as normative-weight individuals (Crandall, 1994). Anti-fat attitudes have been shown to correlate with disordered eating behaviour in both clinical and non-clinical samples (Barnes, Ivezaj, & Grilo, 2014; Pepper & Ruiz, 2007). Items are scored on a 10-point Likert scale from

[12] Small differences in item-total correlations were observed in the Italian sample and a two-factor structure emerged in the Spanish version – however, psychometric properties of the composite scale were excellent.

0 (*very strongly disagree*) to 9 (*very strongly agree*). Higher scores indicate stronger anti-fat attitudes.

3.2.2.4. Self-esteem

Self-esteem was tested using the 10-item Rosenberg Self-Esteem Scale (RSE; Rosenberg, 1965; see Chapter 2). The RSE has been used extensively in international samples (Donnellan, Trzesniewski, et al., 2015). While some evidence exists regarding differences in factor structure in cross-cultural samples, there is no compelling evidence to suggest that unidimensional composite scale scores differ in their relationship with important criterion variables compared with other structural variants (Donnellan, Ackerman, & Brecheen, 2015).

3.2.2.5. Body Image

Body image was assessed using the 7-item Appearance Evaluation subscale of the Multidimensional Body Self-Relations Questionnaire (MBSRQ; Brown, Cash, & Mikulka, 1990; Cash, 2000). This subscale measures feelings of physical attractiveness and body satisfaction and is scored on a 5-point Likert scale ranging from 1 (*definitely disagree*) to 5 (*definitely agree*). Higher scores indicated greater body satisfaction. The scale has good internal reliability in both male and female sample, good (males) to excellent (females) test-retest reliability, and has demonstrated convergent, discriminant, and construct validities in demographically and culturally diverse clinical and non-clinical samples (Brown et al., 1990; Cash, 2000; Mautner, Owen, & Furnham, 2000).

3.2.2.6. Eating Behaviour

Eating behaviour was assessed using the same measures as in Study 1, namely the Dutch Eating Behavior Questionnaire (DEBQ), Eating Disorders Diagnostic Scale (EDDS), and current dieting behaviour.

The dimensional structure of the DEBQ is measurement invariant by age, gender, and BMI status and has been confirmed in numerous international and diverse cultural samples, although women and higher-weight individuals tend to score higher on the subscales (Wardle, 1987). Psychometric properties are also excellent across cultural samples (e.g., Brunault et al., 2015; Dakanalis, Zanetti, Clerici, Madeddu, Riva, & Caccialanza, 2013; van Strien et al., 1986; Y. F. Wang, Ha, Zauszniewski, & Ross, 2018; Wardle, 1987).

In addition to providing a total symptom score, the EDDS can be used to provide diagnostic indications of the presence of eating disorders. Presence of Binge Eating Disorder (BED) or Bulimia Nervosa (BN) was evaluated according to the criteria stipulated in the Diagnostic and Statistical Manual of Mental Disorders, 5th edition (DSM-5; American Psychiatric Association, 2013). A subset of the items also captures the frequency of binge eating episodes in the previous 3- (BE3) and 6-month (BE6) periods (Stice et al., 2000). The EDDS has been validated in international samples and diverse cultures, including male and female Hong Kong adolescents (S. W. Lee et al., 2007) and in clinical and non-clinical Dutch adult women (Krabbenborg et al., 2011) and no-clinical samples of adult and adolescent Chilean females (Silva et al., 2012).

3.2.2.7. Anthropometrics and demographics

Self-report height and weight were collected during the eligibility screening questions for the study, and used to calculate BMI (weight in kg/height in metres squared).

Participants were asked to provide age, gender, ethnicity, level of education, and current profession. Participants had the option to decline to answer any of these questions.

3.2.3. Handling of missing data

Missing values analyses of questionnaire items indicated only a small number of missing responses (0 – 1.1%). Little's MCAR test was used to assess the pattern of missingness. A non-significant *p* value on this test indicates that data are missing completely at random (MCAR). In this case, Little's MCAR test $\chi^2(5{,}675) = 5825$, $p = .08$, indicating no pattern of data missingness. Missing items were therefore deleted pairwise for scales that used mean scores. One participant had missing data on eight of the ten items on the DEBQ External Eating subscale, and their data were excluded for that measure. As the Rosenberg Self-Esteem Scale uses a sum scale score, participants with missing data on any items were excluded from analyses with that scale ($n = 4$).

Twenty participants (5.3%) did not provide their weight and/or height, thus making it impossible to calculate their BMI. Missing values analysis suggested that cases with missing BMI data just failed to meet the non-significance criteria for being MCAR, Little's MCAR test $\chi^2(31) = 45.2$, $p = .048$. Independent *t*-tests were conducted to identify differences between participants with BMI data available versus missing.

Participants without BMI data were older, had lower self-esteem, worse body image, and had experienced more weight stigma from others, although effect sizes were small (all Cohen's *d*s ≤ .27). Based on these characteristics, it seems likely that individuals with missing BMI might tend to be heavier, and were either unwilling to convey this information, or chose not to weigh themselves and were unable to provide it. As BMI is strongly correlated with experienced weight stigma, and as the structural equation model used in this study does not allow missing values in covariates, non-random missing BMI data could lead to misrepresentation of the relationships in the model. Thus, a decision was made to impute missing BMI values. Linear regression analysis was conducted to see whether BMI could be predicted using the remaining independent variables. The model was significant, $F(12,338) = 18.7$, $p < .001$), and explained 39.9% of the variance in BMI. Thus, missing BMI values were imputed using the expectation maximisation (EM) estimation. The EM method is an iterative procedure that estimates the means, covariance matrix, and correlation of scale variables with missing values based on the likelihood under the distribution of the variable. Each iteration is conducted in two steps: first, an E step uses log-likelihood to produce a conditional expectation of the missing data given the observed values and current estimate of the parameters, e.g., correlations; the M step then performs full information maximum likelihood estimation as though the missing data had been filled in, to compute parameters that maximise the expected log-likelihood from the E step. These parameter estimates are used in the subsequent E step, and the process repeats until convergence is achieved. Missing data on demographic variables (age 0.5%, gender 0.8%, race/ethnicity 19.5%) were not imputed.

3.2.4. Data analysis

3.2.4.1. Preliminary analyses

Log-transformations were performed on variables with non-normal distributions, namely, the SSI, AFAQ and BMI; however, transformation did not alter the results of subsequent analyses, and raw data are presented throughout. Descriptive statistics were calculated for sample characteristics. Differences by demographic characteristics were explored using independent *t*-tests, one-way analysis of variance with robust test of equality of means, and χ^2 tests. Bivariate correlations and partial correlations controlling for BMI were calculated for study variables.

3.2.4.2. Composite measure of eating behaviour

Given the high correlations between measures of disordered eating behaviour, exploratory factor analysis (EFA) was used to identify a more parsimonious factor structure. Principal axis factoring was run with Direct Oblimin rotation with Kaiser normalisation using a random 50% of the sample. Oblique rotation was chosen as it was expected that subscales would be correlated with each other to some extent. It was stipulated that item factor loadings should be > .5 on the primary factor and < .3 on any other factors. As recommended by Stevens (2002; cited in Field, 2013) for samples greater than 250, factor extraction decisions were based on the scree plot, rather than eigenvalues. A three-factor solution was the best fit for the data. As the subscales were allowed to correlate, unique variance explained by each factor in the rotated factor solution could not be determined; however, prior to rotation, the three factors explained 69.5% of the variance in eating behaviour scores. The first factor, which was labelled Binge Behaviour, comprised the two binge eating frequency scores and the EDDS sum score. The second factor, labelled Restraint, contained the DEBQ Restraint subscale and current dieting behaviour. The final factor comprised the DEBQ External and Emotional Eating subscales, and was labelled Disinhibition.

Cross-validation of this factor structure was obtained by conducting confirmatory factor analysis (CFA), in the other half of the sample. Goodness of model fit to the observed data was assessed with the two-index reporting method recommended by Hu and Bentler (1999) for maximum likelihood-based estimation, using the absolute fit index Standardised Root Mean Squared Residual (SRMR) and the incremental fit index Comparative Fit Index (CFI). Cut-off values close to .95 for the CFI and .08 for the SRMR generally indicate a good fit between the hypothesised model and the observed data (Hu & Bentler, 1999). The model was an acceptable fit for the data: $\chi^2(11) = 55.6$, $p < .001$, CFI = .91, SRMR = .065.[13]

3.2.4.3. Bifactor analysis

Bifactor analysis is a form of confirmatory factor analysis that allows for the parsing of variance into unique and joint components (Brunner, Nagy, & Wilhelm, 2012; Chen, West, & Sousa, 2006; Rindskopf & Rose, 1988). It gets its name from the fact that scale items are allowed to load onto two factors – their own specific construct and a general factor that captures any underlying commonality between the specific components (see Figure 3.1). The bifactor model allows for the commonality among the scale items

[13] Two possible alternative models were also tested: a unidimensional model with all eating behaviour measures loading onto a single "disordered eating" factor, and a second-order two-factor model, where the first-order factors represented more generic non-physiological eating patterns (made up of the DEBQ subscales and current dieting behaviour) and eating pathology (made up of the EDDS symptom score and binge eating behaviour), and these first-order factors then loaded onto a second-order "disordered eating" factor. Neither model was a good fit for the data.

explained by the general negative self-judgment factor to be partialled out, with the scale-specific factors representing only the unique shared variance among the items on each scale. This is achieved by specifying the inter-factor correlations to equal zero, thus forcing the common variance in the model (i.e., excluding the item-specific residual variance) to be split between four orthogonal factors. Variance in item scores are explained by the direct influence of the general factor, the influence of specific constructs, independent of the general factor, plus item-level residual variance not accounted for by either the underlying negative self-judgment factors or the scale-specific factors.

Model-based scale reliabilities were calculated following Rodriguez et al (2016). The reliability statistic ωH represents the amount of total variance attributed to variance on the general factor, and ωHS refers to the proportion of total variance attributable to specific factors after partitioning out the variance explained by the general factor. As with other reliability statistics, the value of ω can range from 0 to 1.

Analyses were conducted using maximum likelihood (ML) estimation.[14] Starting values were allocated to factor loadings and the variance of latent factors was fixed to unity to facilitate model identification.

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[14] Although ML estimation assumes multivariate normal distribution of the measured variables in the population, it is robust to mild to moderate normality violations (Curran et al., 1996; Fan & Wang, 1998). Descriptive statistics indicated approximately normal distribution of indicators, with only mild values of skew and kurtosis (absolute values ≤ .99 and ≤ 1.4).

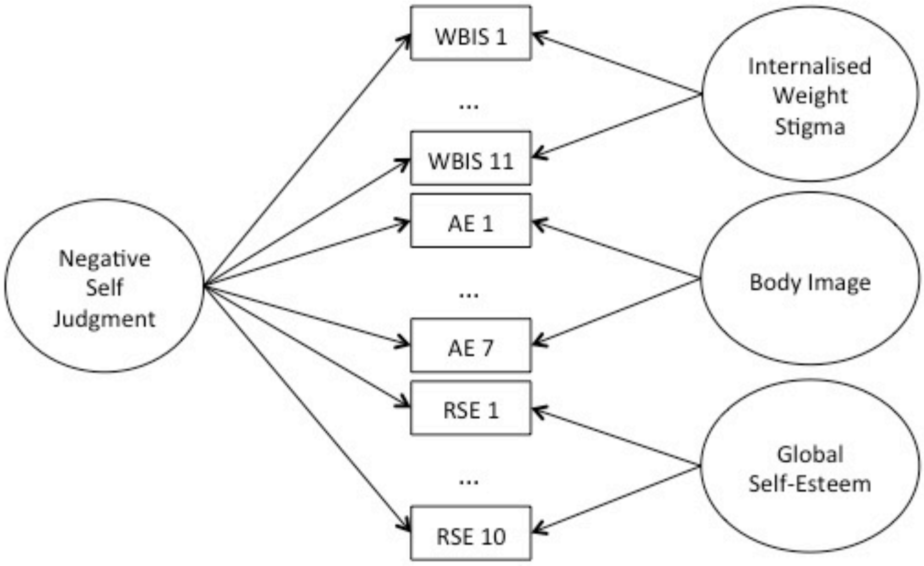

Figure 3.1. Schematic representation of the bifactor model. For clarity, only first and final scale items are shown for each measure, with remaining items represented by ellipses. AE = Appearance Evaluation scale; RSE = Rosenberg Self-Esteem Scale; WBIS = Weight Bias Internalization Scale.

Goodness of model fit to the observed data was assessed using the same two-index reporting method outlined above. However, CFI tends to decline with increasing number of indicators in the model (Kenny & McCoach, 2003). In the present analysis, the maximum number of variables per factor was 28, thus, following Chen et al (2012), a less stringent cut-off of .90 was used for the CFI to indicate goodness of fit.

3.2.4.4. Mediation analysis

Structural equation modelling was conducted with experienced weight stigma as the predictor, disordered eating behaviour as the outcome, and the components of the bifactor model as the mediators. Gender and BMI were included in the model as covariates.[15] We used a bootstrapping resampling procedure (DiCiccio & Efron, 1996; Fritz & MacKinnon, 2007) with 1000 bootstrap samples to construct confidence intervals for the path estimates and indirect effects. An effect was considered statistically significant if the 95% confidence interval did not include zero.

3.3. Study 2 Results

3.3.1. Sample characteristics

The sample was predominantly female, and, although drawn from a reasonable wide geographic base (16 countries), predominantly White (see Table 3.1). Participants were generally well educated and in white-collar professions. A good range of body sizes were represented in the sample. Means, standard deviations, internal reliability statistics, and correlations for study variables are displayed in Table 3.2. Additionally, 32.2% of participants were weight-loss dieting, 27.7% were watching what they ate so as not to gain weight, and 39.8% were not dieting. Overall, 8.2% of the sample met the DSM-5 diagnostic criteria for BED and 7.9% met the criteria for BN. Neither BED nor BN correlated with either experienced (BED point biserial correlation r_{pb} = .09, p = .08; BN r_{pb} = -.01, p = .92) or internalised weight stigma (BED r_{pb} = -.06, p = .74; BN r_{pb} = .06, p = .56). As such, neither BED nor BN were included in subsequent regression-based analyses.

[15] Although both experienced weight stigma and BMI had non-normal distributions, and gender is categorical, all are exogenous variables in the model, which does not present a problem for ML estimation.

Table 3.2. *Study 2 Sample Characteristics*

Variable	Mean (SD) / %
Age (range 18–69 years)	37.6 (12.1)
Gender	
Male	11.6%
Female	87.6%
Geographic location[a]	
United Kingdom	45.4%
United States	34.0%
Oceania	7.1%
Canada	5.8%
Continental Europe	5.5%
Africa	1.1%
Other[b]	1.1%
Race/Ethnicity	
White	71.0%
South Asian/Indian subcontinent	3.2%
Black	2.4%
Chinese	0.8%
Mixed	1.6%
Other[c]	1.6%
BMI (range 25.0–76.2 kg/m^2)	36.8 (8.9)
BMI 25.0 – 29.9	23.0%
BMI 30.0 – 34.9	24.8%
BMI 35.0 – 39.9	19.0%
BMI ≥ 40	28.0%
Highest level of education	
Professional/Doctorate degree	10.8%
Postgraduate qualification	25.9%
Undergraduate/College degree	32.7%
Vocational	9.5%
Secondary/High school	17.2%
Other	3.9%
Profession	
Higher MAP	13.7%
Intermediate MAP	23.2%
Supervisor, clerical, lower MAP	19.8%
Skilled manual	3.2%
Semi-skilled, unskilled manual	0.8%
Student	19.0%
Unemployed	7.1%
Other	13.2%

Note. Reported data only. See Section 3.2.3 for handling of missing values. BMI = body mass index; MAP = managerial, administrative, or professional.

[a]From embedded IP data; [b]Central America, South America, Middle East, all *n* = 1; [c]Hispanic, *n* = 2, Greek, Vietnamese, Native Canadian, Middle Eastern, all *n* = 1.

Table 3.2. *Means, Standard Deviations, Internal Reliability, and Correlations Between Study Variables*

Variable	2	3	4	5	6	7	8	9	10	11
1. BMI	$.54^{***}$	.07	$-.13^{*}$	-.10	-.13	$-.18^{*}$	.01	-.03	.04	$.21^{***}$
2. EWS[a]		$.20^{***}$	.01	$-.18^{***}$	$-.26^{**}$	.01	$.11^{*}$	$.13^{*}$	$.23^{***}$	.10
3. IWS			$.43^{***}$	$-.80^{***}$	$-.73^{***}$	$.37^{*}$	$.41^{***}$	$.51^{***}$	$.70^{***}$	$-.33^{***}$
4. Anti-fat attitudes				$-.32^{***}$	$-.24^{***}$	$.21^{*}$	$.30^{***}$	$.23^{***}$	$.42^{***}$	$-.21^{***}$
5. Body image					$.63^{***}$	$-.30^{*}$	$-.32^{***}$	$-.40^{***}$	$-.56^{***}$	$.27^{***}$
6. Self-esteem						$-.17^{**}$	$-.24^{***}$	$-.30^{***}$	$-.53^{***}$	$.15^{**}$
7. Dietary restraint							$.13^{*}$	$.19^{***}$	$.34^{***}$	$-.59^{***}$
8. External eating								$.57^{***}$	$.50^{***}$	$-.15^{**}$
9. Emotional eating									$.49^{***}$	$-.17^{**}$
10. Eating pathology										$-.30^{***}$
11. Dieting[b]										
Possible range	0–3	1–7	0–9	1–5	0–30	1–5	1–5	1–5	0–113	
Mean	0.9	4.2	1.7	2.4	17.3	2.9	3.2	3.2	25.1	
Standard deviation	0.6	1.4	1.7	0.9	6.0	0.8	0.7	1.0	12.2	
Actual range	0–2.8	1–7	0–8	1–4.7	0–30	1–5	1.4–4.9	1–5	3–75	
α	.96	.93	.86	.89	.91	.90	.87	.95	.81	

Note. Partial correlations controlling for BMI had little effect on correlation coefficients, with the following exceptions: controlling for BMI, experienced weight stigma was significantly correlated with explicit anti-fat attitudes and dietary restraint (both $r = .11$, $p < .05$), and more strongly correlated with external eating ($r = .19$, $p < .001$), and emotional eating ($r = .23$, $p < .05$). BMI = body mass index; EWS = experienced weight stigma; IWS = internalised weight stigma.
[a]Cronbach's α for individual subscales ranged between .52 and .89; seven of the ten multi-item subscales had αs >.70. No validity was obtained for the subscale 'Being attacked' as this consists of a single item. [b]Dieting: 1 = Weight loss dieting, 2 = Watching so as not to gain weight, 3 = not dieting.
$^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$.

3.3.2. Experienced and internalised weight stigma

Experiences of weight stigma were ubiquitous, being reported by almost every participant. Levels of experienced stigma were consistent with those reported in other community samples (Puhl & Brownell, 2006; Vartanian & Novak, 2011), with frequent experiences of stigma recorded in most domains (Figure 3.2). There was a small but significant positive relationship between experienced and internalised weight stigma (Spearman's $\rho = .20$, $p < .001$). In addition, with the exception of physical assault, all domains of the Stigmatizing Situations Inventory were significantly correlated with higher levels of internalised weight stigma and lower self-esteem.

However, after controlling for BMI, only nasty comments (from all sources), embarrassment of loved ones, negative assumptions, being excluded or ignored, and job discrimination remained significantly associated with internalisation, and only interpersonal sources of stigma remained significantly associated with self-esteem.[16] Participants' own anti-fat attitudes were similar to those reported in other higher-weight samples (Burmeister et al., 2013; Durso, Latner, & Ciao, 2016) and had small to moderate correlations with internalised weight stigma, body image, and global self-esteem, in the expected directions.

3.3.3. Relationship with demographic variables

Levels of experienced and internalised weight stigma did not differ by age, profession, or education, although there was a tendency for individuals with higher degrees to

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[16] See Appendix D for SSI domain-specific data.

report less internalised weight stigma. Given that 71% of the sample identified as White, and no other group made up more than 3.2% of the sample, comparisons by race/ethnicity groups were not possible.[17]

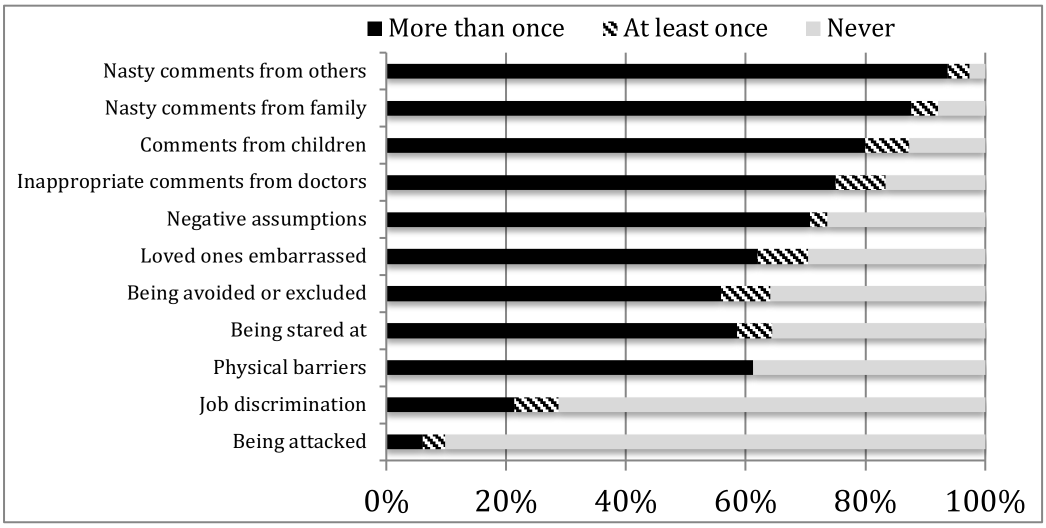

Figure 3.2. Frequency of experienced weight stigma across eleven domains.

3.3.3.1. Gender differences

No statistically significant gender differences emerged for the majority of study variables (see Table 3.3). However, women experienced around twice as much stigma as men overall, and women reported higher scores on all subscales of the Stigmatizing Situations Inventory with the exception of being physically attacked. These gender differences remained significant after controlling for BMI. However, there was a trend suggestive of differences on internalised weight stigma, anti-fat attitudes, and BN, and the lack of statistical significance could be due to the relatively small number of male

[17] As an exploratory analysis, race/ethnicity was dichotomised into White and Other ethnicities. Independent samples *t*-tests indicated no significant differences in either internalised or experienced weight stigma by race/ethnicity categorised in this manner.

participants in the sample. Thus, subsequent regression analyses were controlled for gender.

Table 3.3. *Gender Differences on Study Variables*

Variable	Male *M (SD) / % (n)*	Female *M (SD) / % (n)*	*p*	Effect size
Experienced weight stigma	0.49 (0.4)	0.99 (0.6)	.00	1.72
Internalised weight stigma	3.92 (1.3)	4.25 (1.4)	.15	
Explicit anti-fat attitudes	2.15 (2.0)	1.59 (1.6)	.08	
Self-Esteem	18.6 (5.1)	17.0 (6.4)	.10	
Body image	2.49 (0.9)	2.37 (0.9)	.39	
Dietary restraint	2.82 (0.8)	2.90 (0.8)	.49	
External eating	3.31 (0.6)	3.22 (0.7)	.39	
Emotional eating	2.90 (0.9)	3.26 (1.0)	.02	0.24
Eating pathology	23.4 (12.9)	25.4 (12.2)	.31	
Bulimia Nervosa	2.3% (1)	8.7% (29)	.14	
Binge Eating Disorder	6.8% (3)	8.4% (28)	.71	
Dieting status			.02	0.15
Weight-loss dieting	27.3% (12)	33.2% (110)		
Watching	45.5% (20)	25.1% (83)		
Not dieting	27.3% (12)	41.7% (138)		

Note. Statistical tests were independent sample *t*-tests for continuous variables and χ^2 tests for categorical variables. Effect sizes are Cohen's *d* and Cramer's *V*, for continuous and categorical variables, respectively.

3.3.3.2. Geographical differences

Region was a significant predictor of experienced weight stigma, and this relationship held when controlling for BMI (see Table 3.4). Respondents in Europe and North America tended to experience the highest levels of weight stigma overall, and on all domains of the Stigmatizing Situations Inventory. Some differences in levels of internalised weight stigma were also apparent. Approximately two-thirds of participants from the UK and Oceania reported at least some degree of internalised weight stigma (i.e., they scored above the neutral mid-point on the WBIS), compared with only around 40% of participants from the US and Europe. Interestingly, regional averages were inversely proportion to regional mean BMI, such that participants with the highest mean BMI by region had the lowest levels of internalised weight stigma, and vice versa.

Table 3.4. *Regional Differences in Experienced and Internalised Weight Stigma*

	Region						
	UK	N America	Europe	Oceania	Other	Test statistic	Effect size
Variable	*n* = 172	*n* = 151	*n* = 21	*n* = 27	*n* = 8		
BMI	34.5 (7.3)	39.3 (10.2)	39.8 (9.3)	35.4 (5.5)	37.7 (9.5)	6.7***	.06
EWS	0.8 (0.6)	1.1 (0.6)	1.3 (0.5)	0.7 (0.5)	0.9 (0.7)	10.9***	.09
% EWS	98.3%	100%	100%	100%	100%	ns	
IWS	4.5(1.3)	3.9 (1.4)	3.6 (1.4)	4.6 (1.5)	3.9 (1.5)	4.5**	.04
% IWS > 4	66.3%	45.7%	42.9%	66.7%	50%	16.7**	.21

Note. Data are means (*SD*) unless otherwise stated. Test statistics are Welch's *F* for continuous variables and χ^2 for categorical variables. Effect sizes are ω^2 for analysis of variance and Cramér's *V* for χ^2 tests. BMI = body mass index; EWS = experienced weight stigma; IWS = internalised weight stigma.
* $p < .05$, ** $p < .01$, *** $p < .001$; ns, not significant.

3.3.3.3. Intersectional effects of weight stigma on eating behaviour

Due to small sample sizes for Europe, Oceania, and other regions, moderation effects were tested only for UK and North American participants. Analyses were run individually for the three forms of disordered eating, to ascertain whether there were regional differences in coping styles. For simplicity, UK and North American participants were tested at the same time, with categorical variable coding as 1 = UK and 0 = North America. Gender was coded as 1 = Female, 0 = Male. BMI was included as a covariate in all analyses.

There was a positive main effect of experienced weight stigma on disinhibition and a marginal negative effect on dietary restraint. Internalised weight stigma was a significant positive predictor of binge behaviour and disinhibition and a significant negative predictor of dietary restraint. These relationships were not significantly moderated by gender, location, or their interaction.

3.3.4. Mediation analysis

The bifactor model was a good fit for the data, $\chi^2(322) = 1049$, $p < .001$, CFI = .90, SRMR = .06.[18] Items on the WBIS loaded negatively onto the general construct, whereas items on the Appearance Evaluation and RSE scales loaded positively. Thus, the general construct appears to represent an underlying *positive* self-judgment factor. Structural equation modelling was conducted with experienced weight stigma as the predictor variable, the components of the bifactor measurement model as the mediators, and the disordered eating latent construct as the dependent variable. This approach allowed the relative contribution of the construct-specific internalised weight stigma, body image, and self-esteem factors and the general underlying positive self-judgment factor to be assessed independently as mediators, whilst controlling for variance in the other factors. To this end, a parallel mediation model was tested – that is, the significance of indirect pathways between experienced weight stigma and disordered eating were explored for all possible mediators

[18] Three alternative models were tested: a unidimensional model with all items from the three scales loading onto a single common factor; a first-order model with each of the three scales represented by its own factor, which were allowed to correlate; and a higher-order model where the three first-order factors loaded onto a second-order general factor. The bifactor model was a superior fit to the data than these alternative factor structures (see Appendix E).

simultaneously. Thus, each specific indirect pathway controlled for all other pathways in the model. Gender and BMI were entered as covariates for all steps in the mediation pathway; however, only the relationship between gender and experienced weight stigma was significant. The model was then re-run with the non-significant covariate paths removed.

Results of the parallel mediation analysis are displayed in Figure 3.3. Experienced weight stigma was not a significant predictor of global positive self-judgment when controlling for the construct-specific factors, but did significantly predict each of the construct-specific factors, controlling for all other factors in the model. The general and construct-specific factors all significantly predicted disordered eating controlling for each other. Standardised indirect effects are shown in Table 3.5.

A number of anomalous findings emerged. First, the relationship between experienced weight stigma and the body image construct was positive; that is, being stigmatised by others appeared to *improve* body image. Similarly, the self-esteem factor was positively associated with disordered eating, suggesting that higher self-esteem led to *more* disordered eating. Likewise, the indirect pathways from experienced weight stigma to disordered eating via body image and self-esteem were negative, suggesting that experienced weight stigma *decreased* disordered eating via these mediators, and the pathways via positive self-judgment and internalised weight stigma were non-significant.

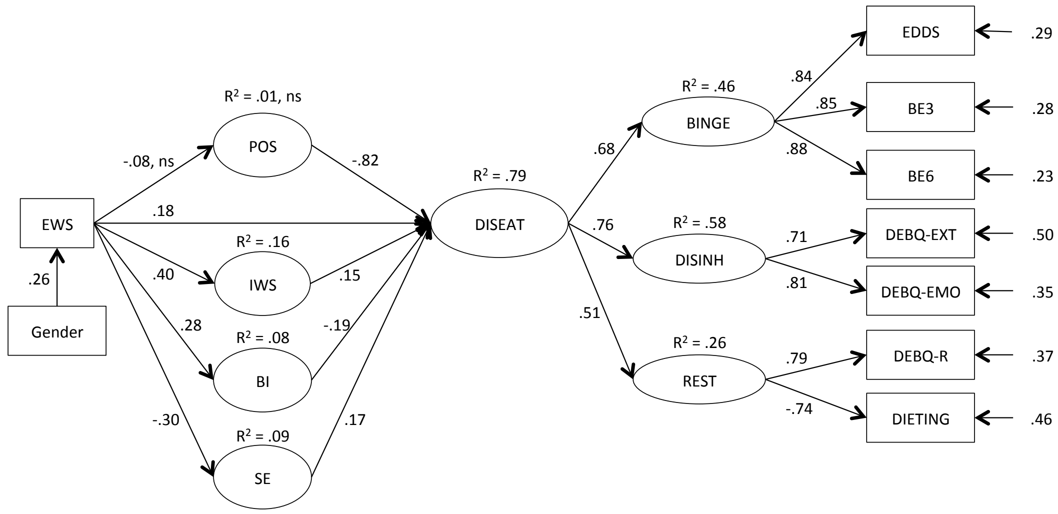

Figure 3.3. Parallel mediation analysis predicting disordered eating behaviour. Standardised coefficients displayed. For the sake of simplicity, items loading onto the POS, IWS, BI, and SE factors are not displayed. Latent variables: BI = body image; BINGE = binge eating behaviour; DISEAT = disordered eating; DISINH = disinhibition; IWS = internalised weight stigma; POS = positive self-judgment; REST = dietary restraint; SE = self-esteem. Manifest variables: BE3/BE6 = binge eating frequency in previous 3/6 months; DEBQ-Emo = emotional eating; DEBQ-Ext = external eating; DEBQ-R = restraint; EDDS = Eating Disorders Diagnostic Scale total symptom score; EWS = experienced weight stigma. Dieting coded: 1 = weight-loss dieting, 2 = watching so as not to gain weight, 3 = not dieting. ns = not significant at $p < .05$ level.

Table 3.5. *Indirect Effects of Experienced Weight Stigma on Disordered Eating via General and Construct-Specific Factors From Bifactor Analysis*

Pathway	Coefficient	*SE*	95% CI	*p*
Total effect	.20	.07	[.05, .34]	.01
Indirect effects				
EWS → POS → Disordered eating	.06	.05	[-.02, .19]	.23
EWS → IWS → Disordered eating	.06	.04	[-.03, .14]	.13
EWS → BI → Disordered eating	-.05	.02	[-.10, -.00]	.03
EWS → SE → Disordered eating	-.05	.03	[-.10, .01]	.05

Note. Standardised coefficients shown. 95% confidence intervals based on 1000 bootstrapped samples. The direct effect is usually reported to provide an indication of the existence of other potential mechanisms that are not included in the model, and that, by definition, must be responsible for any residual significant effect of the predictor on the outcome when indirect effects have been taken into account. It is calculated as the difference between the total effect and the sum of the indirect effects, and is therefore not meaningful when the indirect effects have opposite valences as in the present case; hence this effect is not reported. BI = body image; EWS = experienced weight stigma; IWS = internalised weight stigma; POS = positive self-judgment.

A closer examination of the item loadings and variance partitioning on the construct-specific factor provides some insight into these findings, and highlights the difficulties inherent in identifying what exactly remains in a construct-specific factor once the variance shared with an underlying general factor has been partitioned out (see Table 3.6). Of the eleven items on the WBIS, only two are reverse scored (signifying *lower* internalised weight stigma, i.e., a more positive self-judgment). When controlling for the general factor, the loadings of these items onto the construct-specific factor became non-significant, suggesting that almost all of the reliable variance in these items was explained by the general positive self-judgment factor. The remaining nine items loaded onto the internalised weight stigma factor with loadings ranging from .196 to .463, median .331. An average of 12.0% of the variance in positively scored items (i.e., higher internalised weight stigma) was explained by the internalised weight stigma construct after partialling out the general factor and the item-level residual variance, whereas the corresponding figure for reverse-scored items was only 0.7%. Thus, the internalised weight stigma factor clearly represented a negative weight-based attitude toward the self. In total, 15.1% of the variance in WBIS scores was explained by the construct-specific factor, with 78.1% of the variance attributable to the underlying general factor (and 6.8% item-level residual variance). Reliability of the construct-specific internalised weight stigma factor was also low (ωHS = .14).

Table 3.6. *Standardised Factor Loadings, Proportion of Variance Associated With General and Specific Factors, and Scale Reliabilities for Bifactor Model*

	Standardised factor loadings				% Variance explained		
Item number[a]	POS	IWS	BI	SE	% General	% Specific	% Residual
			Weight Bias Internalization Scale (WBIS)				
-WBIS1[b]	-.484	.099[†]			23.4%	1.0%	75.6%
+WBIS2[c]	-.685	.232			47.0%	5.4%	47.6%
+WBIS3[d]	-.543	.436			29.5%	19.0%	51.5%
+WBIS4[e]	-.757	.225			57.3%	5.1%	37.6%
+WBIS5[f]	-.718	.452			51.6%	20.4%	28.0%
+WBIS6[b,f]	-.786	.463			61.8%	21.4%	16.8%
+WBIS7[b]	-.715	.383			51.1%	14.7%	34.2%
+WBIS8[b]	-.580	.342			33.7%	11.7%	54.6%
-WBIS9[e]	-.768	.066 [†]			59.0%	0.4%	40.6%
+WBIS10[g]	-.699	.196			48.9%	3.8%	47.3%
+WBIS11[b,c,d]	-.706	.246			49.8%	6.1%	44.1%
Scale total					78.1%	15.1%	6.8%
			Appearance Evaluation scale (AE)				
+S/O: AE1	.728		.214		53.1%	4.6%	42.4%
+S: AE2	.850		.038[†]		72.3%	0.1%	27.5%
+O: AE3	.474		.491		22.5%	24.1%	53.4%
+S: AE4	.817		.029[†]		66.7%	0.1%	33.2%
+S: AE5	.778		.101[†]		60.6%	1.0%	38.4%
-S: AE6	.584		.289		34.1%	8.4%	57.5%
-S/O: AE7	.699		.588		48.8%	34.6%	16.6%
Scale total					82.4%	8.4%	9.2%
			Rosenberg Self Esteem Scale (RSE)				
+RSE1	.756			.220	57.2%	4.8%	38.0%
-RSE2	.432			.537	18.6%	28.8%	52.5%
+RSE3	.435			.471	18.9%	22.2%	58.9%
+RSE4	.406			.444	16.5%	19.7%	63.8%
-RSE5	.447			.601	20.0%	36.2%	43.8%
-RSE6	.402			.605	16.2%	36.7%	47.2%
+RSE7	.500			.573	25.0%	32.9%	42.1%
-RSE8	.502			.372	25.2%	13.8%	61.0%
-RSE9	.546			.642	29.8%	41.2%	29.0%
+RSE10	.698			.438	48.7%	19.2%	32.2%
Scale total					47.8%	43.7%	8.5%
ω-H / ω-HS	.864	.141	.076	.437			

Note. +/- before item numbers indicates item valence; negative valence designed to be reverse scored on their original scale construct. S/O indicates whether item refers to respondent's own views (S, self) or their impressions of other people's views (O, other). ω-H / ω-HS represent amount of total variance attributed to variance on the general factor and to specific factors after partitioning out the variance explained by the general factor, respectively. BI = body image factor; IWS = internalised weight stigma factor; POS = general positive self-judgment factor; SE = global self-esteem factor.

[a]Item number on scale as originally published. Item content pertains to: [b]weight-related self-worth; [c]body image; [d]others' attitudes; [e]desire to change weight; [f]distress at weight status; [g]fat identity.

[†]Non-significant factor loading ($p \geq .05$).

Of the seven items in the Appearance Evaluation scale, two are reverse scored (i.e., indicating body dissatisfaction) and five are scored such that higher item responses indicate better body image. After controlling for the general factor, three of these positive items no longer significantly loaded onto the body image factor, and a fourth had the next lowest loading (.214). Further, an average of 6.0% of the construct-specific variance in positive items was accounted for by the body image factor, compared with 21.5% of the variance of reverse-scored items. Thus, the items representing the body image factor, after partialling out positive self-judgment, largely represent body *dissatisfaction*, with the valence of the factor being reversed from that of the original scale. This could then explain the positive relationship between experienced weight stigma and the body image factor – stigma experiences *increased* body *dissatisfaction*. It does not, however, explain why this body dissatisfaction factor then negatively predicted disordered eating. However, 82.4% of the total variance in scores on the Appearance Evaluation scale was explained by the general factor, with only 8.4% explained by the specific body image factor, and ωHS was only .08; thus, it may be unwise to interpret this effect at all (Chen et al., 2012).

Turning to the self-esteem factor, overall, 43.7% of variance in RSE scores was attributable to the construct-specific factor, compared with 47.8% that was explained by the general factor. Reliability of the construct-specific self-esteem factor (ωHS = .44) was considerably higher than that for the other two construct specific factors. Examination of the RSE item factor loadings on the construct-specific factor, once common variance with the other measures had been removed, indicated a small effect of item valence, such that mean loading of positively scored items was .429, whereas the mean loading of reverse-scored items was .551, suggesting, in line with the hypothesised interpretation of the underlying construct, that partialling out the positive self-judgment variance strengthened the relationship between the reverse-scored items and the remaining self-esteem factor. Similarly, on average, only 19.8% of the variance in the positive items on the RSE was explained in the construct-specific self-esteem factor, compared with 31.4% of the variance on reverse-scored items.

The unexpected indirect effect findings simply reflect the valence of the already discussed regression coefficients, whereby a positive regression coefficient to the mediator and a negative regression coefficient from the mediator to the dependent variable are multiplied to provide a negative indirect effect, and vice versa. The non-significant findings for the pathways with positive self-judgment and internalised weight stigma as mediators may have more to do with splitting out the total effect in this manner, when all pathways appear to be equally relevant. Based on the model-derived standardised coefficients for the respective paths in these mediation models, a sample size of approximately 400 would be needed to detect a significant mediation effect with .8 power at a significance level of .05 using bootstrap resampling procedures (Fritz & MacKinnon, 2007). Thus, a sample size of 379 may be slightly underpowered to detect these significant indirect effects when split across four mediators. In the present analysis, the 95% confidence intervals for both the positive self-judgment and the internalised weight stigma mediation effects were close to not including zero, and therefore a slightly larger sample size may have produced significant findings for these mediators.

A more important question is whether the construct-specific factors supply additional information beyond that provided by the common general factor, or whether these findings simply reflect a form of common method bias, whereby effects are driven largely by the valence of the items, rather than by a theoretically sound underlying construct. Supporting this possibility is the fact that of the three specific factors, only internalised weight stigma, which, by definition, is orthogonal to the underlying positive self-judgment factor, behaved as theoretically predicted. Both measures that had strongly shared method bias with the general factor (i.e., positive valence), behaved in unpredictable ways in the mediation model. While it could be argued that the body image factor is uninterpretable as a unique construct due to the very low proportion of the variance in its items explained by the construct-specific factor, the same cannot be said for the self-esteem factor, where over 40% of the variance in response scores was constrained within the construct-specific factor.

3.3.5. Post hoc analyses

3.3.5.1. Common method bias resulting from item and factor valence

A series of post-hoc analyses were undertaken in an attempt to determine whether the paradoxical effects of the construct-specific mediators on eating behaviour were due to common method bias. First, non-significant loadings on factor-specific constructs were removed; that is, items were allowed to load onto the common factor, but were excluded from the domain-specific factor that they no longer represented – known as an incomplete bifactor model (Chen et al., 2006). Similarly, items with under 5%, and, subsequently, under 10%, of their variance explained by the construct-specific factor were removed, and the model re-evaluated. Most of these adjustments resulted in very small decrements in model fit, but did not eliminate the paradoxical findings for the body image and/or self-esteem factors. In fact, the positive relationship between the self-esteem factor and disordered eating was stable across all analyses.[19]

3.3.5.2. Simple mediation analyses

Possible issues arising, from splitting of total indirect effects between several mediators in the parallel mediation analysis may be overcome by considering one mediator at a time. Thus, following Gonzalez and MacKinnon (2016), two simple mediation models were run, the first using the construct-specific internalised weight stigma factor derived from the bifactor model as the sole mediator, and the second using a unidimensional internalised weight stigma factor based solely on the items of the WBIS as the mediator, ignoring other possible sources of common variance. This technique allows for the impact of ignoring multidimensionality to be explored. If internalised weight stigma, as delineated by partialling out common variance using bifactor analysis, is the *true* mediator of the relationship between experienced weight stigma and disordered eating behaviour, then treating internalised weight stigma as unidimensional and running the mediation model with the original WBIS scale items effectively contaminates the *pure* variance of the construct-specific factor with unnecessary variance shared with other constructs. Under these circumstances, this would produce a poorer model fit, increase bias within the parameters, weaken

[19] An exploratory model where the positively and negatively worded items of the RSE were allowed to load onto separate, correlated, factors, resulted in a small improvement in fit of the model to the observed data, $\Delta\chi^2(1) = 59$, $p < .001$, but no change in fit indices. However, the full mediation model with the two-factor self-esteem construct in place of the original unidimensional construct failed to converge.

the indirect effect, and reduce the statistical power of the analysis (Gonzalez & MacKinnon, 2016).

The path diagram for the bifactor mediation model is displayed in Figure 3.4. The positive and negative items of the RSE were *a priori* allowed to load onto separate correlated factors in the bifactor model. The bifactor mediation model was a generally poor to the data, $\chi^2(595) = 1867$, $p < .001$ CFI = .85, SRMR = .15. The unidimensional model (Figure 3.5) was an adequate fit for the data on most fit indices, $\chi^2(165) = 803$, $p < .001$ CFI = .85, SRMR = .08, and a significantly improved fit compared with the bifactor model, $\Delta\chi^2(430) = 1064$; critical value = 479.[20] Additionally, the standardised path coefficient from the mediator to the dependent variable was almost double in size in the unidimensional compared with the bifactor mediator model, and almost two-thirds of the variance in disordered eating was explained by the model with the unidimensional mediator, compared with under 20% in the model with the bifactor mediator. The total, direct, and indirect effects for the two models are shown in Table 3.7, and indicate that the indirect effect of experienced weight stigma on disordered eating was slightly stronger for the unidimensional than the bifactor mediator.

[20] As this simple mediation model replicates the standard test of internalised weight stigma as a mediator of the relationship between experienced weight stigma and disordered eating behaviour, an attempt was made to explore any differences in mediation effects by demographic factors. Only gender had a secondary grouping making up over 10% of the sample size (the largest race/ethnicity group after White, was South Asian at 3.2% of the sample). Thus, a multigroup analysis was attempted using gender as the grouping variable. However, the model failed to converge, likely due to inadequate sample size of male participants.

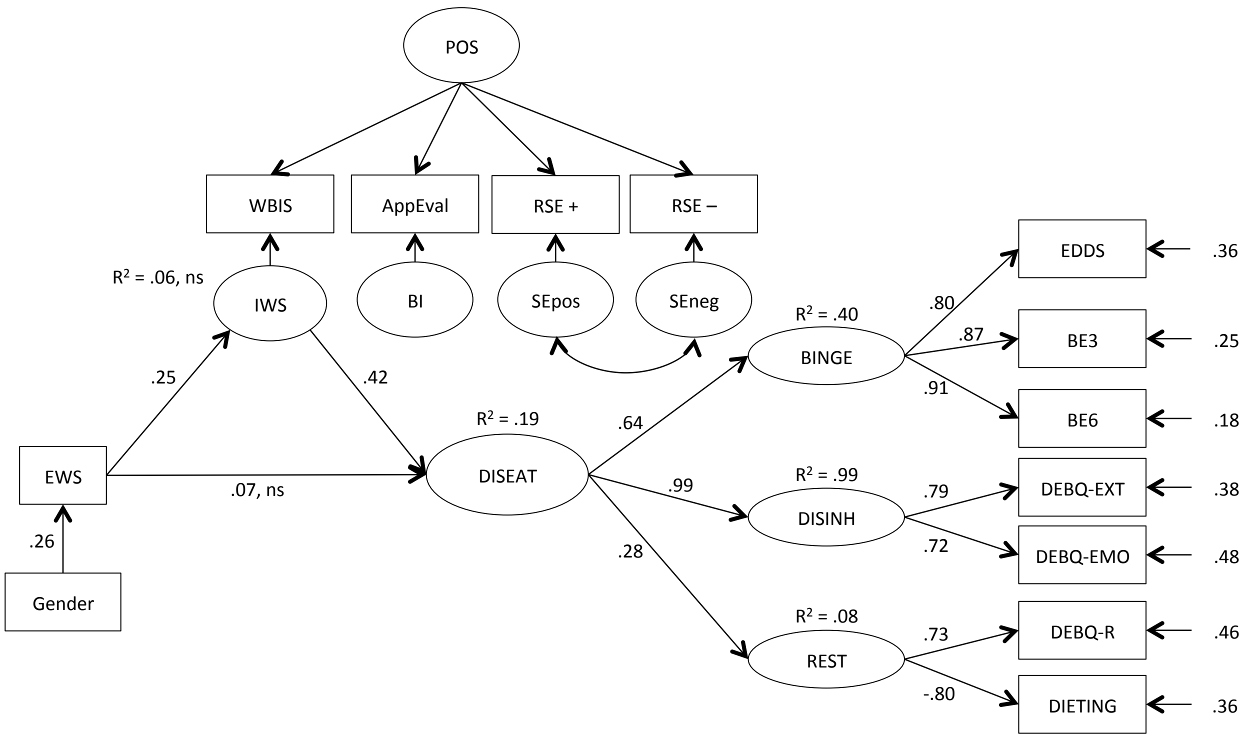

Figure 3.4. Simple mediation model predicting disordered eating with construct-specific internalised weight stigma factor derived from bifactor analysis as mediator. Standardised coefficients displayed. For the sake of simplicity, observed item scores loading onto the POS, IWS, BI, and SE factors in the bifactor model are displayed as a single manifest variable; however, individual scale items were used as predictors in the analysis. Latent variables: BI = body image; BINGE = binge eating behaviour; DISEAT = disordered eating; DISINH = disinhibition; IWS = internalised weight stigma; POS = positive self-judgment; REST = dietary restraint; SE = self-esteem. Manifest variables: BE3/BE6 = binge eating frequency in previous 3/6 months; DEBQ-Emo = emotional eating; DEBQ-Ext = external eating; DEBQ-R = restraint; EDDS = Eating Disorders Diagnostic Scale total symptom score; EWS = experienced weight stigma; Q1–Q11 = items on the WBIS; WBIS = Weight Bias Internalization Scale. Dieting coded: 1 = weight-loss dieting, 2 = watching so as not to gain weight, 3 = not dieting. ns = not significant at $p < .05$ level.

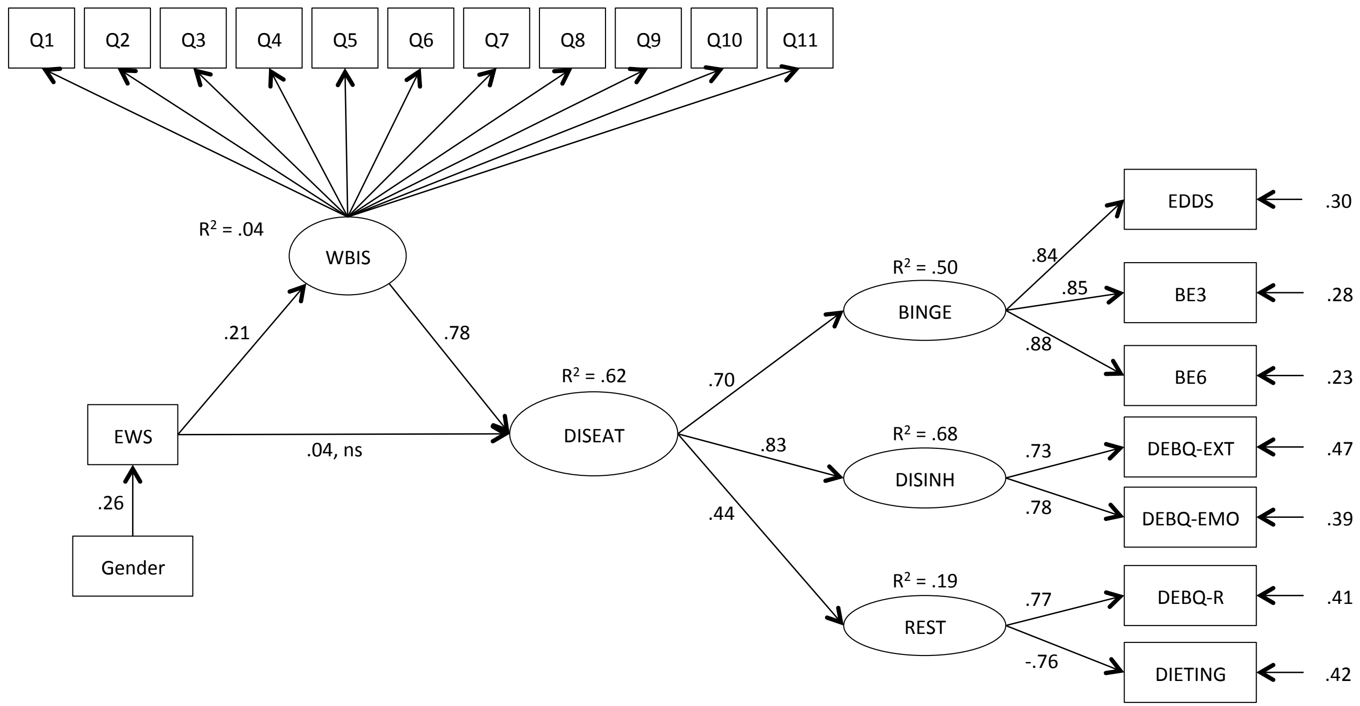

Figure 3.5. Simple mediation model predicting disordered eating with unidimensional internalised weight stigma factor based on loadings of WBIS items only acting as mediator. Standardised coefficients displayed. For the sake of simplicity, observed item scores loading onto the POS, IWS, BI, and SE factors in the bifactor model are displayed as a single manifest variable; however, individual scale items were used as predictors in the analysis. Latent variables: BI = body image; BINGE = binge eating behaviour; DISEAT = disordered eating; DISINH = disinhibition; IWS = internalised weight stigma; POS = positive self-judgment; REST = dietary restraint; SE = self-esteem. Manifest variables: BE3/BE6 = binge eating frequency in previous 3/6 months; DEBQ-Emo = emotional eating; DEBQ-Ext = external eating; DEBQ-R = restraint; EDDS = Eating Disorders Diagnostic Scale total symptom score; EWS = experienced weight stigma; Q1–Q11 = items on the WBIS; WBIS = Weight Bias Internalization Scale. Dieting coded: 1 = weight-loss dieting, 2 = watching so as not to gain weight, 3 = not dieting. ns = not significant at $p < .05$ level.

Table 3.7. *Indirect Effects of Experienced Weight Stigma on Disordered Eating via Bifactor and Unidimensional Internalised Weight Stigma Factors*

Pathway	Coefficient	*SE*	95% CI	*p*
Bifactor internalised weight stigma				
Total effect	.17	.07	[.04, .32]	.02
Direct effect	.07	.09	[-.08, .26]	.45
Indirect effect	.10	.05	[-.02, .20]	.06
Unidimensional WBIS				
Total effect	.20	.08	[.05, .34]	.01
Direct effect	.04	.07	[-.10, .16]	.57
Indirect effect	.16	.04	[.08, .25]	.00

Note. Standardised coefficients shown. 95% confidence intervals based on 1000 bootstrapped samples. EWS = experienced weight stigma; WBIS = Weight Bias Internalization Scale.

3.4. Discussion

This is one of the first weight stigma studies to recruit a non-treatment-seeking, higher-weight sample, from a large number of countries. The sample displayed good diversity across the higher-weight BMI range, and efforts to recruit individuals with a range of weight-related attitudes and beliefs appear to have been successful. Consistent with findings from previous studies (Carr & Friedman, 2005; Hatzenbuehler et al., 2009; Lewis et al., 2011), experiences with weight-related stigma were almost universal, and women experienced more weight stigma then men in all domains of daily life. Experiencing weight stigma in domains involving interpersonal interactions was more likely to be associated with higher internalised weight stigma than events occurring at the structural or institutional level, consistent with previous findings (Durso, Latner, & Hayashi, 2012). Similarly, interpersonal but not other forms of stigma were associated with reduced self-esteem.

Interestingly, experienced weight stigma was more prevalent in regions where participants had higher mean BMI, but internalised weight stigma tended to be lower in those regions. One possible explanation for this could be the presence of a norming effect, whereby higher-weight bodies are less obviously deviant from regional norms, and this non-deviance may result in lower weight-related self-devaluation. Some evidence for this contention can be found in countries where fat was traditionally idealised. For example, analysis of 226 Samoan men and women living in Samoa or New Zealand in the mid-1990s found that traditional fat-positive values were no longer prevalent and thin bodies were deemed more healthy, attractive and desirable (Brewis, McGarvey, Jones, & Swinburn, 1998). And yet, despite very high levels of "overweight and obesity" (55–85% across samples, by ethnic-appropriate BMI cut-offs), heavier individuals did not devalue themselves any more than non-heavy individuals, were equally likely to have positive views of their own bodies and no increase in drive for weight change compared with "normal weight" participants. Similarly, across two studies in the US, although the relationship between weight stigma concerns, i.e., fear of mistreatment by others due to weight, increased with increasing BMI, this effect was attenuated in counties with higher mean BMI (Cornick, Teter, & Thaw, 2016). And in a large international study of over 18,000 university students across 22 countries, perceptions of "overweight" status increased at the same rate across countries with changes in local BMI deciles (Wardle, Haase, & Steptoe, 2006). That is, local comparisons, rather than objective BMI, appeared to drive self-perception. Nevertheless, in the present study, higher mean BMI within regions was associated with more experiences of stigma from others, suggesting that local norms are not apparently driving others' perception of higher-weight individuals. It should be noted that these BMI statistics are not necessarily typical of the region as a whole but only represent the participants in the present study. It is theoretically possible that recruitment bias may have influenced these results; however, advertisements for the present study did not mention weight stigma, and were deliberately vague about the topic of study. Combined with the variety of outlets through which participants were recruited, this would argue against a likely effect of recruitment bias on these results. Another possibility is that significant effects for the influence of demographic variables were chance findings due to multiple testing. However, where gender differences were present, specifically, higher rates of experienced weight stigma, emotional eating, and weight loss dieting in women than in men, these findings were consistent with the wider literature on these constructs. In the case of significant socioeconomic and geographical differences, although omnibus tests were used throughout, it would be unwise to draw firm conclusions without replications of these findings in other samples.

One interesting finding of the present study was the absence of any geographic or gender effects on the relationship between weight stigma and eating behaviour, indicating a relatively universal response to weight stigma. Conceptually, this seems unlikely. Notable cultural differences have been observed in body image, forms of eating pathology, and their interaction (Dolan, 1991; Musaiger et al., 2013; see also Chapter 4). However, although the present study included participants from 16 different countries, the majority were nevertheless English-speaking Western-style societies, and may have been unsuitable for highlighting true cultural differences. A more worrying possibility is that expressions of prejudice toward higher-weight individuals, once the purview of traditionally American or Western European countries, and less pronounced in more collectivist cultures (Brewis et al., 1998; Crandall et al., 2001), have now become so globally entrenched that it is becoming more difficult to detect any regional differences, even in countries where fat was once idealised and valued (Aryeetey, 2016; Brewis, Wutich, Falletta-Cowden, & Rodriguez-Soto, 2011; Hackman, Maupin, & Brewis, 2016). Nevertheless, the mechanisms via which these attitudes translate to health behaviours may still vary (Sheffield et al., 2005; Tareen, Hodes, & Rangel, 2005), and more in depth cross-cultural research is needed to answer these questions.

The present findings also raise questions regarding the role of internalised weight stigma in mediating the relationship between experienced stigma and disordered eating behaviour. First, a bifactor model including the WBIS, RSE, and Appearance Evaluation scales was a good fit for the data, supporting the existence of an underlying general positive self-judgment component. Given the extremely high correlations between these scales, this was unsurprising. However, the very low construct-specific reliability for the WBIS and Appearance Evaluation scales does raise the question of how much additional information they are providing. Attempts to test this by assessing them simultaneously as mediators of the relationship between experienced weight stigma and disordered eating behaviour confirmed that they cannot be reliably separated.

Numerous studies in educational, health, and personality research have successfully identified differential direct and indirect pathways via construct-specific and general factors based on bifactor analyses (e.g., Chen et al., 2006; Király et al., 2015; Lac & Donaldson, 2017; Lauriola & Iani, 2016). Thus, it is not solely the fact that these constructs are conceptually related that is causing the statistical issue in the present analysis – rather it is the lack of differentiation between them, at least in higher-weight individuals who reside in fat-hostile environments where the overlap is likely to be considerable.

Secondly, controlling for the indirect pathways between experienced weight stigma and eating behaviour via body image, global self-esteem, and positive self-judgment, the construct-specific internalised weight stigma factor was no longer a significant mediator of the relationship. This finding was confirmed by simple mediation analyses in which a model containing a unidimensional WBIS mediator was a better fit to the data than one with a construct-specific internalised weight stigma mediator with shared variance partialled out. Thus, across the parallel and simple mediation models, these findings suggest that a distilled internalised weight stigma construct is not the *true* mediator of the relationship between experienced weight stigma and disordered eating. Rather, studies indicating that internalised weight stigma significantly mediates this relationship are measuring a construct that is partially confounded by the related constructs of body image, global self-esteem, and general (lack of) positive attitudes toward the self.

The question arises, "Does it matter?" Given that the items of the WBIS that remained significant predictors of the construct-specific internalised weight stigma factor once common variance had been partitioned out were, in some ways, more distinctively related to the theorised meaning of the construct than was the case for the other residualised construct-specific factors, its reduced ability to predict such a key behavioural outcome raises questions about its utility in future research. Yet, the WBIS has good internal validity (Durso & Latner, 2008), has been shown to be linked with several key outcomes of interest (Carels et al., 2010; Durso, Latner, & Hayashi, 2012; Hilbert, Braehler, Haeuser, & Zenger, 2014; J. B. Webb & Hardin, 2016), and provides a potentially useful target for interventions aimed at improving wellbeing and quality of life in higher-weight individuals (Mensinger & Meadows, 2017; Pearl, Hopkins, Berkowitz, & Wadden, 2016). Even in the present analysis, the construct-specific internalised weight stigma factor was significantly predicted by experienced weight stigma, and demonstrated a statistically significant positive relationship with disordered eating, even when controlling for body image, global self-esteem, and general positive self-judgment. In contrast, experienced weight stigma did not predict the general positive self-judgment, which may be considered to represent a more trait-like construct.

A recently published review of the psychometric properties of weight stigma measures accorded the WBIS positive scores on theoretical clarity and content validity (Lacroix, Alberga, Russell-Mayhew, McLaren, & von Ranson, 2017). Based on the present findings, this rating appears to be overly positive. The 11-item scale was distilled from an original pool of 19 questions, covering a rather wide range of cognitive and affective responses to one's own weight status. The extent to which these items specifically related to the proposed definition of "self-devaluation due to weight" is questionable, and items were removed from the scale based on an *a priori* assumption of unidimensionality. It is therefore interesting to note that the resulting scale appears to consist of numerous different concepts, including concern about others' attitudes, body image, and desire for weight change – which could arguably be categorised as body image, or as a pragmatic response to a pervasively anti-fat environment, even in the absence of self-devaluation (see also Chapter 5), that appear to have little to do with self-devaluation *per se*. This analysis highlights that internal reliability of a construct (e.g., Cronbach's α), which tends to be high for the WBIS, may be misleading in terms of construct unidimensionality – items that are highly interrelated are not necessarily all measuring the same thing (for a review, see McNeish, 2017). Indeed, bifactor analysis in the present study revealed a pattern in the nature of items that remained relatively strongly related to the internalised weight stigma factor after partialling out common variance with global self-esteem and body image. Excluding reverse-scored items, the items with satisfactory loadings onto the construct-specific factor were those relating to self-devaluation, psychological distress, and fear of others' attitudes. This appears to be more similar to the conceptualisation of weight self-stigma used in the development of the Weight Self-Stigma Questionnaire, which distinguishes between self-stigma and fear of being stigmatised by others. Interestingly, a validation study of a Spanish version of the WBIS in 59 higher-weight, mostly treatment-seeking individuals, identified a two-factor structure (Gomez & Baile, 2015). The first factor explained 51% of the variance in WBIS scores in this sample, and included all of the items classified in the present study as describing self-devaluation, two mixed-concept items, and the item described herein as "fat identity" (see Table 3.6). The second factor explained a further 14% of the variance and included items about desire for change, fear of others' attitudes, body image, and one item relating to distress. Thus, despite its widespread use in current weight stigma research, the 11-item version of the WBIS appears to lack theoretical clarity.

The present study has a number of limitations. First, despite efforts to recruit a demographically diverse sample, participants in the study were nevertheless predominantly female, White, and based in either the UK or North America, and this study was likely underpowered to uncover any intersectional effects of weight stigma had they been present. Future studies are more likely to be successful in this respect if they involve an international and multicultural team of research collaborators, who can also provide different perspectives and local input in study design and interpretation. Additionally, the data in the present study were cross-sectional, precluding any conclusions regarding causality, and relied on self-report measures, which may be open to self-serving bias or demand characteristics.

Finally, bifactor analysis provided a useful technique for addressing a vexing issue with conceptually overlapping variables. However, it is not without its critics. In particular, some have questioned the utility of trying to interpret residualised construct-specific factors when there is a strong underlying general factor explaining the majority of the variance (Chen et al., 2012). While this certainly raises practical difficulties for the researcher, it does not present a reason to avoid the technique – rather it highlights the need for better construct clarity and specificity, and ought to be used more often during the early stages of measure development.

In conclusion, internalised weight stigma does mediate the relationship between experienced weight stigma and maladaptive eating behaviours. However, much of the indirect effect between experienced stigma and eating behaviour is transmitted via a more general underlying positive self-judgment factor, rather than via conceptually distinct constructs of internalised weight stigma, body image, and self-esteem. Greater conceptual clarity in the study of internalised weight stigma is needed to fully understand the true mechanisms via which societal weight stigma impacts on individuals' self-directed judgments, how this impacts on downstream health-related behaviours, and how best to address the problem clinically or at the societal level.

CHAPTER 4. Studies 3 and 4: Weight stigma as a predictor of "food addiction"

The following two studies have been published in the journal Appetite. Due to space limitations in the present thesis, only analyses pertaining specifically to weight stigma, some of which were not included in the original publication, are reported here. The original paper is included in Appendix F.

4.1. Introduction

The concept of "food addiction" has attracted great interest within the scientific community, particularly in terms of implications for public policy on obesity prevention and management (Gearhardt, Grilo, DiLeone, Brownell, & Potenza, 2011). The Yale Food Addiction Scale (YFAS) was developed to identify individuals exhibiting addictive-like behaviours with respect to foods, and is based on the DSM-IV-TR[21] criteria for diagnosis of substance dependence (Gearhardt, Corbin, & Brownell, 2009). These criteria identify seven potential symptoms of addiction syndromes, namely: taking the substance in larger amounts or over a longer period than intended; persistent desire or unsuccessful attempts to reduce or stop use; continued use of the substance despite negative consequences; excessive time or money spent obtaining the substance; important social, occupational, or leisure activities reduced because

[21] Diagnostic and Statistical Manual of the American Psychiatric Association, 4th edition, Text Revision.

of use of the substance; withdrawal symptoms when the substance is discontinued; and requiring larger amounts of the substance to achieve the same effects, i.e., tolerance. Endorsement of three or more of these criteria in the previous year, along with clinically significant distress or impairment, is required to receive a positive "diagnosis" (YFAS+). Based on these criteria, the prevalence of "food addiction" in student and non-clinical populations is generally between approximately 5% and 15%,[22] although significantly higher rates have been observed in "obese" or eating disorder samples (for a review, see Pursey, Stanwell, Gearhardt, Collins, & Burrows, 2014).

Several of the symptoms associated with a YFAS+ diagnosis overlap with symptoms of binge eating disorder (BED), in particular, cravings and eating larger amounts of food than intended, leading to phenotypic similarity that have raised the question of whether the construct of "food addiction" provides additionally clinically utility beyond assessment for BED (Ziauddeen & Fletcher, 2013). Indeed, the two conditions share a number of neurological and behavioural characteristics, including reward dysfunction, high impulsivity, and emotional dysregulation (for a review, see Schulte, Grilo, & Gearhardt, 2016). Disordered eating cognitions, such as weight and shape concerns and dietary restraint are also similar in those with either or both condition (Ivezaj, White, & Grilo, 2016). However, difference also exist. For example, symptoms such as

[22] One study in a student sample reported much higher rates of YFAS+ diagnoses (24%; Murphy, Stojek, & MacKillop, 2014).

withdrawal and tolerance are unique to addictive-like conditions may not be experienced in BED, although research is lacking in this area (Schulte et al., 2015). Also, addiction-like eating tends to be triggered by the presence, or desire for, particular problem foods, especially highly processed, high-fat, high-sugar products (Schulte, Avena, & Gearhardt, 2015), whereas BED is characterised more by uncontrollable urges to eat in general. Additionally, not all individuals receiving a positive diagnosis of BED or "food addiction" also meet the criteria for the other condition. Studies conducted in non-treatment-seeking samples suggest that only one-quarter of individuals who are YFAS+ also meet the criteria for BED (Gearhardt, Boswell, & White, 2014; Ivezaj et al, 2016). In contrast, approximately 40–50% of those with BED meet the criteria for YFAS+ in both community (Gearhardt et al., 2014; Ivezaj et al., 2016) and treatment-seeking samples (Gearhardt et al., 2012; Gearhardt, White, Masheb, & Grilo, 2013). Comorbid YFAS+ and BED status is associated with higher depressive symptoms, greater emotional dysregulation, more reward-driven and externally cued eating, and more severe binge eating than BED or "food addiction" alone (Davis, 2013; Gearhardt et al., 2012, 2013; Ivezaj et al., 2016).

Positive diagnosis on the YFAS has been linked to a range of other problem eating behaviors as well as binge eating, including emotional eating (Gearhardt et al., 2009), impaired self-control around food (Burmeister et al., 2013), night eating syndrome (Koball, Clark, et al., 2016; Nolan & Geliebter, 2016), elevated food cravings (Meule, Hermann, & Kübler, 2015), and eating disorder psychopathology (Davis et al., 2011) in both community and clinical samples, with similar findings reported when using the continuous symptom score, i.e., the number of symptoms endorsed. Scores on the YFAS have also been associated with depression (Eichen, Lent, Goldbacher, & Foster, 2013), anxiety (Koball, Clark, et al., 2016), attentional deficit hyperactivity disorder (Davis et al., 2011), weight and shape concern (Burmeister et al., 2013), and reduced quality of life (Brunault et al., 2016). However, the existence of "food addiction" remains highly contentious among the scientific community, with some authors questioning whether the mechanisms underlying "food addiction" are equivalent to those seen in more traditional substance use disorders (Long, Blundell, & Finlayson, 2015; Ziauddeen, Farooqi, & Fletcher, 2012).

In contrast, the concept of "food addiction" is widely accepted within the lay population. For example, a study in a nationally representative US sample (N = 1,009), found that over 70% considered "food addiction" an important contributor to "weight problems" (Barry, Brescoll, Brownell, & Schlesinger, 2009), and in a series of studies in students and staff of a UK university, only six of 364 recruited participants did not believe in the existence of "food addiction" (Ruddock et al., 2016; Ruddock, Dickson, Field, & Hardman, 2015).

4.2. Lay conceptualisation of "food addiction"

Few studies have explored what the concept of "food addiction" means to those who self-diagnose as such and to the lay population in general. Hetherington and MacDiarmid (1993) reported that self-confessed "chocolate addicts" scored highly on items that would map onto DSM-IV criteria for substance dependence. However, when asked what made them feel they were addicted to chocolate, 76% responded that it was their inability to control consumption. No other criteria were widely endorsed. More recently, an online qualitative study reported that understanding of "food addiction" was similar in those who did and did not consider themselves to be addicted to food, with the most frequently mentioned characteristics being reward-driven eating, preoccupation with food, and a perceived lack of self-control around food (Ruddock et al., 2015). This result suggests that lay understanding of the term "food addiction" may be driven predominantly by perceptions of control around food, or eating self-efficacy. However, other characteristics emerging from qualitative studies include non-physiological eating, e.g., in the absence of hunger, frequent and uncontrollable food cravings, usually for specific, energy-dense foods, eating despite negative health consequences, and devoting time and effort to obtain the craved food (Malika, Hayman, Miller, Lee, & Lumeng, 2015; Ruddock et al., 2015), which are similar to the conceptualisation of substance use disorders used in clinical diagnosis, particularly since the addition of "cravings" to the diagnostic criteria in the DSM-5 (American Psychiatric Association, 2013).

4.3. Chronic dieting as a possible predictor of self-perceived "food addiction"

Lowe (1993) theorised that repeated cycles of weight loss and rebound can causally produce a pattern of dysregulated eating that is attributable to abnormal hunger and satiety responses, such that, the natural physiological feedback mechanism that controls "normal" eating is suppressed in chronic dieters. Chronic dieters become acculturated to the presence of hunger signals during the dieting phase of weight loss, but then experience a damping of the satiety response during the physiological and psychological rebound phase that usually follows a dieting attempt. With suppression of normal physiological hunger and satiety signals, susceptibility to alternative internal (e.g., affective) and external triggers increases (Lowe, 1993). Thus, chronic dieters with a mental schema of what is considered "normative" eating, may well label their own over-responsiveness to non-hunger cues as an inability to control themselves, leading to low eating self-efficacy.

How individuals frame an apparent lack of control around food is likely influenced by current societal norms around eating behaviour. As recent health promotion efforts have tended to focus on individual behaviour change, there has been a rise in "healthism" and an emphasis on individuals' moral obligation to conduct themselves for the ultimate good of society (Crawford, 1980; Townend, 2009). Thus, self-classifying as "addicted" to food may be a way in which individuals can explain, to themselves and others, their "failure" to control their intake, whilst also attributing the problem to a biological mechanism rather than a personal weakness (Rogers & Smit, 2000).

If self-perceived "food addiction" (SPFA) is indeed simply an attribution response to dysregulated eating in chronic dieters, then it is likely to be comparatively prevalent in the general population, and to be characterised by cognitions and behaviours associated with chronic dieting that distinguish it from the experience of individuals who do not self-classify as "food addicted." It is worth noting that the hypothesised chronic-dieting model of SPFA does not preclude a similar process occurring in individuals who receive a positive diagnosis on the YFAS. It is likely that people who manifest addictive-like eating cognitions and behaviours will have undergone multiple attempts to restrict the food that they consider to be problematic – indeed, "repeated unsuccessful attempts to quit" is one of the seven symptoms included in the diagnostic criteria for substance dependence. It was predicted that the difference between YFAS+ and SPFA+ is primarily one of degree, and of clinically relevant levels of psychological and behavioural correlates that attach to the more severe YFAS+ status.

4.4. The role of internalised weight stigma

Internalised weight stigma is emerging as an important predictor of disordered eating behaviour, although it remains under-explored in the context of "food addiction," particularly in non-clinical populations. A US study in 57 participants seeking behavioural weight-loss treatment linked internalised weight stigma with higher YFAS symptom scores (Burmeister et al., 2013). A German study involving 240 pre-bariatric patients replicated this finding, and demonstrated that the effect that was partially mediated via greater emotional dysregulation (Baldofski et al., 2016).

Evidence for the link between internalised weight stigma and other forms of problematic eating behaviour is more extensive. A number of studies have demonstrated that internalised weight stigma is associated with drive for thinness (Durso & Latner, 2008; Lippa & Sanderson, 2013) and weight concerns (Sienko, Saules, & Carr, 2016) in self-classified "overweight" community and student samples, and in “obese” treatment-seeking adults and adolescents (Almenara et al., 2017; Durso, Latner, White, et al., 2012; Roberto et al., 2012). Findings regarding the relationship between internalised weight stigma and dietary restraint have been more mixed, with some studies finding significant relationships (Almenara et al., 2017; Schvey, Roberto, & White, 2013; Sienko et al., 2016), whereas others have failed to do so (Lillis et al., 2010; Roberto et al., 2012). However, these studies have all used measures of current or recent dietary restraint, rather than instruments assessing chronicity. To date, no studies have explored the relationship between internalised weight stigma and chronic dieting behaviour.

Finally, it is not yet known whether individuals who present with elevated YFAS symptom count but who do not endorse the items relating to clinically significant distress are at an “intermediate” stage that might subsequently progress to a YFAS+ diagnosis. Little attention has yet been paid to the developmental progression of clinically significant “food addiction.” However, Ziauddeen & Fletcher (2013) have proposed the existence of a “food abuse syndrome,” representing a potential early stage in the natural history of “food addiction.” If SPFA represents such an intermediate stage on the developmental pathway, individuals who self-classify as “food addicted” may be at increased risk of developing clinically significant distress or impairment, thus qualifying for a YFAS+ diagnosis, and its associated psychopathology, and it is possible that internalised weight stigma plays a role in predicting this deterioration.

To my knowledge, only two studies have so far tracked both internalised weight stigma and maladaptive eating behaviour over time (Carels et al., 2010; Schulte, 2016). In a pre-post design, 14-week behavioural weight-loss intervention, baseline internalised weight stigma was strongly correlated with binge eating; however changes in internalised weight stigma between baseline and the end of the intervention were not significantly associated with improvements in binge eating (Carels et al., 2010). The other study assessed weight- and body-related shame and guilt, binge eating, emotional eating, stress, depressive symptoms, and obsessive-compulsiveness in 254 predominantly "normal-weight" male and female Emirati undergraduate students at three time points over the course of an academic semester. One month after baseline, only current emotional eating and baseline binge eating predicted current binge eating, controlling for BMI. At the end of the semester (three months after baseline), emotional eating and weight- and body-related shame and guilt independently predicted higher binge eating scores, and stress predicted lower scores. However, the predictors were mean scores taken over the three time points rather than baseline measures only. Thus, little is known about the utility of internalised weight stigma as a predictor of later eating pathology.

Nevertheless, in a systematic review of studies of internalised mental health stigma, findings from longitudinal studies suggested that baseline levels of self-stigma were negatively associated with both affective (e.g., self-esteem, depressive symptom severity, emotional discomfort) and behavioural (e.g., service utilisation, medication adherence) outcomes at follow-up (Livingston &

Boyd, 2010). Given the link between internalised weight stigma and maladaptive coping strategies (Lillis et al., 2010; Schvey et al., 2016), it seems likely that weight-related self-stigma would be associated with, at the very least, maintenance, and possibly progression, of problematic eating behaviours and attitudes.

4.5. Study 3: Longitudinal study of weight stigma and "food addiction" in a student population

In the present study, the first aim was to determine whether SPFA+ individuals could be identified by a level of the cognitions and behaviors generally associated with problem eating that distinguished them from both "clinical food addiction" (YFAS+) and from individuals who did not self-classify as "food addicts" (non-food addicts, NFA). Note, SPFA+ status was assigned to individuals who self-classified as "food addicts", but who did not meet the criteria for a YFAS+ diagnosis. It was hypothesised that degree of internalised weight stigma, chronic dieting, and overweight preoccupation would be distinguishing factors among the three groups; however, an additional prediction was made that the major discriminating factor between SPFA+ and NFA participants would be perceived self-control around food, whereas clinically significant eating pathology would be the main discriminating factor between YFAS+ and SPFA+ participants, being present in the former but not the latter.

Second, a serial mediation model was proposed, in which weight-related self-devaluation would be linked with chronic dieting behaviour, which would in turn predict reduced eating self-efficacy, and this would then be associated with addictive-like behaviours and cognitions around food. Additionally, fear of weight stigma from others was included as a predictor of self-devaluation (see Figure 4.1). While little is known about the pathways via which internalised weight stigma develops, the decision to include fear of stigma as a proximal predictor in the model was informed by findings from the wider stigma literature suggesting that anticipation of stigma is a significant predictor of internalised stigma (Hing & Russell, 2017; Link et al., 2015; D. M. Quinn, Williams, & Weisz, 2015). However, it is also possible that self-devaluation drives fear of being stigmatised by others. Thus, an alternative model was tested in which the order of these variables was reversed.

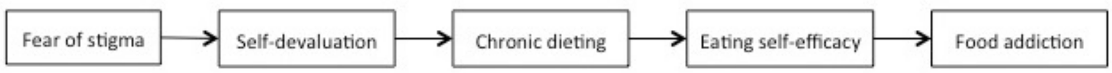

Figure 4.1. Proposed serial mediation model between weight stigma and food addiction

Finally, analyses were conducted to determine whether weight-related self-devaluation and fear of stigma from others at the start of the study would be predictive of worsening "food addiction" at follow-up. It was hypothesised that both would contribute to an ongoing pattern of problematic body image and eating cognitions and behaviours that would contribute to worsening "food addiction" over time.

4.6. Study 3 Methods

4.6.1. Sample

Baseline data were collected from 658 psychology students at the University of Birmingham, who participated in an online study entitled "Easy online eating survey" for course credit between January 2013 and November 2014.
The majority of the sample identified as female and White, and had a BMI in the "normal weight" range (see Table 4.1). A subset of participants was invited to participate in a follow-up study between October 2013 and December 2014.

Due to the nature of the university's research participation scheme, which is a course requisite for only 1st and 2nd year undergraduates, and the timing of survey availability, only 308 students who completed baseline measures were able to participate in the follow-up study, and all did so. Three students filled out the follow-up questionnaire less than seven days after completing the baseline questionnaire and their data were excluded from the analyses, giving a final follow-up sample of 305. Length of follow-up ranged from 155 to 474 days (M = 280, SD = 30 days), and did not differ by food addiction status, Kruskall-Wallis $H(2) = 4.03$, $p = .13$. The study was approved by the University of Birmingham Ethical Review Committee, and informed consent was obtained from all participants.

Table 4.3. *Study 3 Sample Characteristics*

Variable	Baseline (*N* = 658)	Follow-up (*N* = 305)
Gender		
Female	90.0%	91.5%
Male	9.0%	8.5%
Missing/Declined	1.1%	–
Race/Ethnicity		
White	75.8%	80.0%
South Asian	5.6%	8.2%
Other ethnicities[a]	13.0%	10.8%
Declined/Missing	1.5%	1.0%
Age		
Mean (SD)	18.7 (1.3)	19.6 (1.5)
Range	17 – 36	18 – 39
Declined/missing	1.1%	1.0%
BMI		
Mean (SD)	22.0 (3.9)	21.9 (3.7)
Range	14.9 – 44.5	13.7 – 38.9
BMI < 18.5	10.2%	10.8%
18.5 – 24.9	55.6%	70.5%
25.0 – 29.9	9.9%	12.1%
≥ 30.0	2.7%	3.9%
Missing	21.6%	2.6%

[a]Baseline: 2.7% Asian–Chinese, 1.8% Asian–Other, 2.3% Black–African, 1.1% Black–Caribbean, 0.2% White/Black–African, 1.4% White/Black–Caribbean, 1.7% White/Asian, 0.9% Other–Mixed, 0.9% Other; Follow-up: 3.0% Asian–Chinese, 0.7% Asian–Other, 1.3% Black–African, 0.7% Black–Caribbean, 1.6% White/Asian, 1.3% White/Black–Caribbean, 1.6% Other mixed, 0.7% Other.

4.6.2. Measures

4.6.2.1. Food addiction

Participants were initially asked a simple yes/no question: "Do you feel that you are addicted to some foods?" Participants then completed the Yale Food Addiction Scale (YFAS), a 25-item self- report scale measuring addictive behaviours with respect to certain foods (Gearhardt, Corbin, & Brownell, 2009). The YFAS can produce a continuous symptom count score as well as a clinical diagnosis of food addiction. In line with the DSM-IV-TR scoring criteria for substance dependence, upon which the YFAS was based, participants must endorse a minimum of three of the seven symptoms plus experience clinically significant distress or impairment in order to receive a positive diagnosis. The YFAS has good to excellent internal reliability and good test-retest reliability, and convergent, discriminant, and predictive validity in student and community samples (Gearhardt et al., 2009; Lemeshow, Gearhardt, Genkinger, & Corbin, 2016; Meule, Vögele, & Kübler, 2012). Kuder-Richardson's α was .82 in this sample. Participants who received a positive "diagnosis" on the YFAS were classified as YFAS+, independent of their response to the question of self-perceived food addiction. Those who did not receive a YFAS+ "diagnosis" but who nevertheless considered themselves addicted to foods were classified SPFA+. The remainder, who were both YFAS- and SPFA-, were classified NFA.

4.6.2.2. Weight stigma

Internalised weight stigma was assessed using the 12-item Weight Self-Stigma Questionnaire (WSSQ; Lillis et al., 2010), which has two subscales: Self-devaluation, which assesses shame and self-blame with respect to body weight, and Fear of Anticipated Stigma, which assesses worries about being stigmatised by others because of weight. While it can be argued that fear of weight stigma is not equivalent to internalised weight stigma (Link et al., 2015; also see Chapter 1), this measure allows the relative impact of these two constructs to be evaluated. Although the subscales are highly correlated, evidence suggests differential influences on eating behavior and psychological wellbeing

(Almenara et al., 2017; Farhangi et al., 2017; Lillis et al., 2010). Items are scored on a five-point Likert scale from 1 (*completely disagree*) to 5 (*completely agree*). Sum scores are calculated with a possible range from 6 to 30 for each subscale. Higher scores are indicative of increased self-stigma. The WSSQ has been validated in clinical and non-clinical, male and female, higher-weight samples (Lillis et al., 2010). The scale had good internal reliability in the present sample: Cronbach's αs for Self-devaluation and Fear of Enacted Stigma subscales were .93 and .85, respectively.[23]

4.6.2.3. Eating behaviour

Chronic dieting was assessed using the 10-item Restraint Scale (RS; Herman & Polivy, 1980). The scale is made up of two subscales: Concern for Dieting and Weight Fluctuation. The scale captures a history of chronic dieting, and does not necessarily represent current calorie restriction (Lowe, 1993). Item scoring varies but items are summed to create a total scale score, with a possible range of 0–35. Higher scores are indicative of more restrained eating. The scale has adequate internal consistency and excellent test-retest reliability in higher-weight and normative-weight student and non-clinical samples, and is

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[23] As some of the items on this scale are mainly applicable to participants who believe they have a weight problem, this section did not initially have a forced response requirement. However, an interim quality check after the first week of data collection identified a large amount of missing data on this instrument. Of the 157 participants completing the survey in the first week, 132 (84%) did not complete this measure. Given the prevalence of weight dissatisfaction even among lean individuals, it appeared that many students were skipping these questions simply because they could, and a decision was made to make this section non-optional. Individuals who did not consider themselves to have a weight problem could simply disagree with the relevant statements. See Section 4.3.3 for details of missing data handling.

structurally equivalent across gender and racially diverse samples (reviewed in Lowe & Thomas, 2009). Cronbach's α was .84 in the present sample.

Current dieting status was assessed with a single item asking participants to self-designate as either currently dieting to lose weight, currently dieting or watching food intake so as not to gain weight, or not currently dieting (Massey & Hill, 2012).

Perceived self-control over eating was assessed using the Eating Self-Efficacy Scale (ESES; Glynn & Ruderman, 1986). The ESES is a 25-item measure that assesses perceived ability to control eating under a range of situational and emotional conditions. Responses are graded on a 7-point Likert scale ranging from 1 (*no difficulty controlling eating*) to 7 (*most difficulty controlling eating*), and items are averaged to provide a total scale score. Higher scores represent more perceived difficulty in controlling eating, and are therefore indicative of reduced eating self-efficacy. The scale has high internal and adequate test-retest reliability, as well as good convergent validity in both male and female student samples and in weight-diverse community samples; the scale structure is consistent across genders (Glynn & Ruderman, 1986; Ruiz, Berrocal, López, & Rivas, 2003). The ESES has previously been shown to correlate with YFAS symptom count (Burmeister et al., 2013). Cronbach's α was .91 in the present sample.

Finally, general eating pathology was assessed with the Eating Attitudes Test (EAT-26; Garner, Olmsted, Bohr, & Garfinkle, 1982), a widely used 26-item measure assessing the extent of symptoms and concerns characteristic of eating disorders. Possible scores can range from 0 to 78, with higher scores indicative of more disordered eating, and scores of 20 or greater suggesting increased risk of clinical eating disorders (reviewed in Anderson, De Young, & Walker, 2009). The EAT-26 has been extensively validated in female clinical and non-clinical samples. Additionally, the scale has good convergent validity with related constructs in male samples and good discriminant validity in male eating disordered samples (Anderson et al., 2009; Garfinkel & Newman, 2001). Scores on the EAT-26 are highly correlated with both a YFAS+ diagnosis and YFAS symptom count in male and female student samples (Gearhardt et al., 2009; Sanlier, Varli, Macit, Mortis, & Tatar, 2017). Cronbach's α was .89 in the present sample.

4.6.2.4. Overweight preoccupation

Concern with weight was assessed using the Overweight Preoccupation subscale of the MBSRQ (Brown et al., 1990; Cash, 2000). The subscale includes four items, e.g., "I constantly worry about being or becoming fat." Items are scored 1 (*definitely disagree*) to 5 (*definitely agree*) and mean scores calculated. Higher scores indicate a greater degree of preoccupation with weight. The subscale has acceptable internal reliability in both male and female samples, and good/adequate test-retest reliability in males/females, respectively (Cash, 2000). Cronbach's. α was .83 in the present sample.

4.6.2.5. Demographics and anthropometrics

Participants were asked to provide age, gender, and ethnicity, and to report height and weight, which were used to calculate BMI. The option to decline to answer any of these questions was provided.[24]

Measures collected at follow-up were the same as at baseline. All questionnaire measures were forced response. All scales had good internal reliability, with Cronbach's αs ranging from .76 to .97.

4.6.3. Handling of missing values

In order to determine the impact of missing data for weight self-stigma and BMI, the relationship between these measures and key study outcome variables was explored for the participants completing the baseline study before and after these questions became mandatory. There were no differences in proportion of respondents classified in each food addiction category between the two groups. Additionally, there were no statistically significant differences in continuous study variables between the two groups. Missing values analysis confirmed that the data were missing completely at random, Little's MCAR test $\chi^2(57) = 28.2$, $p = 1.0$. Thus, missing data on these variables were imputed using the expectation maximisation (EM) method (see Chapter 3). Missing values on

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[24] As with the WSSQ, 84% of the first 157 participants chose not to provide height and/or weight information, hence, their BMI could not be calculated. Thus, these two items were made non-optional at the same times as the WSSQ. However, responses were entered into a text box, so students were able to type, "I don't know," or "I'd rather not answer," etc., if they so wished, and a small number did so. See Section 4.3.3 for handling of missing data.

demographic variables (gender and ethnicity) were not imputed and were deleted pair-wise; consequently, sample size varied slightly by analysis.

4.6.4. Data analysis

4.6.4.1. Preliminary analyses

All analyses were conducted using SPSS for Mac version 23 and statistical significance indicated by p values < .05, unless otherwise stated.

Gender differences were tested using independent t-tests and ethnicity differences using χ^2 tests. Given the small sample sizes for most of the non-White ethnic groups, ethnicity was dichotomised into White and Other Ethnicities for subsequent analyses, unless otherwise stated.

4.6.4.2. Predictors discriminating between "food addiction" categories

To explore the predictors hypothesised to differentiate between those who did and did not consider themselves "addicted" to food (SPFA+ and NFA) and between self-perceived and YFAS-diagnosed "food addicts" (SPFA+ and YFAS+), multinomial logistic regression was conducted, using SPFA+ as the reference group. Weight-related self-devaluation, fear of stigma, chronic dieting, overweight preoccupation, eating self-efficacy, and eating pathology were entered into the model as predictors.

4.6.4.3. Serial mediation model

To test the hypothesis that weight-related self-devaluation, chronic dieting, and eating self-efficacy serially mediated the relationship between fear of weight-related stigma and "food addiction," separate serial mediation analyses were conducted using path analysis, with YFAS symptom count, YFAS+ diagnosis, and SPFA+ status (that is, self-classifying as “food addicted” but *not* receiving a positive “diagnosis” on the YFAS) as the outcome variables. Significance of indirect effects were tested using bias-corrected bootstrap 95% confidence intervals, which were generated from 10,000 bootstrap samples. Bootstrap standard errors were also produced. For indirect pathways with statistically significant effects, standardised effects are also reported. Standardised indirect effects are expressed in terms of standard deviations of the proximal predictor and the outcome, and are thus insensitive to scale metrics. Thus, standardised indirect effects allow comparison of relative effect sizes between models.

For all outcomes, two alternative models were also tested. First, current dieting behaviour was tested as a mediator in place of chronic dieting behaviour. Secondly, weight-related self-devaluation was used as the proximal predictor of fear of weight-related stigma – that is, the order of these two constructs was reversed. All path analyses were conducted with MPlus 8 (Muthén & Muthén, 1998–2017).

4.6.4.4. Weight stigma as a predictor of change in “food addiction”

Cross-lagged path analysis was used to explore the longer-term effects of weight-related self-devaluation and fear of being stigmatised by others on “food addiction”. Separate models were used to test the effects on “food addiction” status, treated as a continuous variable, and YFAS symptom counts over time. Cross-lagged pathways from baseline “food addiction” variables to weight-stigma variables at follow-up were included in the models to determine whether a reciprocal relationship existed, whereby initial "food addiction" also led to worsening weight-stigma outcomes over time. All follow-up variables were also controlled for length of follow-up and changes in BMI between the two time points. Analyses were conducted in MPlus 8.

4.7. Study 3 Results

4.7.1. Preliminary analyses

As predicted, SPFA was more prevalent than "food addiction" based on YFAS criteria. Over half of the participants (342/658) considered themselves to be addicted to some foods. Of these, however, only 56 (16%; 8.5% of total sample) met the YFAS diagnostic criteria. Thus, 286 individuals (43.5%) believed themselves to be addicted to foods but did not receive a YFAS+ diagnosis and were designated SPFA+.[25] The remaining 316 participants (48.0%) were categorised as NFA.[26]

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[25] Thirteen of 56 individuals meeting the criteria for YFAS+ diagnosis did not consider themselves to be "addicted" to food. Independent *t*-tests and χ^2 tests indicated no significant differences between these two sub-types of YFAS+ participants on study outcomes, with the exception of one YFAS symptom and eating self-efficacy. Only 23.1% of YFAS+ participants who did not consider themselves "addicted" to food endorsed the symptom "Substance taken in larger amount and for longer period than intended," compared with 60.5% who self-classified as food addicted, $\chi^2(1) = 5.6$, $p = .03$, OR = 0.2. Additionally, those who did not self-classify as "addicted" had a mean ESES score of 3.5, compared with 4.3 for those who also rated themselves as food addicts, $t(54) = 2.8$, $p = .01$, Cohen's $d = 0.76$. Subsequent analyses were conducted with and without this minor "subtype" of YFAS+, and no differences found.

[26] ANOVA indicated no differences in BMI between the three "food addiction" categories. However, the three groups were significantly different on all measures of weight stigma, eating behaviour, and body image, with YFAS+ participants expressing the most severe eating pathology, overweight preoccupation, and weight-related self-devaluation and fear of stigma, followed by SPFA+, and the NFA group expressing the least (Meadows, Nolan, & Higgs, 2017; see Appendix F).

Men and women did not differ on "food addiction" category prevalence, or on YFAS symptom count, dieting status, eating self-efficacy, or eating pathology (all $p > .05$); however, women scored significantly higher than men on the dietary restraint scale, weight-related self-devaluation and fear of weight stigma, and overweight preoccupation. Although YFAS+ classification did not differ by ethnicity, Whites were less likely to self-classify as "food addicted" than other ethnicities: 39.9% versus 55.7%, respectively; $\chi^2(2) = 12.8$, $p = .002$.[27] BMI did not differ between the three "food addiction" groups; however, it was significantly correlated with YFAS symptom count ($r = .15$, $p < .001$) and weight stigma variables. Thus, gender, ethnicity, and BMI were included as covariates in subsequent regression analyses.

4.7.2. Unique predictors of "food addiction" status

In order to identify whether SPFA+ could be distinguished from YFAS+ and NFA based on specific characteristics, multinomial logistic regression analysis was conducted with "food addiction" status as the outcome. In line with hypotheses, the following predictors were included in the regression model: weight-related self-devaluation and fear of stigma, chronic dieting, overweight preoccupation,

[27] This effect was largely driven by participants identifying as of South Asian ethnicity (i.e., Asian–Indian or Asian–Pakistani; $n = 64$; 64.1% SPFA+). Other ethnicities had prevalence rates between those identifying as White and South Asian. No differences in any other measure of eating behaviour, body image, weight stigma, or BMI were found between participants of South Asian and White ethnicity. Exploratory analyses were conducted using an alternative coding scheme with three groups: White, South Asian, and Other ethnicities. This did not alter findings; thus results are reported using dichotomous coding (1 = White; 0 = Other ethnicities) for simplicity.

eating self-efficacy, and eating pathology. Ethnicity, gender, and BMI were entered as covariates. Self-perceived "food addiction" was set as the reference category; thus, predictors were tested for their ability to discriminate between, first, SPFA+ and YFAS+, and second, SPFA+ and NFA.

The hypothesised model was a good fit for the data, $\chi^2(16) = 219.9$, $p < .001$, Nagelkerke $R^2 = .34$, and overall percentage of correct classification to food addiction groups was 63.2%. However, several of the hypothesised predictors did not significantly contribute to the model, and a number of reduced models were explored by sequential removal of predictors with non-significant likelihood ratio tests. Chronic dieting, overweight preoccupation, BMI, and gender did not contribute to discrimination between SPFA+ and either of the other two groups. Substituting current dieting status for chronic dieting did not change these findings. Deletion of these variables resulted in a more parsimonious model with no significant reduction in model fit, $\chi^2(10) = 208.9$, $p < .001$, Nagelkerke $R^2 = .33$, or predictive power.

The final model is displayed in Table 4.2. The model correctly classified 20.0% of YFAS+, 59.9% of SPFA+ and 73.0% of NFA participants, with overall accuracy of 62.8%. As predicted, eating pathology, as measured by the EAT-26, successfully distinguished between YFAS+ and SPFA+, but did not distinguish between SPFA+ and NFA. An increase of five points on the EAT-26 was associated with a 30% higher likelihood of being YFAS+ compared with SPFA+. Eating self-efficacy was a significant predictor for both outcomes, but had a bigger role in differentiating between SPFA+ and NFA: for every one-point increase in ESES score, an individual would be twice as likely to be SPFA+ as NFA. Higher weight-related self-devaluation increased the likelihood of being YFAS+ compared with SPFA+, whereas fear of being stigmatised by others was associated with an increased likelihood of being SPFA+ compared with NFA, in each case, a 50–60% increase with each five-point rise in the WSSQ subscales. Ethnicity distinguished between SPFA+ and NFA, with White participants nearly three times as likely to be NFA rather than SPFA+, but did not distinguish between YFAS+ and SPFA+ status.

Table 4.2. *Multinomial Logistic Regression Comparing Predictors of SPFA+ Versus YFAS+ and NFA in Student Sample*

				95% CI for OR		
Predictor	*B*	*SE*	OR	Lower	Upper	*p*
Intercept	-5.33	0.80				.00
EAT-26	0.06	0.01	1.06	1.03	1.09	.00
ESES	0.36	0.16	1.43	1.04	1.97	.03
WSSQ–Self	0.12	0.05	1.12	1.03	1.23	.01
WSSQ–Fear	-0.03	0.05	0.97	0.88	1.07	.55
Ethnicity	0.08	0.38	1.09	0.51	2.27	.83
Intercept	-3.10	0.35				.00
EAT-26	0.00	0.01	1.00	0.98	1.02	.87
ESES	0.70	0.10	2.00	1.67	2.44	.00
WSSQ–Self	-0.04	0.03	0.96	0.91	1.01	.15
WSSQ–Fear	0.10	0.04	1.10	1.03	1.18	.01
Ethnicity	-1.00	0.22	0.37	0.24	0.57	.00

Note. YFAS+ indicates positive diagnosis on Yale Food Addiction Scale; SPFA+ indicates self-perceived food addiction without positive diagnosis on the YFAS; NFA indicates no food addiction. EAT-26 = Eating Attitudes Test-26 (range 0–78); ESES = Eating Self-Efficacy Scale (range 1–7); WSSQ = Weight Self-Stigma Questionnaire; Self-Devaluation and Fear of Enacted Stigma subscales (both range 6–30). Ethnicity scored 1 = White, 0 = Other ethnicities.

4.7.3. Path analysis and serial mediation

In models containing measures of internalised weight stigma, chronic dieting, and eating self-efficacy, and controlling for gender, ethnicity, and BMI, fear of weight-related stigma was a significant independent predictor of self-classifying as "food addicted," but did not predict YFAS+ diagnosis or YFAS symptom count. In contrast, self-devaluation was a significant predictor of YFAS symptom count and a marginally significant predictor of YFAS+ status. Self-devaluation did not predict SPFA+ status (see Table 4.3).

4.7.3.1. Hypothesised serial mediation model

Serial mediation analyses provided some support for the hypothesised model, which was a statistically significant pathway for all three outcomes. However, in all cases, the full serial mediation pathway had the smallest effect size compared with less complex significant pathways. Eating self-efficacy appeared to be a more important mediator than did chronic dieting. None of the indirect pathways that omitted self-devaluation due to weight were statistically significant for any outcome (see Table 4.4).

4.7.3.2. Alternative models

The analyses were repeated with current dieting status in place of chronic dieting. Current dieting status was not a statistically significant predictor of any outcome, and no mediation pathway including current dieting status was statistically significant.

In the alternative model where self-devaluation was hypothesised to precede fear of stigma, different patterns emerged for YFAS-based outcomes and SPFA.

For YFAS symptom count and YFAS+ ‘diagnosis’, none of the indirect pathways that included ‘Self → Fear → Subsequent’ were statistically significant; however, those that excluded Fear were statistically significant, suggesting that fear of stigma exerted its downstream effects on YFAS-based outcomes only via the indirect effect of higher self-devaluation. The direct effects from self-devaluation to YFAS outcomes were statistically significant.[28]

In the case of SPFA+, pathways that included ‘Self → Fear → Chronic dieting/Eating self-efficacy → SPFA+ were again non-significant, but there was a statistically significant indirect path between self-devaluation and SPFA+ status with fear of weight stigma as the sole mediator (B = .04, SE = .01, 95% CI [.01, .06], p = .01; standardised β = .22). However, the direct effect of self-devaluation on SPFA+, controlling for fear of stigma and other mediators, was non-significant.

[28] See Appendix G for full output.

Table 4.3. *Unstandardised Regression Coefficients and Bootstrap Standard Errors for Hypothesised Serial Mediation Models*

	Antecedent															
	Fear of enacted stigma				Self-devaluation				Chronic dieting				Eating self-efficacy			
Consequent	*B*	*SE*	95% CI	*p*	*B*	*SE*	95% CI	*p*	*B*	*SE*	95% CI	*p*	*B*	*SE*	95% CI	*p*
Self-devaluation	.94	.03	[.89, 1.00]	.00												
Chronic dieting	.07	.08	[-.09, .23]	.39	.56	.07	[.43, .68]	.00								
Eating self-efficacy	-.03	.02	[-.06, .00]	.07	.09	.01	[.07, .12]	.00	.04	.01	[.02, .06]	.00				
YFAS symptom count	.02	.02	[-.02, .05]	.42	.04	.02	[.00, .07]	.03	.04	.01	[.02, .06]	.00	.56	.05	[.46, .66]	.00
YFAS+	.01	.02	[-.04, .06]	.70	.05	.02	[.01, .09]	.03	.04	.02	[.01, .07]	.00	.18	.07	[.05, .32]	.01
SPFA+	.05	.02	[.01, .09]	.01	-.03	.02	[-.06, .01]	.17	.01	.01	[-.02, .03]	.67	.36	.05	[.27, .45]	.00

Note. All models include intercept, and control for gender, ethnicity, and BMI. SPFA+ pertains to participants who self-classified as "food addicted" but who did *not* receive a positive "diagnosis" on the YFAS, thus YFAS+ participants are excluded from this analysis. YFAS+ and SPFA+ both dummy coded 1, positive; 0, not positive. Fear of enacted stigma and Self-devaluation scored 6–30; Chronic dieting scored 0–35; Eating self-efficacy scored 1–7. R^2 for YFAS symptom count = .38, YFAS+ = .38, SPFA+ = .27

Table 4.4. *Regression Coefficients and Standard Errors for Serial Mediation Models Predicting "Food Addiction" in a Student Sample*

Pathway	*B*	*SE*	β	95% CI (*B*)	*p*
YFAS Symptom count					
Total effect	.12	.01	.38	[.10, .15]	.00
Direct effect	.02	.02	.05	[-.02, .05]	.42
Indirect effects					
Fear → Self → YFAS symptom count	.04	.02	.11	[.00, .07]	.03
Fear → Chronic dieting → YFAS symptom count	.00	.00	.01	[-.00, .01]	.39
Fear → Eating self-efficacy → YFAS symptom count	-.02	.01	-.05	[-.03, .00]	.08
Fear → Self → Chronic dieting → YFAS symptom count	.02	.01	.07	[.01, .04]	.00
Fear → Self → Eating self-efficacy → YFAS symptom count	.05	.01	.15	[.03, .07]	.00
Fear → Chronic dieting → Eating self-efficacy → YFAS symptom count	.00	.00	.01	[-.00, .01]	.41
Fear → Self → Chronic dieting → Eating Self-Efficacy → YFAS symptom count	.01	.00	.04	[.01, .02]	.00
YFAS+					
Total effect	.09	.01	.46	[.07, .11]	.00
Direct effect	.01	.02	.05	[-.04, .06]	.70
Indirect effects					
Fear → Self → YFAS+	.21	.10	.21	[.00, .08]	.03
Fear → Chronic dieting → YFAS+	.02	.02	.02	[-.00, .01]	.41
Fear → Eating self-efficacy → YFAS+	-.02	.02	-.02	[-.01, .00]	.14
Fear → Self → Chronic dieting → YFAS+	.11	.04	.11	[.01, .04]	.01
Fear → Self → Eating self-efficacy → YFAS+	.08	.03	.08	[.00, .03]	.01
Fear → Chronic dieting → Eating self-efficacy → YFAS+	.00	.00	.00	[.00, .00]	.44
Fear → Self → Chronic dieting → Eating Self-Efficacy → YFAS+	.02	.01	.02	[.00, .01]	.03

Pathway	*B*	*SE*	β	95% CI (*B*)	*p*
SPFA+					
Total effect	.06	.01	.30	[.04, .08]	.00
Direct effect	.05	.02	.26	[.01, .09]	.01
Indirect effects					
Fear → Self → SPFA+	-.02	.02	-.12	[-.06, .01]	.17
Fear → Chronic dieting → SPFA+	.00	.00	.00	[-.00, .00]	.77
Fear → Eating self-efficacy → SPFA+	-.01	.01	-.05	[-.02, -.00]	.10
Fear → Self → Chronic dieting → SPFA+	.00	.01	.01	[-.01, .01]	.68
Fear → Self → Eating self-efficacy → SPFA+	.03	.01	.15	[.02, .04]	.00
Fear → Chronic dieting → Eating self-efficacy → SPFA+	.00	.00	.01	[-.00, .00]	.36
Fear → Self → Chronic dieting → Eating Self-Efficacy → SPFA+	.01	.00	.04	[.00, .01]	.00

Note. All models controlled for gender, ethnicity, and BMI. SPFA+ pertains to participants who self-classified as "food addicted" but who did *not* receive a positive "diagnosis" on the YFAS, thus YFAS+ participants are excluded from this analysis. Standard errors and 95% confidence intervals derived from 10,000 bootstrap sampled. *B* = unstandardised regression coefficient; β = standardised regression coefficient; Fear = fear of enacted weight stigma; Self = weight-related self-devaluation; SPFA = self-perceived food addiction; YFAS = Yale Food Addiction Scale.

4.7.4. Prediction of worsening "food addiction" over time

Thirty-five participants (11.5%) progressed to a "worse" "food addiction" category over the follow-up period. Findings from cross-lagged path analysis supported the idea that fear of being stigmatised by others due to weight, but not self-devaluation, was a source of worsening "food addiction" status over time, even after controlling for baseline "food addiction" status (see Figure 4.2). No reciprocal relationships were observed. That is, "food addiction" status at baseline did not predict changes in self-devaluation or fear of stigma at follow-up. Self-devaluation at baseline had a moderate but statistically significant impact on fear of stigma at follow-up, but, contrary to expectations, the reverse was not true. Length of follow-up had a small but statistically significant independent effect on fear of stigma only (path not-shown); changes in BMI did not have a significant independent effect on outcomes at follow-up. Overall, the model explained 35.6% of the variance in "food addiction" status at follow-up, 4.5% of which was accounted for by the effect of baseline weight-stigma variables. The analysis was repeated with YFAS symptom count as the outcome of interest; however, no significant cross-lagged effects were found.

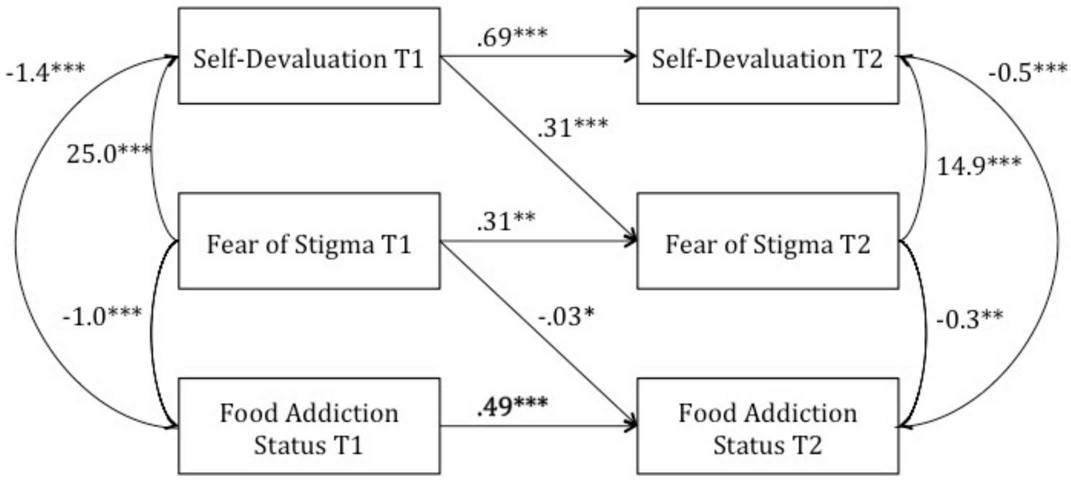

Figure 4.2. Cross-lagged path model between weight-related self-devaluation, fear of stigma, and food addiction status at baseline (T1) and follow-up (T2), controlling for length of follow-up and change in BMI. Only statistically significant pathways shown. Estimates are unstandardised coefficients and covariances. In line with the observed continuum in disordered eating behaviours and cognitions across "food addiction" categories, "food addiction" status was treated as a continuous variable, coded 1 = YFAS+, 2 = SPFA+, 3 = NFA. Self-devaluation and fear of stigma both scored 6–30. * $p < .05$, ** $p < .01$, *** $p < .001$.

4.8. Study 3 Discussion

The prevalence of SPFA was high, with half of the 658 participants considering themselves to be "addicted" to some foods. Only one in eight of these also received a positive "diagnosis" on the YFAS, giving a YFAS+ rate of 8.5% for the whole sample, consistent with findings from other studies in non-clinical populations (Meule, 2011).

Interestingly, weight-related self-devaluation significantly discriminated between YFAS+ and SPFA+ but not SPFA+ and NFA, whereas the opposite was true for fear of enacted weight stigma, suggesting that fear of stigma may play a bigger role in SPFA, whereas self-devaluation may be linked more strongly with YFAS-based outcomes. The divergent roles of self-devaluation and fear of enacted stigma could be indicative of a multi-staged effect of weight stigma, with fear of stigma being an early driver of disordered eating behavior, which is consistent with the findings from the serial mediation pathway identified in the present study, discussed further below. As expected, SPFA+ participants did not display the same degree of eating pathology as participants classified as YFAS+, and the two groups could be distinguished based on this measure. In line with hypotheses, self-perceived difficulty controlling eating significantly discriminated between SPFA+ and NFA; however, eating self-efficacy also significantly discriminated between SPFA+ and YFAS+, indicating that scores in the YFAS+ group were sufficiently higher than those in the SPFA+ group to make this possible, even when controlling for eating pathology. However, while the model accurately predicted over half of SPFA+ cases, the accuracy in classifying YFAS+ status was relatively low, correctly identifying only one in five participants with a YFAS+ "diagnosis", suggesting that other constructs, perhaps those associated with addictive behaviours in general rather than those linked to disordered eating and body image concerns, may be more important in differentiating between these two "conditions."

As hypothesised, fear of being stigmatised by others predicted self-devaluation, which in turn was associated with addictive-like eating behaviours. With one exception, the reverse relationship whereby self-devaluation predicted fear of stigma, which was then associated with problem eating behaviour, was not supported. The directionality of these findings is consistent with research from the wider stigma literature. In a US study of 105 adults with diagnosed mental illness who had experienced discrimination from others because of their condition, previous discrimination was linked with greater internalised mental health stigma via expectations of being stigmatised and discriminated against in future situations (D. M. Quinn et al., 2015). Similarly, an Australian study of 177 adults with problem gambling found that perceived negative stereotypes and social attitudes toward people with gambling problems indirectly predicted self-stigma via anticipation of social stigmatisation (Hing & Russell, 2017).

Some support emerged for the proposed serial mediation model linking fear of weight-related stigma from others and expression of addictive-like behaviours around food, via weight-related self-devaluation, chronic dieting behaviour, and low eating self-efficacy. However, the full proposed model generally explained less of the variance in "food addiction" outcomes, than did more parsimonious pathways. In the case of YFAS+ status and YFAS symptom count, fear of stigma was an indirect predictor of outcomes with self-devaluation as the single-mediator; that is the Fear → Self-devaluation → YFAS symptom count/YFAS+ status pathways, in the absence of chronic dieting and/or eating self-efficacy, contributed a large portion of the total indirect effects, suggesting that other mechanism besides the proposed link via chronic dieting and dysregulated eating may be driving this relationship. Nevertheless, both the Fear → Self-devaluation → Eating self-efficacy → YFAS symptom count/YFAS+ and Fear → Self-devaluation → Chronic dieting → YFAS symptom count/YFAS+ were important contributors to the total indirect effects. No direct relationship between fear of stigma and YFAS-based outcomes were observed. That is, the negative effect of anticipated stigma was manifested only via its impact on self-devaluation.

While similar results emerged for the serial mediation model predicting SPFA+ status, the Fear → Self-devaluation → Eating self-efficacy → SPFA+ pathway contributed the major portion of the total indirect effects; in contrast, the Fear → Self-devaluation → Chronic dieting → SPFA+ pathway was not statistically significant, raising doubts about the validity of the hypothesised origins of SPFA+. That is, chronic dieting does not appear to be necessary to explain the relationship between weight stigma and SPFA. Additionally, unique to SPFA+ status, the direct path from fear of stigma to SPFA+ was statistically significant, and accounted for the majority of the total effects of the model, with the sum of all indirect pathways playing only a minor role in predicting SPFA+. When the reverse model was tested, the direct effect of self-devaluation on SPFA+, controlling for fear of stigma, was non-significant. These results are consistent with the findings of the multinomial regression analyses, which looked at unique discriminating predictors of addictive-like eating behaviour, and suggest that self-stigma may be more strongly associated with YFAS-based outcomes, whereas fear of stigma may play a more important role in SPFA.

The absence of a direct effect of fear of stigma on YFAS-based outcomes could be due to the concealable nature of "food addiction". However, Link and colleagues (2015) proposed that anticipation of stigma may have deleterious effects on individuals with mental illness, another concealable condition, even in the absence of internalisation. In a study of 65 psychiatric inpatients with a diagnosis of psychosis, they found that what they called “symbolic interaction stigma” – the process whereby people with a stigmatised identity anticipate and rehearse potential social interactions for their likely stigmatising content, was more common than internalised mental illness stigma, and was linked to withdrawal from social situations involving people who had not suffered with mental illness, even when controlling for self-stigma. In contrast, self-devaluation but not anticipated rejection was a significant predictor or low self-esteem (Link et al., 2015).

An alternative explanation could be that “food addiction” is more accepted than some other forms of substance dependencies, with the non-illicit nature of the substance in question perhaps negating some of the moral judgment that may attach to, for example, abuse of illegal drugs (Phillips & Shaw, 2013). Yet, smokers and alcoholics are often stigmatised, although both tobacco and alcohol are legal substances; but everybody must eat – nobody is obliged to smoke or drink alcohol. Thus, an understanding that some people may be more susceptible to a substance from which they cannot abstain may increase the social acceptability of “food addiction.” Limited support for this contention comes from a US study that found that people tended to frame “food addiction” more as a disease than was the case with smoking; however, “food addiction” was nevertheless considered to be due to individual choices to a larger extent than alcoholism (DePierre, Puhl, & Luedicke, 2014).

The relative unimportance of self-stigma in the mediation model for SPFA+ status was unexpected. It is likely that alternative mechanisms mediate the relationship between fear of stigma and SPFA. Little is known about the process by which fear or expectation of stigma leads to internalisation, or the contexts in which this occurs, and there may be something distinct about "clinical food addiction" that distinguishes it from SPFA in this respect.

Contrary to expectations, weight-related self-devaluation did not predict worsening "food addition" over time, although it did have a small effect on worsening fear of stigma from others. Interpretation of these findings is limited by the small number of participants who experienced worsening "food addiction" over the follow-up period, and it is possible that this analysis may have been underpowered to detect an effect. In contrast, baseline fear of stigma did predict worsening "food addiction". Thus, in the present environment, where anti-fat attitudes are prevalent and discrimination relatively common, this finding has implications for the development of problem eating behaviours. Further studies are needed with more diverse samples, particularly in higher-weight populations who may have elevated internalised weight stigma and anticipation or expectation of stigma from others.

One possible limitation of this study is the large amount of imputed data for BMI and weight self-stigma in the baseline data set, amounting to 20% of the total baseline sample. Expectation Maximisation imputation of this data, i.e., drawing on relationships between these and other study variables in students who had completed all measures, would have had the effect of reducing variability among values on these outcomes. This, in turn, would have increased the likelihood of obtaining significant findings on subsequent analyses. However, statistical analyses indicated the data were missing completely at random and no significant differences existed on other study variables between students who did and did not complete the WSSQ and anthropometry questions prior to them being made compulsory, suggesting no systematic pattern of non-response beyond a certain level of apathy among some students who must complete such studies for course credit. Thus, despite the large amount of imputed data, the impact on overall findings is likely to be limited. Support for this contention comes from the fact that, notwithstanding increased likelihood of significant findings, BMI was not a significant predictor of outcomes of interest, and disparate significance effects were observed between self-stigma and fear of stigma and different "food addiction" outcomes both at baseline and at follow-up.

Another possible limitation is that an iterative multinomial logistic regression procedure was used to derive the final prediction model, and significant findings may have been the result of multiple testing. Replication of these findings in a different sample would strengthen the support for this model.

4.9. Study 4: Cross-sectional study of weight stigma and "food addiction" in a community sample

The focus in Study 3 was on more traditional measures of disordered eating and body image, such as current and previous dieting behaviour, and overweight preoccupation. The findings indicated that within that context, weight-related self-devaluation and/or fear of stigma from others played an important role in distinguishing degree of "food addiction". However, accuracy of classification of YFAS+ participants was only 20%, suggesting that other factors likely play a more important role in distinguishing YFAS+ from SPFA+.

Other research on food addiction has explored the roles of broader constructs such as cravings, clinical comorbidities – in particular, depressive symptoms and binge eating, and trait impulsivity (Davis et al., 2011; Imperatori et al., 2014; Ivezaj, White, & Grilo, 2016; Meule & Kübler, 2012; Meule, Heckel, Jurowich, Vögele, & Kübler, 2014; Meule et al., 2015; Nolan & Geliebter, 2016). The role of internalised weight stigma within this more clinical representation of disordered eating behaviour is unclear. Additionally, although studies in weight-loss treatment-seeking populations have found strong positive associations between internalised weight stigma and both depression and binge eating (Burmeister et al., 2013; Durso, Latner, White, et al., 2012; Palmeira, Pinto-Gouveia, Cunha, et al., 2017), studies in higher-weight community samples have tended to show weaker relationships between internalised weight stigma and depression (Hilbert, Braehler, Haeuser, & Zenger, 2014; Hilbert et al., 2015; Schvey & White, 2015), and to date, have not explored the relationship with binge eating behaviour, despite the fact than BED is the most prevalent form of clinically recognised eating disorder (Kessler et al., 2013), although massively under-diagnosed (Kornstein, Kunovac, Herman, & Culpepper, 2016), and sub-clinical binge eating behaviour is widespread even among community samples (Stice, Marti, Shaw, & Jaconis, 2009; Stice et al., 2013). To date, no studies have explored the relationship between internalised weight stigma and food cravings.

The purpose of Study 4 was two-fold: first, to replicate the cross-sectional findings from Study 3 in a diverse, non-student, community sample, and second, to extend these findings to include measures more broadly related to behavioural control and clinical correlates of eating pathology.

It was predicted that scores on the Binge Eating Scale and depressive symptoms would significantly differential between SPFA+ and YFAS+ in logistic regression models, and would increase the predictive accuracy of the models in correctly classifying YFAS+ participants. Cravings, binge eating, and attentional impulsivity were expected to differentiate between SPFA+ and NFA, but not be sufficiently different to discriminate between SPFA+ and YFAS+.

4.10. Study 4 Methods

4.10.1. Sample

Participants were recruited to an "Online eating survey" using Amazon's Mechanical Turk (MTurk) worker pool. Eligibility criteria were initially limited to workers who had completed at least 100 previous "jobs" on the MTurk platform, and who had at least a 95% approval rating for their work, as this has been shown to improve data quality (Peer, Vosgerau, & Acquisti, 2014).
An interim check on participant numbers and geographical location indicated that participants from the Indian subcontinent were disproportionately represented. As the potential impact of cultural differences on the findings was unclear, it was decided to limit future participants to those currently living in the US, Canada, UK, Ireland, Australia, and New Zealand. Additionally, to make the

survey available to a wider sample, the required number of previous completed projects was reduced to 50, but the required approval rating increased to 100%. Participants were paid US $0.50 for their time. Seven hundred and forty-seven participants provided informed consent and began the study. Of these, 660 (88%) completed it. To ensure that participants were engaged in the survey, four “catch” questions were used. This practice also reduces the likelihood of automated form completion by “bots”, and is an additional method of ensuring high-quality data (Prince, Litovsky, & Friedman-Wheeler, 2012). Given the length of the survey, up to one incorrect response was allowed; however 46 participants incorrectly answered more than one “catch” question, and their data were excluded. Thus the final sample included 614 participants and was relatively diverse in terms of demographic and anthropometric variables (see Table 4.5). The study was approved by the University of Birmingham Ethical Review Committee.

4.10.2. Measures

Participants completed the same questionnaires as in Study 3. Additional demographic questions relating to education level and profession were added for this non-student sample. In addition, measures of binge eating, food cravings, trait impulsivity, and negative affect were included.

4.10.2.1. Binge eating

The Binge Eating Scale (BES) is a 16-item questionnaire assessing the frequency and severity of behaviors, cognitions, and affect associated with binge eating (Gormally, Black, Daston, & Rardin, 1982). The BES has high internal consistency

Table 4.5. *Study 4 Sample Characteristics*

Variable	% / *M (SD)*	Missing/Declined
Gender	54.9% F, 37.0% M	8.1%
Age	35.1 (11.8)	8.3%
Range	14–77	
Race/Ethnicity		8.8%
White	58.6%	
South Asian	19.1%	
African-American	5.2%	
Hispanic	3.4%	
Other ethnicities[a]	4.9%	
Nationality		9.8%
US	64.5%	
Indian subcontinent	19.2%	
Europe	4.1%	
Other[b]		
Education		8.1%
Graduate/professional	19.1%	
College/university degree	44.8%	
Other[c]	28.0%	
Profession		8.1%
Higher MAP	5.4%	
Intermediate MAP	18.4%	
Supervisor, clerical, junior	26.1%	
Manual	9.7%	
Student	8.8%	
Unemployed	10.6%	
Other	12.9%	
BMI	35.1 (11.8)	8.1%
Range	11.4–84.9	
BMI < 18.5	6.0%	
18.5 – 24.9	37.1%	
25.0 – 29.9	21.3%	
≥ 30.0	27.4%	

Note. BMI = body mass index; MAP = managerial, administrative, or professional.
[a]2.3% Asian–Other, 2.0% mixed race, 0.3% Native American, 0.2% Hawaiian, 0.2% Other ethnicity.
[b]Canada, UK, Oceania, South-East Asia, South America, Other, all < 1.0%. [c]Vocational 8.1%, Secondary 17.4%, Some secondary 1.3%, Other 1.1%.

in clinical and non-clinical samples and good concurrent validity with other measures of binge eating (Brunault et al., 2016; Gormally et al., 1982). It has been used in food addiction studies in non-eating disordered samples (Gearhardt, Corbin, & Brownell, 2009), and scores on the BES have been shown to mediate the relationship between YFAS symptom count and psychopathology in treatment-seeking overweight and obese adults (Imperatori et al., 2014). Item scoring varies by question, but a sum score is created for the whole scale, with a possible range of 0 – 46. Accepted diagnostic cut-offs for the BES are 18–26 to indicate moderate binge eating and 27 or higher for severe binge eating (Marcus, Wing, & Lamparski, 1985). Cronbach's α in the present study was .92.

4.10.2.2. Food cravings

Trait food cravings were measured using the Food Craving Questionnaire–Trait (FCQ-T; Cepeda-Benito, Gleaves, Williams, & Erath, 2000). This widely used scale comprises 39 items assessing cognitive, affective, and behavioral aspects of cravings across different situational contexts, including in the absence of a craved food, prior to, during, and after eating a craved food, and what triggers the cravings. The scale has excellent internal and test-retest reliability and convergent and discriminant validity in non-clinical samples (Cepeda-Benito et al., 2000). In a large study of German university students, YFAS+ participants scored more highly than YFAS- participants on the total scale score and all subscales with the exception of anticipation of positive reinforcement, consistent with the increased cravings but absence of positive reward experienced in more traditional addictive conditions (Meule & Kübler, 2012). Subjects identify how often each of the items would apply to themselves, with items scored on a six-point Likert scale from 1 (*never/not applicable*) to 6 (*always*). Scores are summed to provide a total measure of food craving propensity, with a possible range of 39–234. The scale showed excellent internal consistency in the present sample (α = .98).

4.10.2.3. Impulsivity

Trait impulsivity was measured using the Barratt Impulsiveness Scale–Short Form (BIS-15; Spinella, 2007). The BIS-15 comprises 15 items across three subscales, which capture different aspects of impulsivity – namely attention, motor, and non-planning impulsivity. Attentional impulsivity assesses difficulty concentrating or remaining focused in the present; motor impulsivity refers to the tendency to act without thinking; and non-planning impulsivity is defined as a lack of forethought regarding future events. The BIS-15 has good reliability and validity in non-clinical samples (Meule, Vögele, & Kübler, 2011; Spinella, 2007), and the subscales have previously been shown to correlate differentially with eating behaviour and food addiction symptoms. Attentional impulsivity, in particular, has been linked with food cravings, emotional eating, night eating, and YFAS symptom count in non-clinical samples (see Meule, 2013 for a review of measures of impulsivity and overeating), although some studies have also found significant, but smaller, correlations with the other subscales (e.g., Meule et al., 2015). Participants indicate how often they think or behave in certain ways, using a 4-point Likert scale from 1 (*rarely/never*) to 4 (*almost always/always*). Sum scores for each subscale can range from 5–20. Internal reliability was adequate; Cronbach's αs were .71, .79, and .71 for the Attention, Motor, and Non-planning subscales, respectively.

4.10.2.4. Mood

Depressed mood was measured using the Center for Epidemiological Studies–Depression scale (CES-D; described in Study 1) (Radloff, 1977). The scale has a possible range 0–60, with scores greater than 16 considered indicative of severe depressive symptom. Cronbach's α in the present sample was .93.

4.10.3. Handling of missing values

Missing values on demographic and anthropometric variables were not imputed, and these variables were deleted pairwise where relevant. Five participants had a total of eight missing data points on other study outcome measures. No variable had more than one data point missing. Given the very small number of missing data points, data imputation was deemed unnecessary, and missing values were replaced with participants' mean values for the respective scale or subscale.

4.10.4. Data analysis

In addition to the analyses conducted in Study 3, multinomial logistic regression was conducted in two stages. As a first step, the model tested in Study 3 was replicated in this non-student sample to confirm its generalisability. A second logistic regression was then conducted, adding in scores on the BES, FCQ-T, CES-D, and BIS-15 subscales. Improvements in model fit compared with the first model were assessed by changes in model χ^2, pseudo-R^2, and accuracy of "food addiction" status classification.

4.11. Study 4 Results

4.11.1. Preliminary analyses

Eighty-four participants (13.7%) were classified as YFAS+, 249 (40.6%) as SPFA+, and the remaining 281 (45.8%) as NFA.[29] Food addiction status did not differ by age, gender, education level, or profession. However, male and female participants differed on YFAS symptom count, dietary restraint, EAT-26, and overweight preoccupation. Consistent with findings in Study 3, non-White ethnicity was associated with an increased likelihood of being SPFA+ than NFA. In addition, in the present sample, ethnicity was also associated with an increased risk of receiving a YFAS+ diagnosis. Again, the effect of ethnicity was driven predominantly by participants identifying as South Asian.[30] Thus subsequent analyses were controlled for ethnicity and gender.

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[29] Within the YFAS+ category, most (n = 76) also self-classified as "food addicts," but a small subset (n = 8) did not. This subset did not differ from the larger group of YFAS+ participants on YFAS symptoms, but did differ on a number of other measures. YFAS+ participants who also self-classified as "food addicted" had higher scores on ESES, BES, and FCQ-T than YFAS+ participants who did not self-classify as "food addicted." All subsequent analyses were run with and without these cases and the results did not differ; therefore, all YFAS+ participants were combined into a single group.

[30] Exploratory analyses revealed that South Asian respondents endorsed more YFAS symptoms (mean 3.2) than White and Other ethnicities (both 2.3; p = .001). Significantly more South Asian participants endorsed almost all of the YFAS symptoms, with the exception of repeated failed attempts to quit or cut down and continuing use despite negative consequences. Examination of other study outcomes by gender indicates that South Asian participants reported either no difference or more favourable scores on almost all study outcomes compared with White and participants of other ethnicities. The one exception was for scores on the Food Cravings Questionnaire. South Asians reported statistically significant higher scores on all but two of the FCQ subscales, although the absolute difference in

4.11.2. Unique predictors of "food addiction" status

As a first step, the model tested in Study 3 was replicated in this non-student sample. The predictors that influenced the model were largely the same as in the student sample in Study 3, with the exception of the roles played by chronic dieting and weight-related self-devaluation (see Table 4.6).

Table 4.6. *Multinomial Logistic Regression Comparing Predictors of SPFA+ Versus YFAS+ and Non-Food Addicts in Community Sample: Standard Predictors*

Predictor	*B*	*SE*	OR	95% CI for OR Lower	95% CI for OR Upper	*p*	Student sample (Study 3) OR	Student sample (Study 3) *p*
YFAS+ versus SPFA+							OR	*p*
Intercept	-5.34	0.79				.00		
RS	-0.04	0.03	0.97	0.91	1.03	.25	–	–
EAT-26	0.03	0.02	1.03	1.00	1.06	.03	1.06	.00
ESES	0.68	0.15	1.98	1.48	2.65	.00	1.43	.03
WSSQ-Self	–	–	–	–	–	–	1.12	.01
WSSQ-Fear	0.09	0.03	1.09	1.03	1.15	.00	0.97	*ns*
Ethnicity	0.59	0.32	0.55	0.30	1.03	.06	1.09	ns
SPFA+ versus NFA								
Intercept	-2.98	0.38				.00		
RS	0.06	0.02	1.06	1.02	1.11	.01	–	–
EAT-26	-0.01	0.01	1.00	0.97	1.02	.66	1.00	*ns*
ESES	0.70	0.10	2.02	1.65	2.47	.00	2.00	.00
WSSQ-Self	–	–	–	–	–	–	0.96	*ns*
WSSQ-Fear	-0.04	0.02	1.04	0.93	1.01	.10	1.10	.01
Ethnicity	-1.10	0.23	0.33	0.21	0.52	.00	0.37	.00

Note. YFAS+ indicates positive 'diagnosis" on Yale Food Addiction Scale; SPFA+ indicates self-perceived food addict only; NFA indicates no food addiction; RS = Restraint Scale (range 0–35); EAT-26 = Eating Attitudes Test-26 (range 0–78); ESES = Eating Self-Efficacy Scale (range 1–7); WSSQ = Weight Self-Stigma Questionnaire; Self-devaluation and Fear of Enacted Stigma subscales (both range 6–30). Ethnicity scored 1 = White, 0 = Other.

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scores was small (South Asian 38.5, White 36.6, Other ethnicities 36.2, p = .01). See Meadows, Higgs, & Nolan, 2017, Appendix F for a discussion of these findings.

First, chronic dieting remained in the model and significantly predicted categorisation as SPFA+ versus NFA, with a 5-point increase in scores on the Restraint Scale (possible range 0–35) being associated with a 30% increased likelihood of being SPFA+. Chronic dieting did not distinguish between YFAS+ and SPFA+. The significant roles of disordered eating and eating self-efficacy were the same in both samples. However, while weight-related self-devaluation was a significant discriminator between YFAS+ and SPFA+ in the student sample, it did not contribute to the model in this community sample.

Fear of enacted weight stigma significantly discriminated between YFAS+ and SPFA+, but not between SPFA+ and NFA, the opposite pattern to that seen in the student sample. There was also a trend for non-White ethnicity to be associated with increased likelihood of receiving a YFAS+ diagnosis, although this did not reach statistical significance. The final model was a good fit for the data, $\chi^2(10) = 229.2$, $p < .001$; Nagelkerke $R^2 = .40$), and correctly predicted 35.9% of YFAS+ cases (compared with 20% in the student sample), 55.6% of SPFA+ and 72.4% of NFA, with overall accuracy of 60.5%.

As a second step, scores on the BES, FCQ-T, CES-D, and BIS-M and BIS-A subscales were added to the model. The BIS-NP subscale was not included as scores did not differ between the three groups.[31] Sequential removal of predictors not contributing to the model led to the removal of chronic dieting, disordered eating, fear of weight-related stigma, and the BIS-15 attentional and

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[31] See Meadows, Nolan, & Higgs, 2017; Appendix F.

motor subscales, with no loss in model fit or predictive accuracy. The final model is displayed in Table 4.7.

The model was a good fit for the data, $\chi^2(10) = 271.9$, $p < .001$, Nagelkerke $R^2 = .45$) and correctly predicted 41.0% of YFAS+ cases, 55.6% of SPFA+ cases, and 75.5% of NFA cases, overall accuracy 62.7%. Neither weight-related self-devaluation nor fear of stigma from others remained in the final model.

Table 4.7. *Multinomial Logistic Regression Comparing Predictors of SPFA+ With YFAS+ and Non-Food Addicts: Additional Predictors*

				95% CI for OR		
Predictor	*B*	*SE*	OR	Lower	Upper	*p*
YFAS+ versus SPFA+						
Intercept	-6.95	0.91				.00
ESES	0.32	0.18	1.37	0.97	1.94	.07
FCQ-T	0.02	0.01	1.02	1.01	1.03	.01
BES	0.02	0.02	1.02	0.98	1.07	.32
CES-D	0.06	0.01	1.06	1.03	1.09	.00
Ethnicity	-0.63	0.32	0.53	0.29	0.99	.05
SPFA+ versus NFA						
Intercept	-3.01	0.40				.00
ESES	0.38	0.12	1.46	1.15	1.85	.00
FCQ-T	0.01	0.01	1.01	1.00	1.02	.05
BES	0.04	0.02	1.04	1.01	1.08	.03
CES-D	-0.01	0.01	0.99	0.97	1.01	.56
Ethnicity	-0.88	0.22	0.41	0.27	0.64	.00

Note. YFAS+ indicates positive diagnosis on Yale Food Addiction Scale; SPFA+ indicates self-perceived food addiction without positive diagnosis on the YFAS; NFA indicates no food addiction. ESES = Eating Self-Efficacy Scale (range 1–7); FCQ-T = Food Craving Questionnaire-Trait (range 39–234); BES = Binge Eating Scale (range 0–46); CES-D = Center for Epidemiological Studies-Depression scale (range 0–60). Ethnicity coded 1 = White, 0 = Other ethnicities.

4.11.3. Path analysis and serial mediation

4.11.3.1. Hypothesised serial mediation model

The majority of significant indirect pathways identified in Study 3 were replicated in the present sample (see Table 4.8). However, the single-mediator pathways Fear → Self-devaluation → YFAS symptom count/YFAS+ status, both contributing a notable proportion of the indirect effects in the student sample, were not statistically significant. In contrast, while none of the pathways that excluded self-devaluation were significant for any outcome in the student sample, this was not the case in the present study. Likewise, the direct path between fear of stigma and YFAS-based outcomes, controlling for all other variables, was statistically significant only in the present sample.

The total model effects were similar in both samples, indicating that the difference was due to the smaller proportion of the total effect explained by serial mediation pathways in the community sample. In contrast, the total indirect effects of fear of stigma on SPFA+ status was much larger in the present study than in the student sample, largely due to the additional contribution of pathways excluding self-devaluation.[32]

4.11.3.2. Alternative models

In line with the findings in Study 3, current dieting status was not a statistically significant predictor of any outcome in the present sample, and no mediation pathway including current dieting status was statistically significant.

However, in contrast to the findings in Study 3, pathways originating with Self → Fear were statistically significant, whereas direct effects from self-

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[32] Because BMI was higher in the present sample than in the student sample, it was possible that the relatively increased importance of fear of weight-related stigma from other was due to the participants being generally heavier. The analyses were re-run controlling for BMI but fear of stigma remained a highly significant predictor of downstream eating behaviours, in the absence of an indirect effect via self-devaluation.

Table 4.8. *Regression Coefficients and Standard Errors for Serial Mediation Models Predicting "Food Addiction" in a Community Sample*

Pathway	*B*	*SE*	β	95% CI (B)	*p*	Study 3 *p*
YFAS Symptom count						
Total effect	.13	.01	.46	[.11, .15]	.00	.00
Direct effect	.03	.02	.12	[.00, .07]	.04	.42
Indirect effects						
Fear → Self → YFAS symptom count	.00	.01	.01	[-.02, .02]	.87	.03
Fear → Chronic dieting → YFAS symptom count	.01	.00	.03	[.00, .02]	.02	.42
Fear → Eating self-efficacy → YFAS symptom count	.03	.01	.11	[.02, .05]	.00	.08
Fear → Self → Chronic dieting → YFAS symptom count	.01	.00	.05	[.01, .02]	.00	.00
Fear → Self → Eating self-efficacy → YFAS symptom count	.03	.01	.12	[.02, .05]	.00	.00
Fear → Chronic dieting → Eating self-efficacy → YFAS symptom count	.00	.00	.01	[.00, .01]	.02	.41
Fear → Self → Chronic dieting → Eating Self-Efficacy → YFAS symptom count	.01	.00	.02	[.00, .01]	.00	.00
YFAS+						
Total effect	.08	.01	.50	[.06, .09]	.00	.00
Direct effect	.03	.01	.21	[.01 .06]	.01	.70
Indirect effects						
Fear → Self → YFAS+	.00	.01	.01	[-.03, .02]	.94	.03
Fear → Chronic dieting → YFAS+	.00	.00	.01	[-.01, .01]	.72	.42
Fear → Eating self-efficacy → YFAS+	.02	.01	.11	[.01, .03]	.00	.14
Fear → Self → Chronic dieting → YFAS+	.00	.00	.01	[-.01, .01]	.71	.01
Fear → Self → Eating self-efficacy → YFAS+	.02	.00	.13	[.01, .03]	.00	.01
Fear → Chronic dieting → Eating self-efficacy → YFAS+	.00	.00	.02	[.00, .01]	.03	.44
Fear → Self → Chronic dieting → Eating Self-Efficacy → YFAS+	.00	.00	.02	[.00, .01]	.01	.03

Pathway	*B*	*SE*	β	95% CI (*B*)	*p*	Study 3 *p*
SPFA+						
Total effect	.03	.01	.21	[.02, .05]	.00	.00
Direct effect	-.02	.01	-.15	[-.05, .00]	.09	.01
Indirect effects						
Fear → Self → SPFA+	.00	.01	.01	[-.02, .02]	.93	.17
Fear → Chronic dieting → SPFA+	.00	.00	.03	[.00, .01]	.09	.77
Fear → Eating self-efficacy → SPFA+	.02	.01	.12	[.01, .03]	.00	.10
Fear → Self → Chronic dieting → SPFA+	.01	.00	.04	[.00, .01]	.03	.68
Fear → Self → Eating self-efficacy → SPFA+	.02	.00	.13	[.01, .03]	.00	.00
Fear → Chronic dieting → Eating self-efficacy → SPFA+	.00	.00	.02	[.00, .01]	.02	.36
Fear → Self → Chronic dieting → Eating Self-Efficacy → SPFA+	.00	.00	.02	[.00, .01]	.00	.00

Note. YFAS+ indicates positive diagnosis on Yale Food Addiction Scale; SPFA+ indicates self-perceived food addiction without positive diagnosis on the YFAS. Fear = Weight Self-Stigma Questionnaire–Fear of enacted stigma subscale; Self = Weight Self-Stigma Questionnaire–Self-devaluation subscale.

Table 4.9. *Standardised Coefficients for Direct and Indirect Mediation Pathways in Student and Community Samples*

	YFAS symptom count		YFAS+		SPFA+	
Pathway	Student	Community	Student	Community	Student	Community
Hypothesised model						
Direct effect	.05	.12*	.05	.21**	.26**	-.15
Indirect effects						
Fear → Self → DV	.11*	.01	.21*	.01	-.12	.01
Fear → Chronic dieting → DV	.01	.03*	.02	.01	.00	.03
Fear → Eating self-efficacy → DV	-.05	.11***	-.02	.11**	-.05	.12***
Fear → Self → Chronic dieting → DV	.07**	.05**	.11**	.01	.01	.04*
Fear → Self → Eating self-efficacy → DV	.15***	.12***	.08*	.13***	.15***	.13***
Fear → Chronic dieting → Eating self-efficacy → DV	.01	.01*	.00	.02*	.01	.02*
Fear → Self → Chronic dieting → Eating Self-Efficacy → DV	.04***	.02**	.02*	.02*	.04**	.02**
Alternative model						
Direct effect	.14*	.01	.27*	.00	-.15	.01
Indirect effects						
Self → Fear → DV	.04	.09*	.04	.16**	.22**	-.11
Self → Chronic dieting → DV	.09**	.06**	.14**	.01	.02	.06*
Self → Eating self-efficacy → DV	.19***	.17***	.10*	.18***	.20***	.18***
Self → Fear → Chronic dieting → DV	.01	.02*	.01	.00	.00	.02
Self → Fear → Eating self-efficacy → DV	-.04	.08***	-.02	.08**	-.04	.09***
Self → Chronic dieting → Eating self-efficacy → DV	.05***	.03**	.03*	.03**	.05**	.03**
Self → Fear → Chronic dieting → Eating Self-Efficacy → DV	.00	.01*	.00	.01*	.00	.01*

*Note***.** YFAS+ indicates positive diagnosis on Yale Food Addiction Scale; SPFA+ indicates self-perceived food addiction without positive diagnosis on the YFAS. DV= dependent variable; Fear = Weight Self-Stigma Questionnaire–Fear of enacted stigma subscale; Self = Weight Self-Stigma Questionnaire–Self-devaluation subscale.

devaluation to “food addiction” outcomes, controlling for all indirect pathways, were non-significant in the present sample.[33] For clarity, Table 4.9 provides a comparative overview of the standardised coefficients and statistical significance of serial mediation pathways for hypothesised and alternative models in both student and community samples.

4.12. Study 4 Discussion

This study confirmed that SPFA is prevalent in the general community in a large international sample. The logistic regression model derived in the student sample was largely replicated in this community sample, with lower sense of self-control around food increasing the likelihood of being YFAS+ compared with SPFA+, and SPFA+ compared with NFA, and general eating pathology distinguishing between YFAS+ and SPFA+ but not between SPFA+ and NFA. This replication provides strong support for the distinctive differences in eating self-efficacy between all three groups, distinguishing SPFA+ as a unique entity somewhere between “clinical food addiction” and absence of addiction-like cognitions and behaviours, but falling short of a clinically relevant level of eating pathology. However, whereas weight-related self-devaluation uniquely predicted YFAS+ compared with SPFA+ in the student sample, it did not remain a significant distinguishing factor in the present sample. Similarly, fear of stigma from others was no longer a statistically significant discriminating factor

[33] See Appendix G.

between SPFA+ and NFA, although in this sample, it did discriminate between YFAS+ and SPFA+.

Another difference in the community sample was that chronic dieting now increased the likelihood of being SPFA+ compared with NFA (but did not distinguish the two "addiction" groups). It is possible that as a measure of chronicity, this construct may be more important in an older sample, and scores on the Restraint Scale tended to be higher in the community sample across all three "food addiction" group than was the case in the student sample.

As expected, addition of measures of craving, binge eating, impulsivity, and depressive symptoms to the regression models improved classification accuracy for YFAS+ participants compared with the model that used more traditional measures of disordered eating and body image only; however, given the importance of these additional variables in addictive-like behaviors, the improvement was smaller than might have been expected. The most recent revision of the Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association, 2013) combined the previously separate diagnostic criteria for substance abuse and substance dependence into a new category of Substance-Related and Addictive Disorders, which includes both substance use disorders and behavioral addictions. This change resulted in the addition of several new symptom types, most of which could be relevant to addictive-like eating behavior, and included the incorporation of "cravings" into the diagnostic criteria (Meule & Gearhardt, 2014). The original version of the YFAS was created to reflect DSM-IV criteria for substance use disorders, and thus did not include an assessment of craving frequency or intensity; an updated version that reflects DSM-5 diagnostic criteria has now been designed and validated (YFAS 2.0; Gearhardt, Corbin, & Brownell, 2016). It is possible that the addiction-related constructs used in the present study would have better predictive accuracy for classifying YFAS+ diagnosis based on this updated version of the scale.

Additionally, the variables hypothesised to significantly discriminate between "food addiction" categories only partially supported our hypotheses. As predicted, one of the main distinguishing feature between YFAS+ and SPFA+ was severity of depressive symptoms, with YFAS+ mean scores in the range indicative of severe depression, while SPFA+ scores were much lower and just on the cut-off point suggestive of clinically relevant symptoms. As a YFAS+ diagnosis requires endorsement of clinically significant distress or impairment, in addition to the presence of three or more symptoms, it is perhaps unsurprising that depressive symptomatology should be such an-important distinguishing factor between YFAS+ and SPFA+.

Interestingly, binge eating behavior, a construct closely linked with "food addiction", did not distinguish between YFAS+ and SPFA+, again providing some support for the potential clinical significance of SPFA+ status, albeit at a subclinical level of eating pathology: YFAS+ scores on the BES indicated moderately severe binge behavior, while SPFA+ scores did not. General eating pathology was also no longer a significant predictor in the final model.

Contrary to our hypothesis, trait craving scores also significantly discriminated between YFAS+ and SPFA+. This suggests that it is not only distress about symptoms that distinguishes between these conditions, but that severity of cravings in YFAS+ is noticeably more intense than in SPFA+. As predicted, cravings and binge behavior distinguished between SPFA+ and NFA, but attentional impulsivity did not. Eating self-efficacy remained a significant discriminating variable between SPFA+ and NFA in the expanded model; however, weight stigma variables were no longer significantly discriminated between the categories when measures of food cravings, depressive symptoms, and binge eating were entered into the model.

Consistent with the findings from the multinomial regression analyses, weight-related self-devaluation appeared to be less important in defining “food addiction” in the present sample than in the previous student sample. Serial mediation analyses indicated that fear of being stigmatised by others had a notable downstream effect on eating behaviour in the present sample, even in the absence of an indirect effect through higher self-devaluation, which did not occur in the student sample, and this difference could not be explained by higher BMI in the community sample. These findings corroborate those of Link et al (2015), supporting a role for fear of stigma independent of its effects on internalisation, and extend those findings to the domain of eating behaviour. However, in contrast with the findings in Study 3, weight-related self-devaluation also indirectly predicted problematic eating behaviour via its effects on fear of stigma. While the evidence cited above provides support for the role of anticipated or expected stigma as a predictor of internalisation in a range of mental health conditions, to our knowledge, this is the first study to test the reciprocal relationship, whereby internalised stigma predicts fear of stigma. Such a relationship does have face validity. It seems likely that internalised weight stigma will increase expectation that others would concur with one’s devalued status, and may well increase vigilance for such events, possibly resulting in a vicious cycle with potentially detrimental sequelae for quality of life among some higher-weight individuals. Nevertheless, although a theoretically plausible explanation for these differences can be proposed, differences in predictors of addictive-like eating between the two samples may be statistical artefacts resulting from multiple testing, and findings should be confirmed in other samples before firm conclusions are drawn.

4.13. General discussion

The present studies are the first to explore the relative prevalence and characteristics of "food addiction" using both a diagnostic measure of "food addiction" and individuals' own perceptions of their "addiction" status. These are also the first studies to explore the role of weight-related self-devaluation and fear of stigma from others in the development of addictive-like eating patterns. The ability of weight-related self-devaluation and fear of stigma from others to distinguish between the three "food addiction" groups varied by sample. Fear of stigma appeared to be an important predictor of both YFAS-related outcomes and SPFA+ in the community sample (Study 4), whereas self-devaluation played a more pivotal role in "food addiction" pathways in the student sample (Study 3). One possibility could be that life experiences may increase the importance of anticipated or expected stigma from others, whereas self-stigma may be more important for younger people; however correlations between age and both stigma measures were non-significant in the student sample, and increasing age correlated with reduced fear of stigma in the community sample. The higher BMI in the community sample also could not explain this finding. It may be that age acts as a proxy for life experiences in general, but prior levels of experienced weight stigma specifically is what differentiates between these two samples. Unfortunately, this construct was not measured. Serial mediation in the community sample provided additional evidence for the direct role of "symbolic" weight stigma on eating behaviour, in addition to the role it plays via its links with greater internalisation. This direct relationship was not found in the cross-sectional analysis of the student sample; however, in longitudinal analysis, fear of stigma from others at baseline predicted worsening "food addiction" at follow-up, whereas internalised weight stigma at baseline did not. While higher levels of weight-related self-devaluation at baseline did not lead to deterioration in "food addiction" status, they did appear to cause further increases in fear of being stigmatised by others. It is possible that a feedback effect operates between self-stigma and fear of being stigmatised by others. Experimental studies that manipulate these stigma variables may provide insights into the nature of any reciprocal relationship between weight stigma and eating behaviour. Longitudinal studies with additional time points would be necessary to further elucidate the progression of these relationships over time.

The chronic dieting hypothesis of SPFA was only weakly supported. While the proposed pathway from fear of stigma → self-devaluation → chronic dieting → eating self-efficacy → "food addiction" was significant in both samples, it represented only a minor explanatory pathway for the overall relationship between the proximal and distal variables. In most cases, across both samples, pathways that included eating self-efficacy but excluded chronic dieting tended to contribute a much larger proportion to the total effect that did those that included chronic dieting, and no evidence was found to support current dieting as an alternative step in the pathway.

Indeed, the most reliably predictive variable among traditional measures of disordered eating behavior and weight and shape concern that distinguished between the three "food addiction" groups was perceived self-control around food, which is also consistent with self-classifying individuals' own qualitative descriptions of their experiences (Hetherington & MacDiarmid, 1993; Ruddock et al., 2015). When factors associated with more severe eating pathology were included, self-perceived control around food remained a significant predictor distinguishing SPFA+ from NFA+, but food cravings and depressive symptoms were the main discriminating variables between YFAS+ and SPFA+.

Strengths of the present studies include replication of findings in two diverse samples and follow-up data with no attrition. However, the follow-up period was relatively short, and limited to a young, homogeneous, predominantly normal-weight, student population. It may be useful to observe whether weight stigma is predictive of worsening eating pathology in a more diverse adult population. Additionally, the characteristics of both clinical and self-classified "food addiction" were examined in terms of both traditional measures of problem eating behavior and body concerns, and also constructs more generally associated with substance use disorders. A major limitation of the present studies is reliance on self-report questionnaire measures. Future studies could experimentally manipulate weight stigma and use objective measures of eating behaviour to more reliably determine the impact of weight stigma on addictive-like eating. Finally, both of these studies were conducted in non-clinical samples. Future studies should explore the applicability of these findings to clinical samples of higher-weight and/or eating disordered populations.

CHAPTER 5. Study 5. Testing a social identity model of weight stigma resistance

5.1. Introduction

As noted in Chapter 1, internalisation of weight stigma is associated with a range of deleterious psychological and physiological effects, and adversely impacts health behaviour and quality of life. As such, higher-weight individuals who do not internalise societal weight stigma may avoid at least some of the harms associated with belonging to a stigmatised group.

Whether a given member of a stigmatised group responds to societal weight stigma by internalising that stigma, fighting back, or being relatively unaffected, depends upon a complex interaction of attitudes, beliefs, and contextual factors. Social identity theory makes predictions about how individuals respond to group-related identity threat, particularly the roles played by group identification, perceived legitimacy of the stigma, and perceptions of group barrier permeability, and these predictions have been corroborated by decades of empirical evidence (for reviews, see Branscombe & Ellemers, 1998; Ellemers et al., 2002). In their paradox model of self-stigma, Corrigan and Watson (2002) provide a predictive formula for determining positioning on the continuum between internalisation and resistance (see Figure 5.1), but failed to consider barrier permeability – a key determinant of stigma response in social identity theory. Barrier permeability may be particularly relevant in the case of the group "Fat," as weight is considered by many to be under an individual's control (Weiner, Perry, & Magnusson, 1988). Corrigan and Watson's conceptualisation of stigma resistance is also limited to an affective response, i.e., righteous anger. While they noted that the "righteous anger" group would be more likely to engage in behaviours related to social change, this was not a prerequisite for classification to this group.

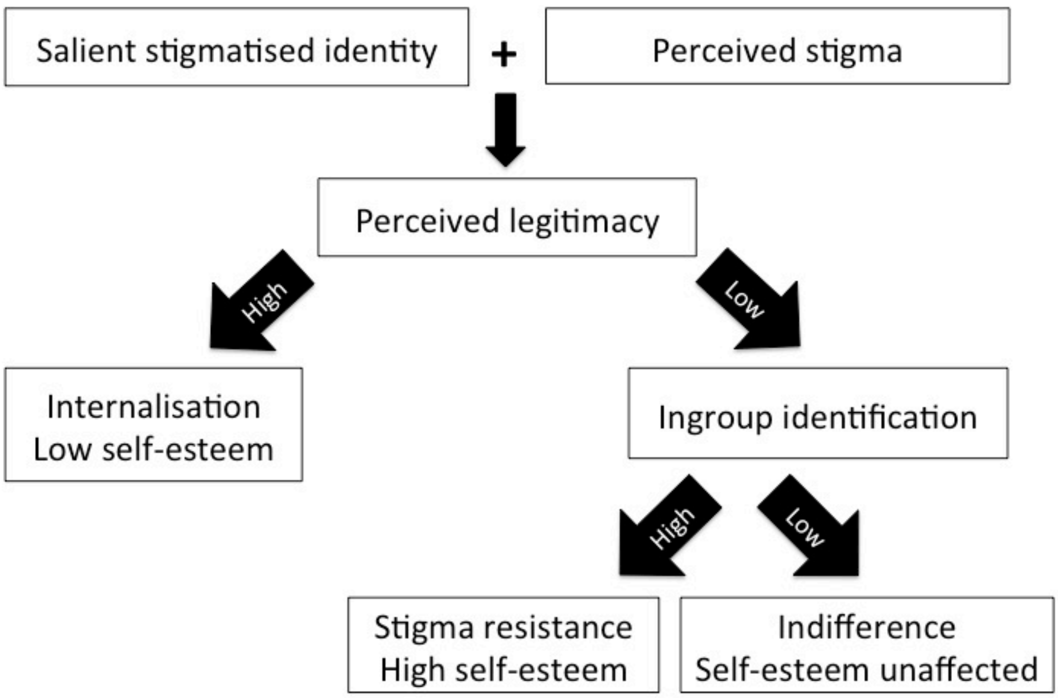

Figure 5.1. Paradox model of self-stigma (adapted from Corrigan & Watson, 2002)

Thoits' (2011) presents a more detailed continuum, with internalisation at one end, overtly challenging behavioural responses to stigma at the other, and degrees of social creativity in between. To date, only one study has considered these forms of stigma response in a higher-weight sample (Lindly et al., 2014), and this study was limited somewhat by small sample size, and a conceptualisation of stigma resistance focusing mainly on the need for and membership of fat rights advocacy organisations.

Indeed, it can be argued that resistance is much more than engagement in collective action. First, it may encompass both intra- and inter-personal processes. Second, resistance may also involve cognitive, affective, and behavioural components. And perhaps most importantly, while a certain group may be considered oppressed within current power status structures, this oppression is most often felt in individual encounters or events, in transient and dynamic instances that engender some form of response from the target. That is, resistance must occur in "moments as well as movements" (Alldred & Fox, 2017, p. 10). Drawing on Corrigan and Watson's (2002) paradox model of self-stigma, and Thoits' (2011) model of challenging stigma, I propose that weight stigma resistance encompasses two main components: *refusing* devalued status, and *fighting* devalued status. Using a social identity theory framework, I test a model of weight stigma resistance that builds upon the paradox model of self-stigma, but incorporates three main differences. First, group identity is considered as a possible moderator at each step of the model. That is, both perceived legitimacy and group identity were explored as predictors of both stigma internalisation and stigma resistance. Secondly, perceived barrier permeability is included as a potential moderator of stigma response – that is, do higher-weight individuals who consider weight to be largely under individual control, and thus envision the possibility of leaving the group "Fat," respond differently to perceived stigma than those who consider group barriers to be largely impermeable. Finally, stigma resistance is conceptualised not only as an affective state, or a collective behaviour, but rather, as a combination of cognitive, affective, and behavioural responses to perceived weight stigma.

5.2. Methods

5.2.1. Sample

Adult participants (age 18–69 years) who self-identified as “overweight,” “obese,”[34] or “fat” were recruited to complete an anonymous online survey on the “Life experiences of overweight individuals.” Invitations to participate in the survey were posted on social media and Internet forums related to weight, weight-loss, health, nutrition, fitness, plus-size fashion, and the size acceptance movement, with no geographical limits. This purposive recruitment strategy was intended to provide a sample likely to have a range of views on the acceptability of societal weight stigma, both positive and negative emotions about their own body weight, and to differ in their levels of fat identity.

The survey was conducted using a dedicated survey platform (Qualtrics.com). After providing consent, participants completed a series of questionnaires and provided demographic data. All participants were entered into a prize draw to win a £50 Amazon voucher (or local equivalent). The study was approved by the University of Birmingham Ethical Review Committee.

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[34] The word “obese” was added to recruitment materials in the present study as a result of a number of emails received from potential participants in Study 2. Respondents wanted to know whether they were eligible to participate if they were “obese” rather than “overweight.”

5.2.2. Measures

Unless otherwise noted, the following measures were scored on a 7-point Likert scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*), with item scores averaged to give a final score for each measure.

5.2.2.1. Perceived discrimination

Perceived discrimination was measured using the 10-item Stigma Consciousness Questionnaire (SCQ; Pinel, 1999). Originally developed to measure gender bias, this questionnaire has now been validated in a number of other stigmatised populations, including racial and sexual minorities. The measure has also been adapted for use in an "overweight/fat" population and has acceptable reliability and convergent validity in non-clinical and weight-loss seeking higher-weight samples (Carels, Domoff, et al., 2013; Schmalz, 2010). Unlike some other measures of perceived discrimination, the SCQ includes items related to both awareness of societal anti-fat stigma in general and to personal experience specifically; for example, "My being overweight/fat does not affect how people act with me;" "Most people do not judge overweight/fat people on the basis of their weight." Following Carels et al (2013), the scale was scored on a 6-point Likert scale (strongly agree to strongly disagree) with no neutral point, but the lower anchor was changed to 0, to indicate no perceived discrimination;[35] thus the upper anchor was 5. Higher scores indicate greater perceived anti-fat stigma. Cronbach's α in the present sample was .86.

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[35] Carels et al (2013) scored the scale 1–6. In the original study by Pinel, the scale included a neutral point. This was omitted in error by Carels et al, and reproduced here.

5.2.2.2. Group identification

Group identification was assessed using the Multicomponent Ingroup Identification Scale (Leach et al., 2008). Following an extensive review of the extant group-identification literature, Leach and colleagues operationalised ingroup identification into five components across two dimensions, supported by CFA. "Individual self-stereotyping," or the extent to which an individual feels commonalities with other group members, and "ingroup homogeneity," that is, how cohesive the individual believes the group to be as a whole, together represent the dimension of "Self-definition" at the group level; "group solidarity," "satisfaction with group membership," and "centrality" of group membership to one's self-identity together represent the dimension of "Self-investment" in the group. Studies that have used the measure have reported differential findings for the group investment and group self-definition dimensions (e.g., Jans, Leach, Garcia, & Postmes, 2015; Leach et al., 2008; Masson & Fritsche, 2014). Construct, predictive, and discriminant validity has been confirmed across multiple group identities (Leach et al., 2008).

The questionnaire was designed to be adapted to any group situation. Here, the group was labelled "overweight/fat," in line with the wording used in the perceived stigma scale. The questionnaire comprises 14 items, 2 to 4 items for each of the five subscales. Mean scores are calculated for each subscale, and for the two superordinate dimensions. Higher scores indicate stronger group identity. Item 8 on the Centrality subscale, "I often think about the fact that I am overweight/fat" significantly reduced the internal validity of the subscale to .59 and it was excluded from further analyses. Internal validity for two-item scales was assessed with the Spearman-Brown coefficient, ρ. Final subscale validity was: Solidarity α = .86, Satisfaction α = .83, Centrality ρ = .81, Self-stereotyping ρ = .68, and Homogeneity ρ = .73. Cronbach's αs for the Group Self-Investment and Self-Definition superordinate dimensions were .87 and .77, respectively.

5.2.2.3. Perceived legitimacy of anti-fat discrimination

Five items assessed the extent to which participants believed the unequal treatment of higher-weight people to be legitimate. For example, "Treating overweight/fat people poorly is justified if it makes them change their lifestyle;" "I don't think it's fair that thin people have higher status than overweight/fat people" (reverse scored). Higher mean scores indicated higher perceived legitimacy of stigma towards heavier individuals. Internal reliability of this five-item scale was .79.

In addition, three items in the WBIS-19 pertain to the perceived legitimacy of anti-fat stigma. For example, "It really bothers me when people look down on overweight people;" "I believe that society's prejudice against overweight people is unfair." In the original WBIS validation study, these items had low scale item-total correlations and were excluded from the final 11-item WBIS questionnaire (Durso & Latner, 2008). However, the low scores obtained on these questions were consistent with the scoring of positive items on the rest of the scale, and it is possible that these questions represent a distinct factor. As part of the confirmatory factor analysis of the WBIS-19, exploratory analyses assessed the value of combining these items with the five legitimacy items created specifically for the present study (see Section 5.3.2).

5.2.2.4. Group permeability

Perceptions of group boundary permeability were assessed with three questions from the Anti-Fat Attitudes Questionnaire-Revised Willpower subscale (D. M. Quinn & Crocker, 1999), which assess weight-loss controllability beliefs. Higher scores indicate stronger belief that individuals have control over their weight, and thus represent greater perceived group permeability. Internal reliability was .92 in the present sample.

5.2.2.5. Internalised weight stigma

Internalised weight stigma was measured with the 19-item version of the Weight Bias Internalization Scale (WBIS; Durso & Latner, 2008). Although the 11-item version of the WBIS is more commonly used, Schvey and colleagues (2013) used the full 19-item scale in an online sample of overweight and obese adults and reported high internal reliability (Cronbach's α = .90). The 19-item version (WBIS-19) also includes questions more closely linked with the conceptualisation of internalised weight stigma as a form of self-devaluation.[36] In the WBIS-19, six items relate to weight-related self-devaluation, two to weight-related psychological distress, two to desire for change, two to body image, one to concern regarding others' opinions, three to perceived legitimacy of weight stigma, two to self-blame, and one to fat identity. Internal reliability of the WBIS-19 was .92.

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[36] See Chapters 1 and 3 for further discussion.

Exploratory and confirmatory factor analyses were conducted on the WBIS-19 prior to its use in subsequent analyses to determine the optimal construct operationalisation (see Section 5.3.2).

5.2.2.6. Self-esteem

Global self-esteem was measured using the Rosenberg Self-Esteem Scale (Rosenberg, 1965). Cronbach's α in the present sample was .90.

5.2.2.7. Stigma resistance

Stigma resistance was assessed using a measure developed specifically for the present study. The questionnaire comprised eight items designed to capture cognitive, affective, and behavioural responses ranging from individual mobility, through indifference, to resistance. Five of the items were adapted from Jetten et al. (2011) and Barreto & Ellemers (2005). Sample items include: "I bring the negative treatment of overweight/fat people to the attention of the appropriate authorities or people in charge." "The way overweight/fat people are treated makes me angry." "It's up to me to change my weight if I want to be treated better" (reverse scored). Higher scores represent greater resistance to stigma.

One item, "I want to lose weight to reduce my chances of being discriminated against," had a low item-total correlation (.29; item-total correlations for other items was .58–.78). This item was deleted from the final scale, leaving seven questions remaining. Exploratory factor analysis (EFA) using principal axis factoring and direct oblimin rotation confirmed a single-factor structure. Cronbach's α of the seven-item scale was .88.

5.2.3. Handling of missing values

Missing values analysis of questionnaire items indicated nineteen participants had missing responses. Little's MCAR test was used to assess the pattern of missingness. A non-significant *p* value on this test indicates that data are missing completely at random (MCAR). In this case, Little's MCAR test was statistically significant, $\chi^2(1,239) = 13,930$, $p = .01$, indicating the data were not missing completely at random. Case by case inspection indicated that 13 participants had only one or two data points missing, but six participants had more than 5% missing data (equivalent to at least four data points across the study). Five of these had data missing on the group identification scale, four on the stigma consciousness scale, and one on the resistance scale. Investigation of response patterns indicated no evidence of unengaged responding; rather, some items on the group identification scale, in particular, appeared difficult for these participants to answer. Participants with over 20% of items unanswered on any questionnaire were excluded from analyses using that variable. For the thirteen participants with one or two data points missing across the study, eleven were on scales that used averaged scores, so no imputation was undertaken. The RSE was the only questionnaire in the present study that used a sum score; one missing data point each for two participants was replaced with the participant's mean score for the remaining nine items.

Fifty-one participants (5.3%) were missing height and/or weight information such that BMI could not be computed. Missing values analysis indicated no overall pattern of missingness, Little's MCAR test $\chi^2(62) = 57.4$, $p = .64$, indicating that these data were missing completely at random, and independent samples *t*-tests confirmed no differences on any study variable between participants with or without BMI data available. As BMI was collected predominantly for descriptive purposes, and was not included in the hypothesised model, missing BMI values were not imputed. Missing values on demographic variables were also not imputed.

5.2.4. Data analysis

Confirmatory factor analysis (CFA) was conducted using Mplus version 8 (Muthén & Muthén, 1998–2017). All other analyses were conducted using IBM SPSS for Mac v23.

5.2.4.1. Preliminary analyses

Descriptive statistics were obtained, and differences by demographic characteristics were explored using independent *t*-tests, one-way ANOVA with robust test of equality of means, and χ^2 tests. Bivariate correlations and partial correlations controlling for BMI were calculated for continuous study variables.

5.2.4.2. Factor analysis of WBIS-19

The data were split randomly into two groups, each including approximately 50% of cases. EFA was conducted on one half of the data (N = 481), using principal axis factoring and direct oblimin rotation with Kaiser normalisation. It was stipulated that item factor loadings > .3 represented a substantive contribution of the item to a factor. As recommended by Stevens (2002; cited in Field, 2013) for samples greater than 250, factor extraction decisions were based on the scree plot, rather than eigenvalues. Internal reliability was calculated for each derived factor.

CFA was conducted with the other half of the data (N = 450) using maximum likelihood estimation. Model fit was assessed using χ^2 values, comparative fit index

(CFI) and standardised root mean squared residuals (SRMR). Cut-off values of .95 for the CFI and .08 for SRMR are generally considered to indicate a relatively good fit of the hypothesised model to the observed data (Hu & Bentler, 1999). However, CFI tends to decline with increasing number of indicators in the model (Kenny & McCoach, 2003). In the present analysis, the maximum number of variables per factor was 19, thus, following Chen et al (2012), a less stringent cut-off of .90 was used for the CFI to indicate goodness of fit in models with higher number of factor loadings. Additionally, as the sample size approached 500, root mean square error of approximation (RMSEA) and its 90% confidence interval would be more reliable than in smaller samples (Hu & Bentler, 1999), and was included as an additional measure of model fit. The RMSEA is an indicator of the proportion of variance not explained in the model. A value of RMSEA of .06 or lower is considered indicative of good model fit, below .08 a reasonable fit, and values above .10 indicate poor model fit (Browne & Cudeck, 1992; Hu & Bentler, 1999).

Model comparison (i.e., selection of superior models) was assessed using fit indices (CFI, RMSEA, SRMR) plus χ^2 difference tests. A reduction in χ^2 greater than the critical value for the change in degrees of freedom indicates a significantly better model fit.

5.2.4.3. Testing hypothesised model of stigma resistance

The hypothesised model was tested with a series of moderated moderation analyses using the PROCESS macro for SPSS v2.15 (Hayes, 2013), model 3 (see Figure 5.2). The dependent variables were: internalised weight stigma, global self-esteem, and stigma resistance.

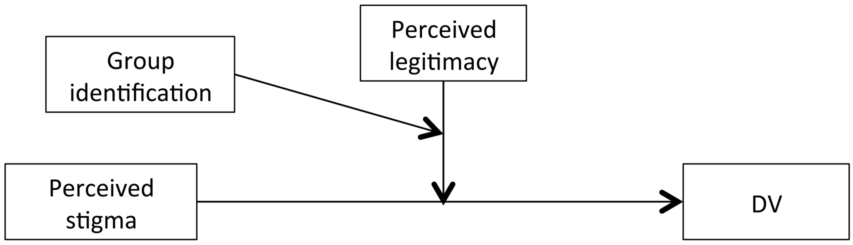

Figure 5.2. Schematic demonstrating moderated moderation analysis, where the relationship between perceived stigma and the outcomes of interest may be influenced by levels of perceived legitimacy, domains of group identification, and their interactions with each other and with perceived stigma. DV = dependent variable.

Alternative measures of group identification were tested as moderators in the model: first, the two superordinate dimensions – group investment and group self-definition; then, the five individual subscales – group solidarity, group satisfaction, group centrality, group self-stereotyping, and group homogeneity – were also tested to explore any differences within the investment and self-definition constructs.

In order to determine whether perceived barrier permeability influenced the proposed model, all analyses were additionally run separately for individuals who responded below the midpoint on the weight controllability beliefs scale – that is, they tended to disagree with statements about weight being completely under individual control, and individuals who responded at or above the midpoint – that is, endorsing beliefs about weight management being largely due to willpower and effort.

Bias-corrected and accelerated bootstrap standard errors and 95% confidence intervals for effects were derived using 10,000 bootstrap samples with replacement. Effects were considered statistically significant if the 95% confidence interval did not include zero. The significance of differences between slopes was tested using Free Statistics Calculators version 4.0 (danielsoper.com).

5.2.4.4. Decision tree analysis

Decision tree analysis was conducted to determine how individuals could best be classified into one of the three proposed terminal outcomes along the self-stigma continuum described in the Corrigan and Watson model of self-stigma, using their levels of perceived weight stigma, perceived legitimacy, group identification, and weight-controllability beliefs as predictors. Individuals who endorsed internalised weight stigma beliefs above the neutral mid-point were termed “internalisers.” The remaining participants were nominated as either “indifferent” if they scored at or below the midpoint on the Stigma Resistance scale, or “resisters” if they scored above the midpoint.

The chi-squared automatic interaction detection (CHAID) algorithm (IBM Corp, 2015; Kass, 1980) was used to grow the model. CHAID uses a stepped procedure to identify the cut-points of the possible predictors that best differentiate between the three groups using a significance-testing framework using the χ^2 test for independence. At each step, the algorithm considers all possible predictors, identifies the best partition for each possible predictor, and selects the one that would best differentiate between outcome options on the dependent variable (i.e., has the lowest p value). The predictor is then further subdivided, being split into ten intervals, or child nodes, and neighbouring nodes are iteratively tested for statistical significance of dependence between the split variable and the outcome variable. Only cut points that produce statistically significant group splits are retained, with interim categories merged together. The CHAID algorithm treats cases with missing data on a predictor as a distinct category and allocates these cases as appropriate based on similarity of outcome prediction to valid cases. To prevent over-fitting, the minimum node sizes were set at 100 participants for parent nodes and 50 for child nodes. Nodes not meeting these criteria were not split. The significance level set for splitting and merging criteria was set at .05, with Bonferroni correction to adjust for multiple comparisons. This procedure is repeated iteratively until further splits are independent of the outcome variable, at which point, tree growth is terminated. The final model provides information on the levels of predictors that best differentiate between the outcome groups.

K-fold cross-validation was used to assess generalisability of the model (IBM Corp, 2015; Ounpraseuth, Lensing, Spencer, & Kodell, 2012). The data set is randomly divided into ten subsamples, or folds, of approximately equal size. A series of tree models are then generated, each excluding data from one of the subsamples. For each tree, the derived model is applied to its excluded subsample to estimate misclassification risk. For categorical dependent variables, this represents the proportion of cases incorrectly classified when cases are assigned to the majority outcome in their respective terminal node. The cross-validated risk estimate for the final tree model, which includes the full data set, is calculated as the mean risk for all ten validation trees, and is an indicator of the generalised predictive accuracy of the tree.

5.2.4.5. Stigma resistance as a predictor of psychological wellbeing

Finally, stigma resistance was explored as a predictor of psychological wellbeing outcomes, given levels of perceived stigma. Hierarchical linear regression was conducted with demographic variables and BMI entered at step 1, perceived stigma at step 2, and stigma resistance entered at step 3.

5.3. Results

5.3.1. Sample statistics

A total of 1,154 participants began the study and 963 (83.4%) completed it.
The sample was predominantly female and White (see Table 5.1). Twenty-six participants (2.7%) had a BMI less than 25 kg/m^2 based on self-reported height and weight. Independent samples *t*-tests showed that these participants had significantly lower scores on measures of internalised weight stigma, group solidarity, and stigma resistance, and higher scores on perceived legitimacy of societal weight stigma, and weight-controllability beliefs than did the remaining participants.[37] As a result, these participants were excluded from subsequent analyses. Five participants were aged over 69 years (70–80 years) and one was aged 17. These participants fell outside the age range specified in the approved ethical application for this study and were also excluded. The final sample size was therefore 931.

[37] See Appendix H.

Table 5.1. *Study 5 Sample Characteristics*

Variable	*M* (*SD*) / %	Missing
Age (range 18–69 years)	40.2 (11.4)	3.8%
Gender		2.9%
Male	9.7%	
Female	85.5%	
Other	1.9%	
Geographic location		3.4%
United Kingdom	34.6%	
North America	51.2%	
Europe	3.8%	
Australia/New Zealand	5.4%	
Other[a]	1.1%	
Race/Ethnicity		8.1%
White	83.7%	
Black (e.g., African American, African Caribbean)	1.9%	
Hispanic	1.5%	
Asian	1.2%	
Multi-racial[b]	2.1%	
Other[c]	8.2%	
BMI (range 25.0–95.0 kg/m^2)	40.2 (10.8)	5.5%
BMI 25.0 – 29.9	14.1%	
BMI 30.0 – 34.9	21.4%	
BMI 35.0 – 39.9	17.9%	
BMI 40.0 – 49.9	27.8%	
BMI ≥ 50.0	13.3%	
Highest level of education		3.3%
Professional or doctorate degree	11.7%	
Master's degree, post-graduate certificate or diploma	28.1%	
University or college degree	35.7%	
Vocational	7.8%	
Secondary/High school	8.3%	
Other	5.0%	
Profession		3.2%
Higher managerial, administrative, or professional	18.4%	
Intermediate managerial, administrative, or professional	27.0 %	
Supervisor, clerical, lower managerial, administrative, or	15.9%	
Skilled manual worker	2.0%	
Semi-skilled or unskilled manual worker	1.2%	
Student	9.5%	
Unemployed	5.2%	
Other	17.7%	

Note. *N* = 931. BMI = body mass index.
[a] Middle East, *n* = 5; Asia, *n* = 5; South America, *n* = 4; Africa, *n* = 1. [b]White–Native American, *n* = *5*; White–Black, *n* = 4; White–Arab, *n* = 2; White–Asian, *n*= 1; White–Indian, *n* = 1; Unspecified, *n* = 8.
[c]South Asian, *n* = 8; Native American, *n* = 3; First Nations, *n* = 1; Greek, *n* = 1; Middle Eastern, *n* = 1.

5.3.2. Factor analysis of WBIS-19

Exploratory factor analysis based on a random half (approximate) of the sample (N = 484) suggested a three-factor structure for the WBIS-19 (see Table 5.2). The first factor (F1) included eleven items, pertaining to: self-blame (2 items); appearance (2 items); fear of others' attitudes (1 item); desire for change (2 items); psychological distress (2 items); self-devaluation (1 item); and fat identity (1 item). The two self-blame items also loaded onto the second factor (F2), although with lower factor loadings, and were considered to load primarily onto F1 unless otherwise stated. F2 comprised four items: self-blame (2 items) and perceived legitimacy (2 items). The third factor (F3) comprised six items, five of which pertained to self-devaluation and one that I had classified *a priori* to pertain to perceived legitimacy (item 19). However, items 14 and 18 clearly refer to the justness of societal attitudes toward higher-weight people in general, whereas item 19 could be said to relate to personal self-worth; thus F3 clearly pertains to one's worth as an individual as moderated by weight status.

In terms of identifying the underlying construct encapsulated by each factor, F1 is almost identical to the WBIS-11 and, as such, lacks conceptual clarity; however, it could be loosely conceived as weight-related distress – negative cognitive and affective states resulting from weight status, for whatever reason, whether related to how you look, how others treat you, if you blame yourself for getting that way, and so on. F2 reflects perceived legitimacy of societal weight stigma, and F3 represents weight-related self-devaluation.

Table 5.2. *Exploratory Factor Analysis of WBIS-19*

Item	F1	F2	F3
1. It's my fault that I'm overweight	.48	.46	
2. As an overweight person, I feel that I am just as competent as anyone[a]	–	–	.74
3. I am less attractive than most other people because of my weight[a]	.69	–	–
4. I feel anxious about being overweight because of what people might think of me[a]	.72	–	–
5. I wish I could drastically change my weight[a]	.84	–	–
6. If only I had more willpower I wouldn't be the weight that I am	.59	.48	–
7. Whenever I think a lot about being overweight, I feel depressed[a]	.79	–	–
8. I feel that being overweight doesn't interfere with my ability to be a good and decent person	–	–	.55
9. I hate myself for being overweight[a]	.76	–	–
10. My weight is a major way that I judge my value as a person[a]	.61	–	–
11. I don't feel that I deserve to have a really fulfilling social life, as long as I'm overweight[a]	–	–	.47
12. I am OK being the weight that I am[a]	.74	–	–
13. As an overweight person, I feel that I am just as deserving of respect as anyone	–	–	.78
14. It really bothers me that people look down on overweight people	–	.74	–
15. Because I'm overweight, I don't feel like my true self[a]	.76	–	–
16. I feel that being an overweight person does not make me unworthy of a loving relationship	–	–	.34
17. Because of my weight, I don't understand how anyone attractive would want to date me[a]	.61	–	–
18. I believe that society's prejudice against overweight people is unfair	–	.70	–
19. If other people don't treat me with respect, I should put up with it because of my weight	–	–	.61
Internal reliability[b]	.93	.80[c]	.77

Note. N = 481. Standardised factor loadings displayed. WBIS =Weight Bias Internalization Scale. [a]Items included in standard WBIS-11. [b]Internal reliability statistic is Cronbach's α except for two-item F2, which is Spearman-Brown coefficient. [c]Items 1 and 6 not included – assumed to load onto F1 only. Alpha with items 1 and 6 included = .76.

CFA using the remainder of the sample (N = 450) found that the unadjusted three-factor structure of the WBIS-19 was a poor fit to the data (see Table 5.3). Items 1 and 6 (self-blame) on F1 had a modification index of 184. Allowing these items to covary significantly improved the fit of the model. Further improvements were obtained by allowing items 5 and 12 (desire for change), 3 and 17 (appearance), and

14 and 18 (perceived legitimacy) to covary. Only items with strong content similarity were allowed to covary. The final 3-factor model was an adequate fit to the data.

Table 5.3. *Confirmatory Factor Analysis of WBIS-19*

Model	χ^2	*df*	RMSEA [90% CI]	CFI	SRMR
WBIS-19					
Unidimensional	1343	152	.132 [.126, .139]	.730	.096
With items covaried[a]	719	148	.093 [.086, .099]	.871	.078
Three-factor	952	153	.108 [.101, .114]	.819	.105
With items covaried[a]	590	149	.081 [.074, .088]	.900	.101
WBIS-17					
Unidimensional	936	119	.124 [.116, .131]	.797	.079
With items covaried[a]	576	116	.094 [.086, .102]	.886	.068
Two-factor	787	120	.111 [.104, .119]	.834	.101
With items covaried[a]	452	117	.080 [.072, .088]	.917	.101
WBIS-11					
Unidimensional	285	44	.110 [.098, .123]	.917	.046
With items covaried[a]	165	42	.081 [.068, .094]	.957	.037
WBIS-Self-devaluation					
Unidimensional[b,c]	18[c]	10	.041 [.000, .072]	.988	.030
WBIS-Distress					
Unidimensional	502	45	.150 [.139, .162]	.852	.071
With items covaried[a]	162	42	.080 [.067, .093]	.961	.045

Note. WBIS-19 comprises items 1–19. WBIS-17 excludes items 14 and 18 (i.e., F2). WBIS-11 is standard scale. WBIS-Self-Devaluation and WBIS-Distress represent the items making up the WBIS-19 F3 and F1 factors, respectively. CFI = Comparative Fit Index; CI = confidence interval; *df* = degrees of freedom; RMSEA = root mean square error of approximation; SRMR = standardised root mean squared residual; WBIS = Weight Bias Internalization Scale. All χ^2 $p < .001$ unless otherwise stated.
[a]Pairs of items 1 and 6, 5 and 12, 3 and 17, and 14 and 18 covaried in all models in which they were included;. [b]One pair of items with modification index > 10 but unsuitable to covary based on face validity; [c]$p = .06$.

An alternative model was tested where items that had cross-loaded onto more than one factor in the EFA (items 1 and 6) were allowed to load onto their secondary factor (Legitimacy) instead of their primary factor (Distress). This model was a worse fit for the data than the corresponding model with the items loading onto the Distress factor. An alternative two-factor model (WBIS-17) that excluded the two-item Perceived Legitimacy factor was also an adequate fit for the data. The original unidimensional WBIS-11 was a good fit for the data, as were the items making up the Distress factor when tested individually as a unidimensional model. The six items making up the Self-devaluation factor were an excellent fit for the data on all fit indices.

Thus, based solely on model fit, the unidimensional WBIS-11, WBIS–Self-devaluation, and WBIS–Distress would all be good structural models, and the three-factor WBIS-19 and two-factor WBIS-17 acceptable structural models. However, the decision on the most suitable model to use for research purposes must lie with the substantive content and interpretability of the factors, and alignment with the conceptualisation of internalised weight stigma. On this basis, any of the two- or three-factor models or the unidimensional self-devaluation model could be considered superior to the WBIS-11.

For the purpose of the present study, the two perceived legitimacy items (items 14 and 18) were tested as possible adjuncts to the five items on the Legitimacy scale created for the study. Internal reliability of the original 5-item scale was .79, and of the five items plus WBIS-19 items 14 and 18 was .84. Thus, scores on these seven items were used to assess perceived legitimacy of weight stigma and the weight-related self-devaluation and distress factors were used to assess different aspects of weight-related self-stigma.

5.3.3. Descriptive statistics

Descriptive statistics for study variables are displayed in Table 5.4. The group identification self-definition dimension was only weakly correlated with BMI and perceived discrimination, and not significantly correlated with global self-esteem, internalised weight stigma, or perceived legitimacy. In contrast, group self-investment was strongly negatively associated with internalised weight stigma, although this effect was driven by the solidarity and satisfaction components; group centrality had only a small association with weight-related distress, and none with weight-related self-devaluation. The modest correlation between group investment and global self-esteem was driven primarily by a moderately strongly relationship between group satisfaction and self-esteem. Group solidarity had only a small association, and group centrality was not linked with self-esteem.

Perceived stigma correlated positively with group solidarity and centrality, but had a small, marginally significant (p = .06), negative association with group satisfaction. Stigma resistance was moderately negatively correlated with self-stigma variables, and had a small positive association with global self-esteem.

Differences in study variables by demographic characteristics are displayed in full in Appendix I. Female participants reported higher levels of stigma consciousness, overall group investment, group solidarity, and stigma resistance, and lower self-devaluation, perceived legitimacy of weight stigma, and weight controllability beliefs. Age was positively associated with self-esteem, and negatively related to stigma consciousness, internalised weight stigma variables, and weight controllability beliefs.

Table 5.4. *Means, Standard Deviations, and Bivariate Correlations Between Study Variables*

Variable	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. BMI	-.08*	.31‡	-.04	-.10†	-.27‡	.29‡	.30‡	.16‡	.25‡	.13‡	.09†	.15‡	-.33‡	.29‡
2. Self-esteem	1	-.39‡	-.58‡	-.67‡	-.13‡	.21‡	.09*	.41‡	-.02	-.05	.00	-.08*	-.08*	.21‡
3. Perceived stigma		1	.17‡	.23‡	-.27‡	.21‡	.30‡	-.06	.29‡	.09†	.05	.11†	-.32‡	.25‡
4. WBIS–Self-devaluation			1	.59‡	.46‡	-.32‡	-.26‡	-.44‡	-.02	.05	-.03	.13‡	.28‡	-.45‡
5. WBIS–Distress				1	.35‡	-.52‡	-.36‡	-.71‡	-.14‡	-.02	-.06	.04	.40‡	-.54‡
6. Legitimacy-7[a]					1	-.46‡	-.49‡	-.39‡	-.17‡	-.04	-.10†	.03	.59‡	-.73‡
7. Group investment[b]						1	.87‡	.81‡	.72‡	.42‡	.39‡	.34‡	-.50‡	.67‡
8. Group solidarity							1	.54‡	.51‡	.48‡	.43‡	.41‡	-.50‡	.66‡
9. Group satisfaction								1	.34‡	.22‡	.23‡	.16‡	-.40‡	.58‡
10. Group centrality[b]									1	.29‡	.26‡	.26‡	-.28‡	.32‡
11. Group self-definition										1	.88‡	.88‡	-.09†	.16‡
12. Self-stereotyping											1	.55‡	-.11†	.20‡
13. Homogeneity												1	-.05	.08*
14. Weight controllability													1	-.67‡
15. Stigma resistance														1
Possible range	0–30	0–5	1–7	1–7	1–7	1–7	1–7	1–7	1–7	1–7	1–7	1–7	1–7	1–7
Mean	17.5	3.5	2.1	4.7	1.9	3.3	3.9	2.6	3.6	3.1	3.4	2.7	3.0	4.7
Standard deviation	5.9	0.8	1.0	1.4	0.9	1.2	1.7	1.2	1.8	1.2	1.3	1.3	1.7	1.4
Actual range	0–30	1.0–5.0	1.0–6.7	1.1–7.0	1.0–5.7	1.0–7.0	1.0–7.0	1.0–7.0	1.0–7.0	1.0–7.0	1.0–7.0	1.0–7.0	1.0–7.0	1.1–7.0

Note. N = 931. Partial correlations controlling for BMI did not significantly affect correlation coefficients (all absolute Z < 1.8, p > .05). BMI = body mass index; WBIS = Weight Bias Internalization Scale.

[a]Five items for legitimacy scale created for present study plus WBIS items 14 and 18 (Perceived Legitimacy factor). [b]Excluding item 8 from original scale.

*p < .05; †p < .01; ‡p < .001.

Higher levels of education were also associated with increased global self-esteem, group investment, group satisfaction, and stigma resistance, and lower internalised weight stigma, weight-related self-devaluation and distress, perceived legitimacy, and weight controllability beliefs. All of these relationships remained significant after controlling for age. Professional standing was significantly associated with several variables, but no consistent pattern emerged. Thus, gender, age, education, profession, and BMI were tested as potential covariates of the moderated moderation models.

It was not possible to test differences by ethnicity due to the low number of non-White participants. Regional differences between the UK and North America (both N > 300) indicated significant differences on all measures, with UK participants reporting lower levels of self-esteem, stigma consciousness, all aspects of group identity, and stigma resistance, and higher levels on measures of internalised weight stigma, perceived legitimacy, and weight controllability beliefs. Other regions yielded too few participants to reliably compare.

5.3.4. Hypothesised model

Data were analysed separately for participants with weight controllability beliefs below the neutral midpoint on the willpower scale, that is, who tended to disagree that weight was entirely under individual control and therefore conceived the group barriers to be relatively impermeable (N = 639), and for those who scored at or above the midpoint, who were considered to perceive the group barriers to be relatively permeable (N = 292).

Due to the skewed nature of perceived legitimacy (M = 1.9, SD = 0.9, skewness = 1.2) and, to a lesser extent, group investment (skewness = 0.39), group self-definition (skewness = 0.24) and perceived stigma levels (skewness = -0.43) (see Appendix J), low and high values of the moderators were set at the 10th and 90th percentiles for each measure to best explore the relative impact across the range of the moderators. Low and high levels of perceived stigma were similar across barrier permeability groups, however some levels of the moderators differed across groups. High perceived legitimacy 4.0 versus 2.3 in the barrier permeable versus impermeable group, respectively; low group investment 1.6 versus 2.1 and high group investment 3.7 versus 5.2 in the permeable versus impermeable groups, respectively.

The five components making up the Multicomponent Ingroup Identification Scale were tested individually as predictors in the regression analyses. Although there were some small variations between the individual components and their parent dimension, none of these differences were statistically significant. Thus, findings for the superordinate dimensions, i.e., group investment and group self-definition, are reported.

Neither gender nor BMI significantly predicted any outcome measure. Age and education were significant predictors of global self-esteem and internalised weight stigma outcomes but not of stigma resistance, and profession was a marginal predictor of both internalised weight stigma and stigma resistance. However, inclusion of these covariates in the model had almost no effect on other variables or the overall relationships with outcome variables. Thus, results are presented for models without covariates.

The conditional effects of perceived stigma at high and low values of the moderators are presented separately for each outcome and by barrier permeability beliefs.

5.3.4.1. Weight-related self-devaluation

Three-way interactions between perceived stigma, perceived legitimacy, and group investment were non-significant in both permeability conditions.[38] However, the conditional effect of perceived stigma on weight-related self-devaluation with perceived legitimacy and group investment as moderators (Figure 5.3A and 5.3B) were generally significant at all but the highest levels of the moderators – that is, more stigma resulted in significantly more self-devaluation (see Table 5.5). Perceiving societal weight stigma to be unjustified and being more invested in the ingroup were somewhat protective against self-devaluation, although differences tended to be small. The only notable difference by permeability condition was in individuals who believed weight stigma was illegitimate and were more highly invested in the group "Overweight/Fat." This combination was associated with smaller increases in self-devaluation with increasing stigma than other moderator combinations, with the protective effect being strongest when barriers were considered impermeable, although the difference in effect size compared with the permeable condition was not statistically significant.

[38] Full regression results for all outcomes are presented in Appendix K.

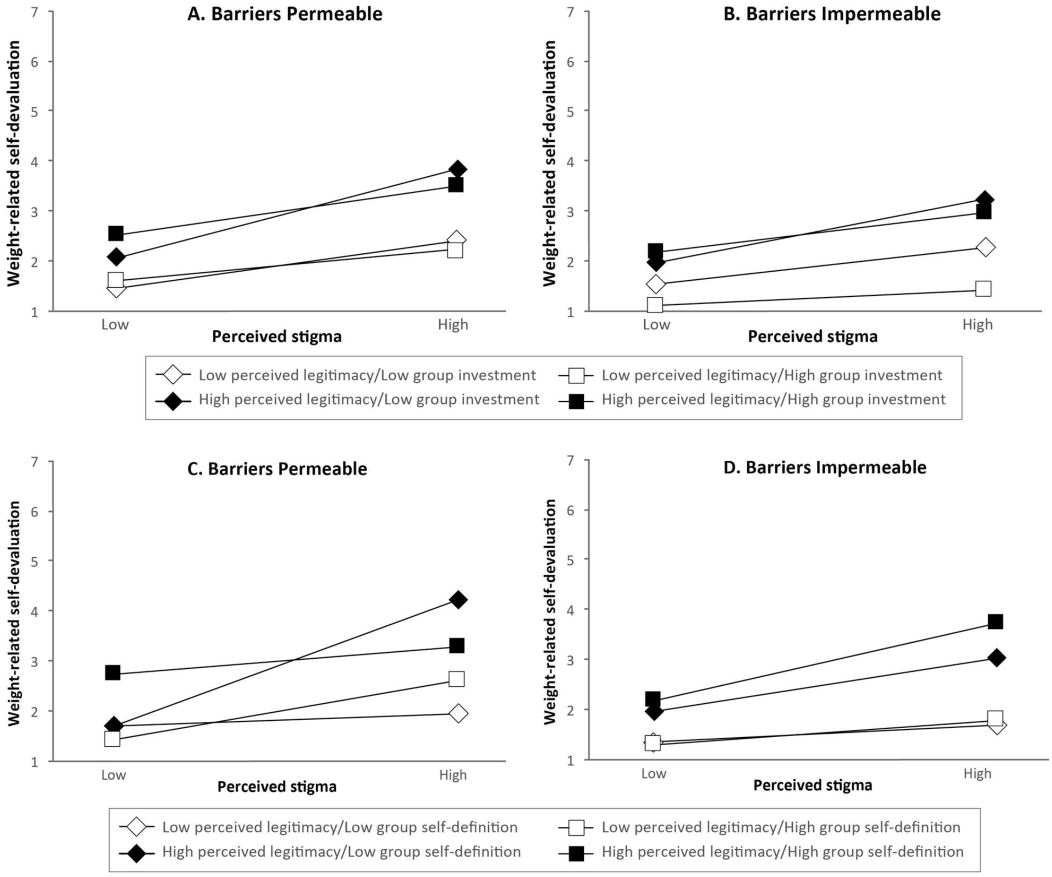

Figure 5.3. Conditional effects of perceived stigma, group identification, and perceived legitimacy on weight-related self-devaluation

Table 5.5. *Slope Gradients, Standard Errors, and Statistical Significance for Conditional Effects of Perceived Stigma on Weight-Related Self-Devaluation*

Slope	Barriers permeable						Barriers impermeable					
	B	*SE*	*t*	*p*	LLCI	ULCI	*B*	*SE*	*t*	*p*	LLCI	ULCI
Perceived legitimacy/Group investment												
Low/Low	0.42	0.16	2.6	.01	0.10	0.75	0.41	0.10	4.0	< .00	0.21	0.61
High/Low	0.80	0.24	3.3	.00	0.32	1.28	0.73	0.16	4.5	< .00	0.42	1.05
Low/High	0.29	0.16	1.9	.06	-0.01	0.60	0.16	0.07	2.5	.01	0.03	0.29
High/High	0.43	0.23	1.9	.06	-0.01	0.88	0.44	0.31	1.4	.16	-0.17	1.04
Perceived legitimacy/Group self-definition												
Low/Low	0.11	0.19	0.6	.57	-0.27	0.48	0.16	0.12	1.3	.18	-0.08	0.40
High/Low	1.17	0.21	5.5	< .00	0.75	1.59	0.55	0.22	2.6	.01	0.12	0.98
Low/High	0.55	0.19	2.9	.00	0.17	0.93	0.25	0.12	2.1	.04	0.01	0.48
High/High	0.26	0.21	1.2	.21	-0.15	0.67	0.89	0.18	0.5	< .00	0.45	1.14

Note. Low and high values set at 10th and 90th percentile, respectively. *B* = unstandardised coefficient; LLCI = lower level 95% confidence interval; ULCI = upper level 95% confidence interval. Low and high values set at 10th and 90th percentile, respectively.

The interaction between perceived legitimacy and group self-definition was more pronounced than that for perceived legitimacy and group investment when barriers were considered permeable but less so when barriers were considered impermeable (see Figure 5.3C; three-way interaction B = -0.2, SE = 0.1, t = -2.7, p = .01; non-significant for barriers impermeable), such that among people who endorsed higher levels of perceived legitimacy of weight stigma and considered boundaries to be permeable, self-defining as "overweight/fat" appeared somewhat protective against self-devaluation when perceived stigma was high, whereas low self-definers saw the steepest increase in self-devaluation at higher levels of perceived stigma.

5.3.4.2. Weight-related distress

Overall, levels of weight-related distress were higher than levels of weight-related self-devaluation in all conditions (see Figure 5.4). Higher perceived stigma, higher perceived legitimacy, lower group investment, and greater weight-controllability beliefs were each individually associated with greater distress, but there was little interaction between the variables. Group self-definition did not influence levels of distress. The conditional effects of perceived stigma on distress were significant at all levels of the moderators in all models (see Table 5.6). Three-way interactions were non-significant in all conditions.

5.3.4.3. Global self-esteem

The only significant predictor of global self-esteem was level of perceived stigma, with more stigma being associated with reduced self-esteem across the board, with the effect being most pronounced in the barriers-impermeable condition. Three-way interactions were non-significant in all conditions.

The conditional effects of perceived stigma on self-esteem were significant at all levels of the moderators in all models, such that more stigma was associated with reduced global self-esteem, with the exception of the combination between high perceived legitimacy and high group investment in the barriers impermeable condition (see Figure 5.5 and Table 5.7).

In the barriers-impermeable condition, low perceived legitimacy plus high group investment again appeared to be somewhat protective, being associated with a 4-point improvement in RSE scores compared with low legitimacy plus low group investment under low stigma conditions. The effect was even greater under high stigma conditions, where high group investment was associated with a 6-point higher RSE score compared with low group investment, despite the same low level of perceived legitimacy. Again, when barriers were considered permeable, individuals who considered societal weight stigma more legitimate and were low-definers had higher self-esteem under low-stigma conditions than did high-legitimate high-definers, but a much steeper reduction under high-stigma conditions – an 11-point drop in RSE scores, compared with a 5-point drop for high-definers; slope difference $t(572) = 1.90$, $p = .06$.

5.3.4.4. Stigma resistance

Overall, levels of stigma resistance were higher when group barriers were perceived to be impermeable (see Figure 5.6 and Table 5.8). Levels of stigma resistance tended not to vary based on levels of perceived stigma, but remained relatively constant, defined only by levels of perceived legitimacy and group identification.

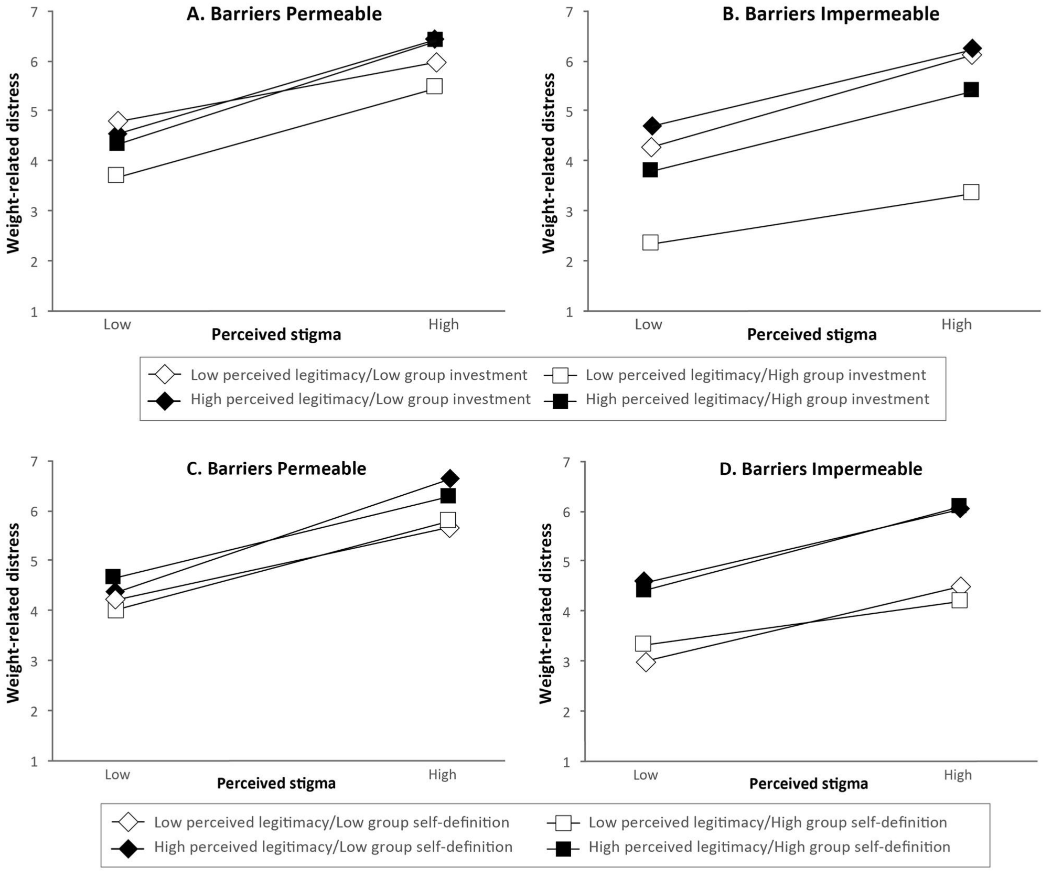

Figure 5.4. Conditional effects of perceived stigma, group identification, and perceived legitimacy on weight-related distress

Table 5.6. *Slope Gradients, Standard Errors, and Statistical Significance for Conditional Effects of Perceived Stigma on Weight-Related Distress*

	Barriers permeable						Barriers impermeable					
	B	*SE*	*t*	*p*	LLCI	ULCI	*B*	*SE*	*t*	*p*	LLCI	ULCI
Perceived legitimacy/Group investment												
Low/Low	0.56	0.17	3.2	.00	0.22	0.90	0.93	0.14	6.6	< .00	0.66	1.21
High/Low	0.85	0.16	5.5	< .00	0.55	1.16	0.78	0.13	6.0	< .00	0.52	1.03
Low/High	0.82	0.11	7.3	< .00	0.60	1.04	0.50	0.12	4.2	< .00	0.27	0.74
High/High	0.95	0.18	5.2	< .00	0.59	1.31	0.81	0.24	3.4	.00	0.34	1.28
Perceived legitimacy/Group self-definition												
Low/Low	0.67	0.25	2.7	.01	0.17	1.16	0.74	0.18	4.0	< .00	0.38	1.10
High/Low	1.03	0.19	5.5	< .00	0.66	1.40	0.72	0.21	3.5	< .00	0.32	1.12
Low/High	0.80	0.21	3.8	< .00	0.39	1.21	0.43	0.17	2.6	.01	0.10	0.75
High/High	0.74	0.13	5.7	< .00	0.49	1.00	0.82	0.14	6.0	< .00	0.55	1.08

Note. Low and high values set at 10th and 90th percentile, respectively. *B* = unstandardised coefficient; LLCI = lower level 95% confidence interval; ULCI = upper level 95% confidence interval. Low and high values set at 10th and 90th percentile, respectively.

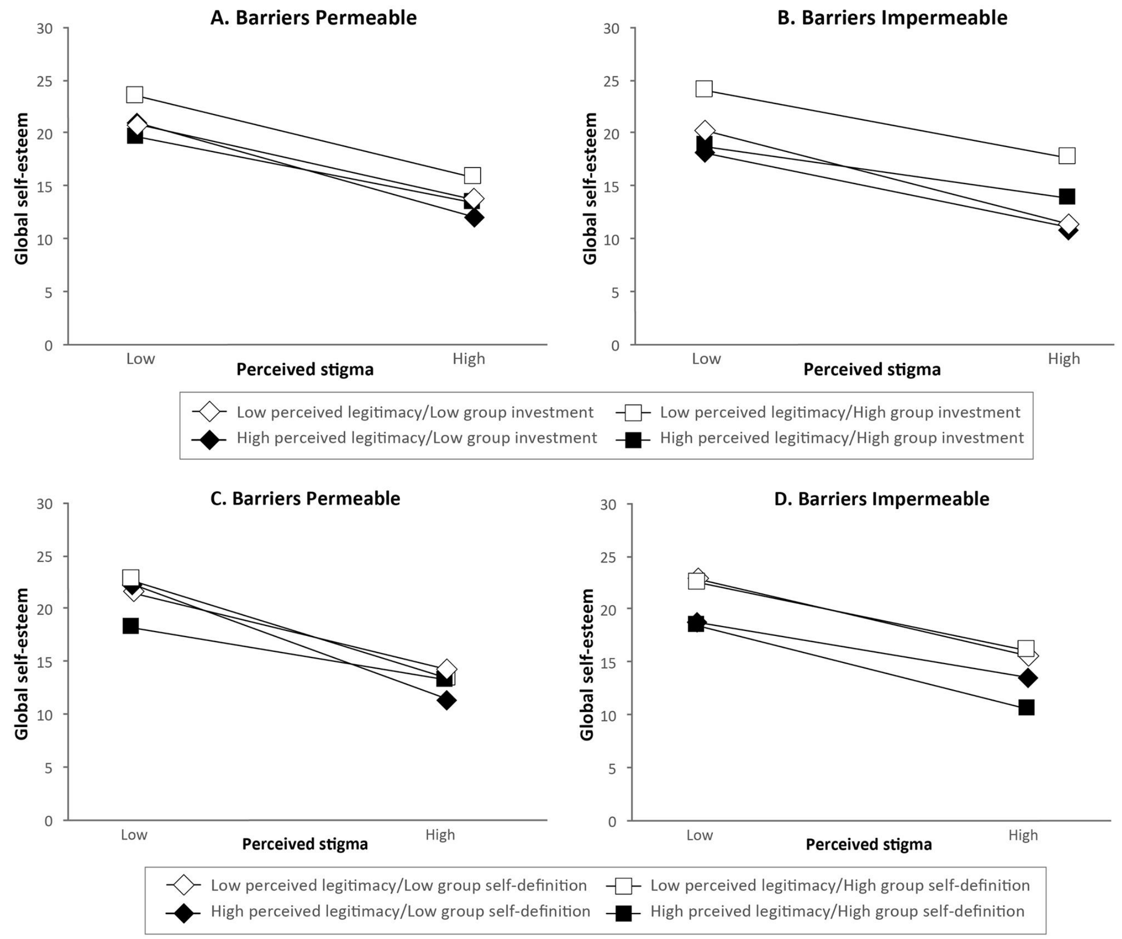

Figure 5.5. Conditional effects of perceived stigma, group identification, and perceived legitimacy on global self-esteem

Table 5.7. *Slope Gradients, Standard Errors, and Statistical Significance for Conditional Effects of Perceived Stigma on Global Self-Esteem*

	Barriers permeable						Barriers impermeable					
	B	*SE*	*t*	*p*	LLCI	ULCI	*B*	*SE*	*t*	*p*	LLCI	ULCI
Perceived legitimacy/Group investment												
Low/Low	-3.2	0.9	-3.6	< .00	-5.0	-1.5	-4.4	0.6	-6.9	< .00	-5.7	-3.2
High/Low	-4.1	1.0	-4.2	< .00	-6.0	-2.2	-3.6	0.8	-4.3	< .00	-5.2	-1.9
Low/High	-3.4	0.8	-4.4	< .00	-5.0	-1.9	-3.2	0.5	-6.0	< .00	-4.3	-2.2
High/High	-2.8	1.1	-2.6	.01	-5.0	-0.7	-2.5	1.6	-1.5	.12	-5.6	0.7
Perceived legitimacy/Group self-definition												
Low/Low	-3.3	1.2	-2.7	.01	-5.7	-0.9	-3.6	0.8	-4.7	< .00	-5.1	-2.1
High/Low	-5.0	1.1	-4.4	< .00	-7.3	-2.8	-3.1	0.5	-5.6	< .00	-4.2	-2.0
Low/High	-3.3	1.2	-2.9	.00	-5.6	-1.1	-3.2	0.7	-4.7	< .00	-4.6	-1.9
High/High	-2.3	0.9	-2.5	.01	-4.1	-0.5	-3.9	0.9	-4.4	< .00	-5.7	-2.2

Note. Low and high values set at 10^{th} and 90^{th} percentile, respectively. *B* = unstandardised coefficient; LLCI = lower level 95% confidence interval; ULCI = upper level 95% confidence interval. Low and high values set at 10^{th} and 90^{th} percentile, respectively.

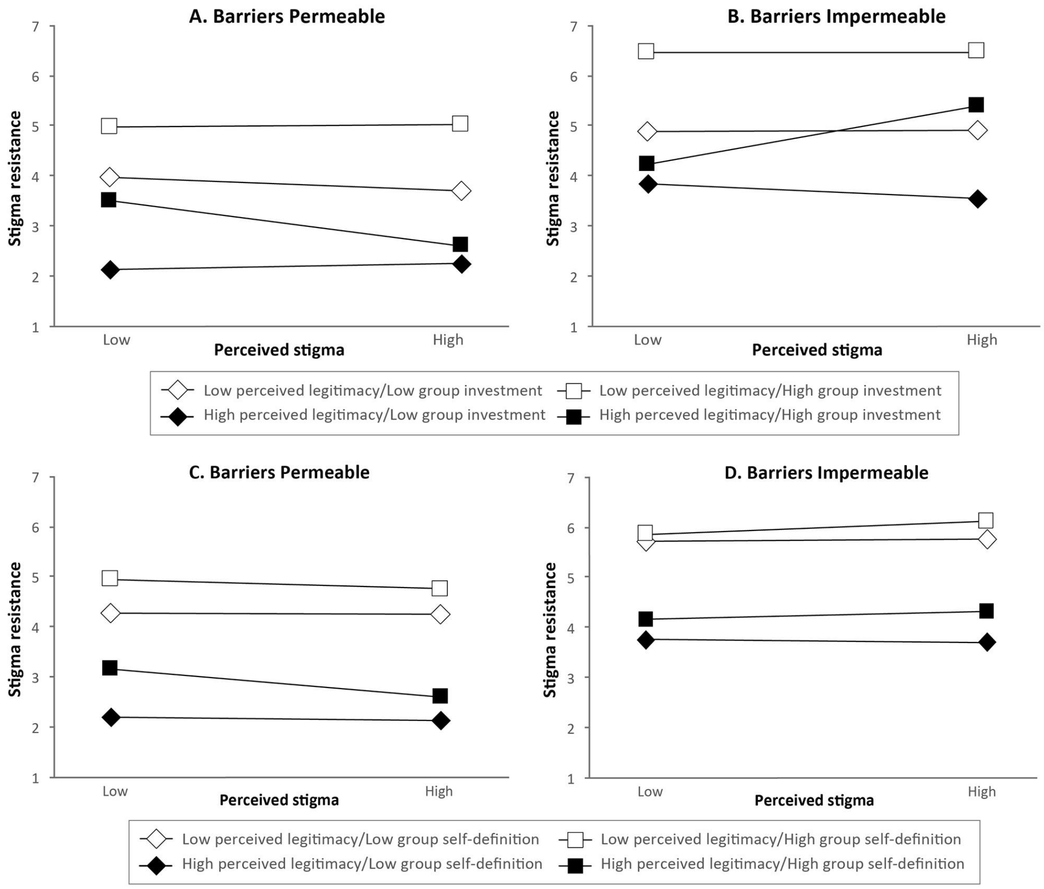

Figure 5.6. Conditional effects of perceived stigma, group identification, and perceived legitimacy on stigma resistance

Table 5.8. *Slope Gradients, Standard Errors, and Statistical Significance for Conditional Effects of Perceived Stigma on Stigma Resistance*

	Barriers permeable						Barriers impermeable					
	B	*SE*	*t*	*p*	LLCI	ULCI	*B*	*SE*	*t*	*p*	LLCI	ULCI
Perceived legitimacy/Group investment												
Low/Low	-0.12	0.25	-0.5	.63	-0.60	0.36	0.00	0.10	0.0	1.0	-0.20	0.20
High/Low	0.06	0.12	0.5	.64	0.18	0.29	0.00	0.08	-1.6	.11	-0.33	0.04
Low/High	0.03	0.28	0.1	.92	-0.52	0.58	-0.00	0.07	-0.0	.99	-0.14	0.14
High/High	-0.41	0.17	-2.4	.02	-0.75	-0.07	0.57	0.24	2.4	.02	0.10	1.04
Perceived legitimacy/Group self-definition												
Low/Low	-0.01	0.26	-0.4	.97	-0.52	0.50	0.03	0.11	0.3	.79	-0.19	0.25
High/Low	-0.04	0.18	-0.2	.84	-0.39	0.32	-0.03	0.11	-0.2	.82	-0.25	0.19
Low/High	-0.08	0.26	-0.3	.75	-0.58	0.42	0.14	0.09	1.5	.13	-0.04	0.32
High/High	-0.25	0.16	-1.5	.12	-0.56	0.07	0.08	0.11	0.8	.43	-0.13	0.30

Note. Low and high values set at 10^{th} and 90^{th} percentile, respectively. *B* = unstandardised coefficient; LLCI = lower level 95% confidence interval; ULCI = upper level 95% confidence interval. Low and high values set at 10^{th} and 90^{th} percentile, respectively.

Individuals lower in perceived legitimacy engaged in more stigma resistance than those who saw societal weight stigma as more justified across all models. The low-legitimacy high-investment combination was associated with the highest levels of stigma resistance, particularly when group barriers were considered impermeable, where it was associated with scores near the maximum on the Stigma Resistance scale. However, individuals who perceived societal weight stigma to be more justifiable but who were nevertheless highly invested in the group "Overweight/Fat" responded differently based on permeability beliefs. When group barriers were considered relatively permeable, stigma resistance significantly decreased in this group as perceived stigma increased (Figure 5.6A), but barrier impermeability had the opposite effect, with people reporting greater engagement in stigma resistance at higher levels of perceived stigma (Figure 5.6B). When self-defining as "overweight/fat" was used in place of group investment, a similar pattern was observed but the effect size was markedly attenuated and the changes were not statistically significant. The three-way interaction between perceived stigma, perceived legitimacy, and group investment was statistically significant in the barriers impermeable condition (B = 0.1, SE = 0.1, t = 2.2, p = .03). The three-way interaction using group self-definition as the measure of identification was non-significant.

Closer inspection of these relationships focusing on the individual components of group investment – group solidarity, group satisfaction and group centrality – indicated that the reduction in stigma resistance under the barriers-permeable high-stigma condition was driven predominantly by the solidarity (B = -0.50, p = .01) and centrality (B = -0.58, p = .01) components of group investment. More stigma was not associated with reduced stigma resistance in individuals high in group satisfaction (B = 0.10, p = .68). In contrast, under barriers-impermeable conditions, the effect was driven predominantly by group satisfaction – that is, higher perceived legitimacy but high group satisfaction was associated with more resistance under high stigma conditions (B = 0.75, p = .00). Group solidarity (B = 0.24, p = .18) and group centrality (B = 0.16, p = .36) did not have a significant effect on stigma resistance with higher perceived stigma.[39]

5.3.4.5. Decision tree analysis

Following the proposed outcome groupings in Corrigan and Watson's paradox of self-stigma model, participants were categorised as "internalisers," "indifferent," or "resisters" based on their scores on the WBIS-17 and Stigma Resistance scales. The full WBIS-17 was used, as scores on the self-devaluation subscale were generally low – only 5.7% scored above the neutral midpoint, and did not provide sufficient range or variance, but the distress subscale alone was felt not to fully capture the construct of internalised weight stigma. Just under half of participants (N = 412, 44.3%) had a WBIS-17 score above the neutral midpoint on the scale, indicating that they tended to agree with internalisation statements, and were classified as internalisers. A further 414 participants (44.5%) had WBIS-17 scores at or below the midpoint and Stigma Resistance scores above the neutral midpoint on that scale – that is they tended to disagree with internalisation statements and agree with resistance statements, and

[39] For the low-legitimacy high-investment combination, slopes did not differ across levels of perceived stigma, so slope change analysis by group investment component could not be conducted; however, examination of actual stigma resistance scores indicated no difference by group investment component.

were classified as resisters. The remaining 105 participants (11.3%) had low scores on both the WBIS-17 and Stigma Resistance scales and were classified as indifferent. Univariate ANOVA confirmed that the three groups differed significantly on global self-esteem, Welch's $F(2, 129.6) = 149.5$, $p < .001$. The internalisers had the lowest self-esteem scores ($M = 13.2$, $SD = 4.6$) and *post hoc* tests (Games-Howell) indicated that this score was significantly lower than those of both resisters and indifferent (both $p < .001$); however, the scores in the indifferent group did not differ significantly from the resisters ($M = 19.8$, $SD = 3.8$ versus $M = 20.0$, $SD = 5.3$, respectively; $p = .93$).

The CHAID analysis produced a tree with five forks and ten terminal nodes (see Figure 5.7). Group investment emerged as the most important predictor of location on the self-stigma continuum, $\chi^2(6) = 275.1$, adjusted $p < .001$. Over half (59.7%) of resisters had a group investment score above 3.67 (nodes 3 and 4) whereas only 13.8% of internalisers and 5.7% of the indifferent group did so. Using a lower cut-point of 2.78 (nodes 2–4), separated out 84.5% of the resisters, although nearly half of internalisers and one-third of the indifferent group also had group investment scores above 2.78.

In the middling group-investment range (2.78 – 4.44; nodes 2 and 3), perceived legitimacy of weight stigma was the next most important predictor, node 2 $\chi^2(4) = 40.1$, adjusted $p < .001$, node 3 $\chi^2(2) = 14.1$, adjusted $p = .02$, with internalisers and indifferent individuals tending to have higher legitimacy scores than resisters. Thus, higher group investment plus low perceived legitimacy (nodes 4, 8, and 11) captured nearly two-thirds of resisters but only a small fraction of internalisers and stigma-indifferent individuals

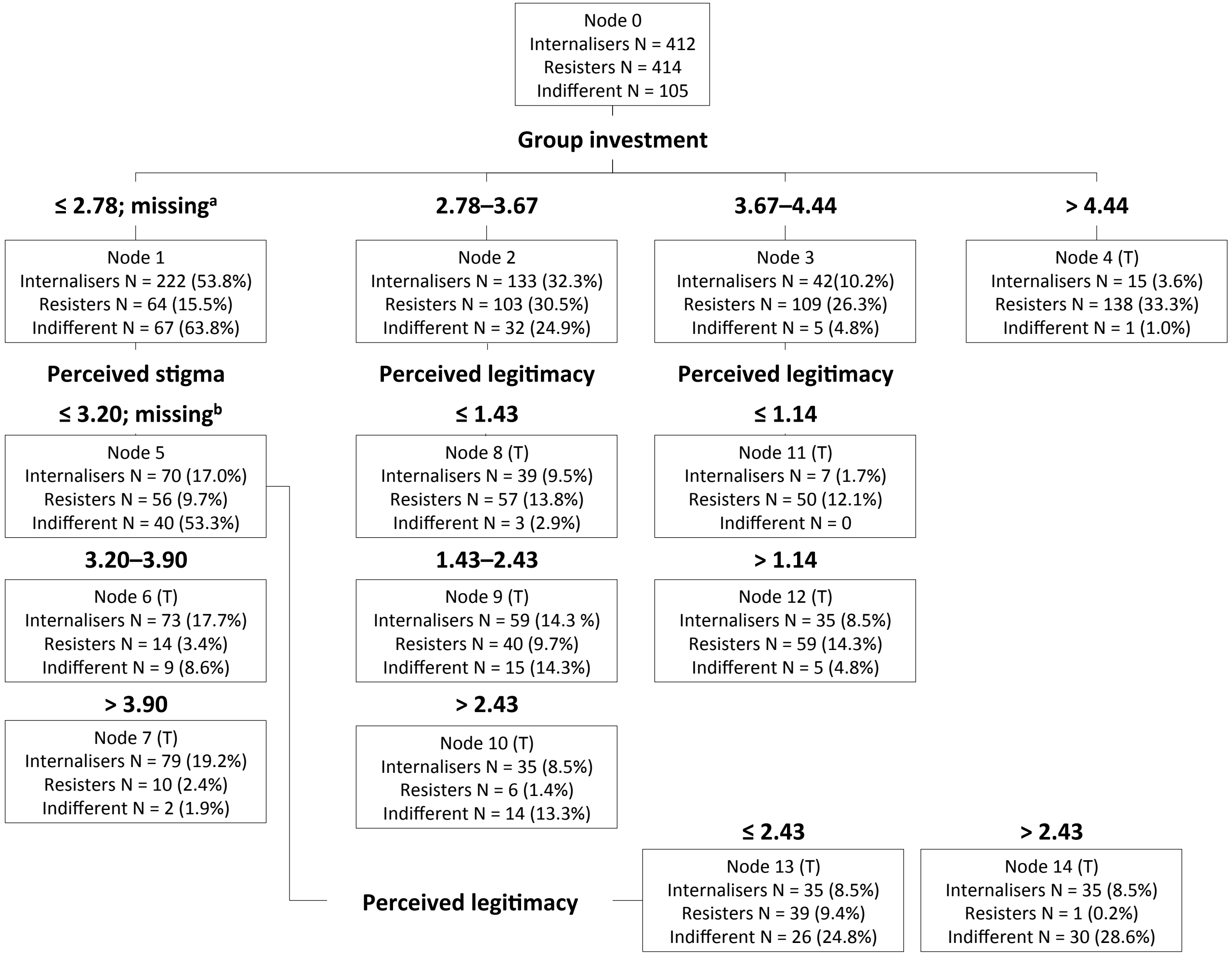

Figure 5.7. Graphical depiction of the decision rules for classification as either internalisers, resisters, or indifferent to perceived weight stigma. Empirically derived cut points are displayed, along with number of participants in each of the three categories assigned to each node. All scales scored 1–7 except perceived weight stigma, scored 0–5. (T) = terminal node. [a]*n* = 8 cases missing data on group investment; [b]*n* = 5 cases missing data on perceived stigma.

At the lowest level of group investment (node 1), low perceived weight stigma separated out the majority of the indifferent group, with a cut-off of 3.2 on the SCQ (scored 0–5) capturing 56 of the 67 (83.6%) of those whose group investment scores placed them in this category, but less than a quarter of the internalisers and one-eighth of the resisters, SCQ $\chi^2(4) = 66.0$, adjusted $p < .001$). Thus, low group investment plus low stigma experience was more likely to be associated with indifference (node 5), but low investment and more stigma experience (nodes 6 and 7) tended to be linked to internalisation.

Perhaps surprisingly, the majority of the resisters in the lowest group investment category (40/64, 62.5%) were also in the lowest perceived stigma group (node 5), suggesting that more stigma may deter resistance when group investment is low. Within this low-investment, low-perceived stigma category (node 5), low perceived legitimacy of weight stigma distinguished the resisters from the other two groups, $\chi^2(2) = 30.7$, adjusted $p < .001$, with 39 of the 40 resisters in this category having perceived legitimacy scores at or below 2.43 (node 13). The internalisers and indifferent respondents in this category were not further distinguished by their perceived legitimacy scores (nodes 13 and 14). Neither group self-definition nor weight controllability beliefs contributed to classification in the model.

Classification accuracy based on assigning each case to the majority outcome in the node that matched its scores on the predictor variables was 68.2% for internalisers, 82.9% for resisters, and zero for the indifferent group, as none of the identified cut-points distinguished a category where indifferent respondents made up the majority.

Cross-validation risk estimate was .34 (*SE* = .02), suggesting moderate generalisability of the model.

Based on the original predictions of the Corrigan and Watson model, a *post hoc* analysis was conducted where perceived legitimacy was forced into the model as the first variable. The resultant decision tree used the same three predictor variables – group investment, perceived legitimacy, and perceived stigma, but correctly predicted 85.9% of internalisers. Prediction accuracy for resisters was 60.1%, and cross-validation was very similar to the original model (.35, *SE* = .02). Thus, it appears that group investment tends to be more useful in predicting stigma resistance, and perceived legitimacy more useful in predicting internalised weight stigma, consistent with the original model.

5.3.5. Does stigma resistance predict psychological wellbeing?

Hierarchical linear regression analyses were conducted with demographic covariates and BMI entered at step 1, perceived weight stigma at step 2, and stigma resistance at step 3. Separate analyses were conducted to predict global self-esteem, weight-related self-devaluation, and weight-related distress. Stigma resistance was associated with significant increases in global self-esteem and decreases in weight-related self-devaluation and distress, after controlling for demographic variables, BMI, and perceived stigma, explaining an additional 8.2%, 22.7%, and 32.6% in variance, respectively (see Table 5.9).

Table 5.9. *Stigma Resistance as a Predictor of Psychological Wellbeing Following Experienced Weight Stigma*

	Global self-esteem					Weight-related self-devaluation					Weight-related distress				
Predictor	*B*	*SE*	β	*t*	*p*	*B*	*SE*	β	*t*	*p*	*B*	*SE*	β	*t*	*p*
Step 1[a,b,c]															
Gender	0.58	0.51	.03	1.1	.25	-0.03	0.09	-.01	-0.4	.71	0.10	0.11	.03	0.9	.35
Age	0.07	0.02	.13	4.3	< .00	0.00	0.00	.00	0.1	.95	-0.00	0.00	-.04	-1.4	.17
Education	0.71	0.14	.15	5.2	< .00	-0.10	0.02	-.13	-4.3	< .00	-0.12	0.03	-.10	-3.9	< .00
BMI	-0.01	0.02	-.02	-0.6	.56	0.00	0.00	.01	0.4	.72	-0.01	0.00	-.06	-2.1	.04
Step 2[a,b,c]															
Perceived stigma	-3.26	0.22	-.46	-14.8	< .00	0.35	0.04	.28	9.1	< .00	0.68	0.05	.39	14.1	< .00
Step 3[a,b,c]															
Stigma resistance	1.33	0.13	.31	10.1	< .00	-0.39	0.02	-.52	-16.7	< .00	-0.64	0.03	-.62	-22.5	< .00
ΔR^2					.08					.23					.33
Total R^2					.30					.30					.45

Note. Parameters are reported for full model only but displayed by regressions step to aid interpretation. Constant included in all models but not displayed in table. *B* = unstandardised coefficient; β = standardised coefficient. Gender coded 1 = Male, 2 = Female. Education coded on ordinal scale with higher values indicating higher level of educational attainment. All changes in R^2 $p < .001$ at every step in all models. BMI = body mass index.

[a]Global self-esteem: ΔR^2 Step 1 = .07, Step 2 = .15. [b]Weight-related self-devaluation: ΔR^2 Step 1 = .04, Step 2 = .04. [c]Weight-related distress: ΔR^2 Step 1 = .05, Step 2 = .08.

Standardised coefficients (β) indicated that stigma resistance was the most important contributor to explained variance in weight-related self-devaluation and distress, offsetting the detrimental impact of experienced stigma. Perceived stigma was a more important contributor to global self-esteem than was stigma resistance, with each 1-point increase in perceived stigma being associated with over a 3-point reduction in RSE scores; nevertheless, scoring at the top of the stigma resistance scale would be associated with an 8-point increase in self-esteem scores compared with a score at the bottom of the resistance scale.

5.4. Discussion

The present study is the first to examine predictors of internalised weight stigma and stigma resistance is a large, diverse sample of higher-weight individuals. The large sample size facilitated the first combined EFA and CFA validation of the original pool of 19 items that produced the standard WBIS (Durso & Latner, 2008). As noted in Chapter 1, the 11-item WBIS was derived based upon the assumption that the construct of internalised weight stigma was unidimensional. However, the items in the resulting 11-item scale appeared to represent a combination of underlying concepts, including fear of how one might be judged by others, desire for change, and psychological distress, all of which may be a natural response to societal weight stigma, even in the absence of self-devaluation. Removing the assumption of unidimensionality resulted in a three-factor scale, the dimensions representing weight-related self-devaluation, weight-related distress, and perceived legitimacy of weight stigma. This three-factor scale was an adequate fit to the data. While the standard 11-item WBIS was a superior fit, the three-factor model has greater conceptual clarity. Indeed, the weight-related self-devaluation factor, which represents the purest interpretation of stigma internalisation, provided the best statistical fit to the data when tested individually. Exploring participants' scale scores, the fact that scores on the weight-related distress subscale were notably higher than those on the self-devaluation subscale provides support for the contention that these items are measuring something different to self-devaluation. It could be that the weight-related self-devaluation subscale provides a true measure of perceived internal worthiness, or lack thereof, whereas the weight-related distress subscale represents feelings and thoughts associated with fears of not fitting into society. Nevertheless, a small number of items on the weight-related distress subscale do refer to self-worth. Future work on internalised weight stigma may benefit from revisiting this construct, using a larger number of pool items, possibly generated with input from the target population, a large, diverse sample, and a thorough psychometric validation of the resulting scale(s).

As predicted by the Corrigan and Watson paradox of self-stigma model, low perceived legitimacy of societal weight stigma, particularly when combined with high group investment, tended to be associated with less internalised weight stigma, higher global self-esteem, and more stigma resistance. A stringent test of the model would require that self-worth be impaired mainly by the high perceived stigma/high perceived legitimacy combination, whereas stigma resistance would be predicted by a three-way interaction between high perceived stigma, low perceived legitimacy and high group identification. Perceived stigma and perceived legitimacy did indeed interact to increase weight-related self-devaluation, but only in the barriers-permeable model, and only in the model with group self-definition as the measure of group identity. The permeability difference makes sense, as perceived legitimacy has a moderate to strong correlation with beliefs that weight is controllable, and thus group boundaries are not fixed. Likewise, self-defining as belonging to the group "Fat" would be expected to be a more important pre-requisite for internalising societal stigma than would group investment. Indeed, there were also significant positive interaction effects involving group self-definition – suggesting that this aspect of group identification matters in predicting who internalises societal stigma.

In contrast, group investment might be expected to be more strongly linked with stigma resistance. Indeed, the expected three-way interaction between perceived stigma, perceived legitimacy, and group investment (but not group self-definition) was observed to predict stigma resistance, but only when barriers were considered impermeable. This is consistent with findings that, in general, when group barriers are considered permeable, members of the group are more likely to pursue individual mobility than engage in individual- or group-level resistance (Ellemers et al., 1993; Wright et al., 1990).

One unexpected finding was that in the barriers-permeable condition, the combination of higher perceived legitimacy of societal weight stigma and low self-definition as "overweight/fat" was associated with notable worsening of weight-related self-devaluation and global self-esteem with increasing levels of perceived stigma, compared with the high-legitimacy high-definer combination, who saw little change as stigma increased. One possible explanation for this finding could be that individuals who do not strongly define themselves as "overweight/fat" may escape high levels of weight-related self-devaluation and decrements in global self-esteem under low-stigma conditions, but when they experience more stigma, the protective effects of their self-perceived low fat identity are outweighed by others' behaviours indicating that society considers them "overweight/fat." This effect may be more pronounced in the barriers permeable condition because of the impression that they *could* have addressed their weight status but have failed to do so. In contrast, high definers are already aware of their "inferior" status, reporting higher levels of self-devaluation under even low perceived stigma conditions, but with shallower increments when perceived stigma is higher.

Looking at the self-definition dimension on the Multicomponent Ingroup Identification Scale, the self-stereotyping and homogeneity components reflect perceived similarity to other higher-weight individuals and similarity within the group in general, respectively (Leach et al., 2008), rather than to whether one defines oneself as overweight/fat. That is, this measure of ingroup self-definition focuses, reasonably, only on definitions as they relate to the group, rather than to whether one thinks of oneself as *being* fat. The tenets of social identity theory and the predictions arising out of them require that the individual defines themselves in terms of their membership in the respective group – that is, self-categorising as a group member (Turner, 1985, 1987; cited in Hogg & Turner, 1987; Tajfel & Turner, 1979), and not simply holding some of the characteristics associated with that group. In this case, the implication is that simply having a higher body weight does not necessarily equate to a social identity in which one self-defines as a member of the group "Fat." It is possible that under high-stigma conditions, an awareness that others see you as "fat" may produce an identity shift resulting in higher self-perceived fatness (Degher & Hughes, 1991; Schafer & Ferraro, 2011), with associated decrements in self-worth in some individuals, even whilst considering oneself distinct from other members of the group "Fat." While recruitment for the present study specified "overweight," "obese," or "fat" participants, there will likely be gradations of perceived fatness within those groups, and higher self-perceived weight may in turn be related to higher levels of weight-related self-devaluation and lower global self-esteem. While the present study recorded self-reported height and weight for calculation of BMI, a measure of self-perceived weight status may have identified differences in individual self-definition not detected by measuring group-level self-definition. Indeed, perceived stigma had a small but significant positive association with group self-definition in the present sample, as well as a modest association with group investment. These findings are consistent with prior research indicating that perceptions of discrimination are associated with higher ingroup identification, confirmed in both cross-sectional (Armenta & Hunt, 2009; Schmitt & Branscombe, 2002; Schmitt, Branscombe, Kobrynowicz, & Owen, 2002) and experimental (Ellemers et al., 1993; Jetten et al., 2001; Jetten, Spears, & Manstead, 1996) studies.

Perceived barrier permeability resulted in only minor differences in the effects of the predictors on weight-related self-devaluation and global self-esteem. In contrast, perceived barrier permeability had a noticeable effect on weight-related distress. In particular, perceiving higher levels of weight stigma and greater perceived legitimacy were both associated with more weight-related distress when barriers were considered impermeable than in the barriers-permeable condition. In contrast, group investment was associated with lower weight-related distress only when barriers were considered permeable; the protective effect was not observed in the barriers-impermeable condition. However, a different picture emerged when predictor interactions were considered. The combination of higher perceived stigma and higher group investment, but not higher group self-definition, offered some protection against weight-related distress only in the barriers-impermeable condition. That is, when weight change does not seem possible, group investment may be a means of reducing distress in the presence of weight stigma. These findings are consistent with the rejection-identification model (Branscombe et al., 1999; Schmitt et al., 2002), which seeks to explain why an individual may choose to identify more strongly with a group that is societally disadvantaged when that disadvantage is made more salient. According to social identity theory, although individuals seek to maximise their self-esteem by associating themselves with higher-status groups, discrimination may lead them to identify more strongly with a stigmatised group to which they belong (Tajfel & Turner, 1979). According to the rejection-identification model, identification with the lower-status group may provide a source of support and acceptance, particularly when faced with a situation in which one's group membership is unlikely to change, alleviating some of the psychological harms of societal stigma (Bat-Chava, 1994; Branscombe et al., 1999; Crabtree, Haslam, Postmes, & Haslam, 2010; Dimitrova, Chasiotis, Bender, & van de Vijver, 2013; Garstka, Schmitt, Branscombe, & Hummert, 2004; Schmitt et al., 2002).

Overall, barrier-impermeability beliefs were associated with higher scores on the Stigma Resistance scale than when barriers were considered permeable. Again, this is consistent with predictions of social identity theory that if an individual cannot leave a group, they are more likely to fight for better treatment (Branscombe & Ellemers, 1998; Ellemers et al., 1993; Wright et al., 1990). However, another unexpected finding was that the high-legitimacy high-investment combination was associated with less stigma resistance under high-stigma conditions when group barriers were considered permeable, but more stigma resistance when barriers were considered impermeable. No such differential relationships were observed for highly invested individuals who were low in perceived legitimacy beliefs.

The seemingly unlikely combination of higher perceived legitimacy but nevertheless higher group investment can perhaps best be understood by the fact that, first, perceived legitimacy tended to be low overall, so "higher" perceived legitimacy is not necessarily "high" perceived legitimacy, with the 90th percentile used in these analyses corresponding only to the neutral midpoint on the legitimacy scale; and second, the three components of group investment – solidarity, satisfaction, and centrality, do not necessarily all carry the same implications. Centrality in particular need not be a positive phenomenon; somebody who is very unhappy about being in the group may nevertheless spend a lot of time considering their group membership. Indeed, the reduction in stigma resistance in the barriers-permeable condition was largely driven by the solidarity and centrality components of group investment. More stigma was not associated with reduced stigma resistance in individuals high in group satisfaction. In contrast, in the barriers-impermeable condition, the rise in stigma resistance with higher perceived stigma was driven by group satisfaction. It is interesting to note that group satisfaction reflects an intrapersonal affective aspect of group membership, whereas solidarity refers to kinship with other group members, perhaps best representing the "group-ness" of belonging to a particular group. Thus, in individuals who are not firmly opposed to the justifiability of societal weight stigma, it appears that it is the intrapersonal affective component of group investment, rather than fraternal considerations, that defines stigma response under high-stigma conditions: preventing a reduction in stigma resistance in the barriers-permeable condition, and being associated with a rise in stigma resistance when barriers are impermeable.

One possible explanation for the predominance of group satisfaction over group solidarity, which might be expected to predict challenging-style resistance, is that the measure of stigma resistance used in the present study focused predominantly on personal beliefs and actions, rather than collective resistance. In the present study, stigma resistance was conceptualised as the opposite of stigma internalisation, expanding on Corrigan and Watson's original "righteous anger." It is possible that a measure of stigma resistance that included items relating to collective action may have been more responsive to the group solidarity component. However, as noted above, higher legitimacy tends to be linked to greater weight controllability beliefs, which in turn suggest greater perceived barrier permeability. Thus, it is also possible that group concerns, i.e., bonding with and support of other group members, will inevitably be lower when barriers are perceived to be permeable. Support for this hypothesis comes from a recent study of French workers living in Swiss border regions, which demonstrated that even anticipation of future upward social mobility (becoming cross-border frontier workers, with associated financial and status gains) was associated with reduced ingroup concern, specifically, motivation to personally engage in activities designed to improve conditions for French people living in these regions (Chipeaux, Kulich, Iacoviello, & Lorenzi-Cioldi, 2017).

Decision tree analysis provided further support for the paradox model of self-stigma. However, in the present sample, group investment was a more important predictor of placement on the internalisation–resistance continuum than was perceived legitimacy. This finding may be due to the large positive skew of the perceived legitimacy measure, with the majority of participants disagreeing with the notion that weight stigma is justifiable. The group investment measure provided a wider variety of responses and thus may have been superior in differentiating between participants.

The level of group investment associated with classifying somebody as a resister rather than an internaliser was surprisingly low, with scores above a cut-off just below the neutral mid-point on the investment dimension alone capturing nearly 60% of resisters and only a very small proportion of internalisers or stigma-indifferent participants. When combined with low perceived legitimacy beliefs, scores above the bottom quartile of group investment separated out resisters from the other groups.

Both internalisers and stigma-indifferent participants were concentrated in the lowest quartile of group investment scores. What distinguished stigma indifference from stigma internalisation tended to be low group investment plus low stigma experience. Low investment coupled with higher perceived weight stigma tended to be linked with internalisation. However, over 15% of resisters were in the lowest quartile for group investment, indicating that such investment is not a necessary prerequisite for resisting devaluation. Most of them also reported low levels of perceived stigma. What distinguished resisters at this level from internalisers and stigma-indifferent participants was, again, their low legitimacy beliefs.

Based on these cut-off points, this model was extremely accurate in classifying resisters, and moderately accurate in classifying internalisers. However, as noted above, the pre-eminence of group investment may be an artefact of a sample skewed toward low legitimacy and low weight-controllability beliefs. When perceived legitimacy was forced into the model as the primary step, correct classification of internalisers was excellent, compared with moderate accuracy in classifying resisters. Thus, the underlying principles of the Corrigan and Watson's paradox model of self-stigma – that perceived legitimacy is the key factor in determining internalisation, appears to be supported.

Finally, the present study explored whether stigma resistance, as a response to perceived weight stigma, was associated with more favourable psychological outcomes. Personal resistance to stigma appeared to offset the detrimental effect of experienced weight stigma on weight-related self-devaluation and distress, and explained between a quarter and a third of the variance in these constructs after controlling for stigma experiences, BMI, and demographic variables. The protective association of stigma resistance on global self-esteem was smaller than the harmful negative effect of experienced weight stigma, but nevertheless contributed to improved self-esteem in the presence of perceived stigma.

Although conceptualised by Corrigan and Watson as the opposite end of a continuum to stigma internalisation, weight stigma resistance in the present study was only moderately correlated with both weight-related self-devaluation and weight-related distress. This is likely, in part, due to the fact that the internalisation construct involves only internal processes, whereas the measure of stigma resistance used here, while focusing on individual aspects of resistance, was conceptualised as both rejecting devaluation and fighting back against it, and, as such, includes behaviours that involve interactions with others. It is possible that an entirely intrapersonal measure of weight stigma resistance would reflect a closer approximation of the opposite of internalisation.

In their development and psychometric validation of the Internalized Stigma of Mental Illness (ISMI) scale, Ritsher and colleagues (2003) reported that the stigma resistance subscale of the ISMI was only poorly associated with the other four subscales (stereotype endorsement, feelings of alienation, social withdrawal, and discrimination experience). Additionally, exploratory factor analyses indicated that items on the stigma resistance subscale often loaded more strongly onto factors associated with other constructs such as global self-esteem and personal empowerment, than onto the factor comprising the other four subscales of the ISMI. The five items of the resistance subscale all referred to internal beliefs and attitudes, and did not involve stigma-challenging behaviours. These findings provide support for stigma resistance as a separate construct, and not just evidence of low internalisation.

While the targets of prejudice and discrimination should not be expected to bear the responsibility for improving their lot, societal weight stigma remains pervasive and structural inequalities deeply embedded (Puhl & King, 2013). Fostering resistance may provide one means to at least minimise some of the psychological harms associated with this phenomenon. Although resistance is generally linked with high group investment, the findings of the present study indicate that it is not a necessary pre-requisite; rather, perceiving societal weight stigma as illegitimate may be sufficient to encourage resistance to devaluation. Thus, an intervention that takes a social justice approach may be effective, even in individuals who remain uncomfortable with group membership. Certainly, studies exploring the development of social activism within societally disadvantaged groups have identified alternate pathways via which individuals become willing to engage in collective action: one involving identifying with a more politicised activism movement, but the other driven predominantly by self-categorisation and a personal cost-benefit analysis of potential gains (Simon et al., 1998; Stürmer et al., 2003). However, group identification is known to provide numerous psychological and other health benefits, both in general, and in stigmatised groups (for a review, see Jetten, Haslam, Haslam, Dingle, & Jones, 2014). These benefits accrue, in part, via a number of mechanisms, including ingroup support structures (Haslam, O'Brien, Jetten, Vormedal, & Penna, 2005; Jetten et al., 2014), and behaviours that affirm their group identity (Corrigan et al., 2013; Saguy & Ward, 2011). It remains to be determined whether stigma resistance would confer the same benefits in the absence of that group identity.

The present study has a number of limitations. First, data were obtained exclusively through the use of self-report measures, which may be prone to demand characteristics and/or social desirability responding. Given the wide range of responses on most measures, this appears not to have presented a major problem. One possible exception is the case of perceived legitimacy. Scores on this measure were very heavily skewed, with the vast majority of respondents reporting very low perceived legitimacy beliefs. However, correlational analyses provide evidence for the veracity of these self-reports. Defining oneself as fat would not be expected to determine whether one perceives societal stigma to be justified, and indeed these measures were unrelated. However, legitimacy beliefs were negatively associated with group investment, global self-esteem, and stigma resistance, and positively associated with weight-related self-devaluation and distress. Thus, it appears that despite recognising that such stigma is unjustified, many individuals nevertheless devalue themselves because of their weight.

Another limitation is the cross-sectional design of the study, which precludes determination of causal pathways. In particular, it is unclear whether stigma resistance, as a tool to offset some of the harms associated with societal stigma, would be amenable to interventions designed to promote it, and a better understanding of the causal mechanisms involved in the development of stigma resistance would be necessary prior to the design of such interventions. It is unclear whether resistance would inevitably arise from interventions focusing on belief structures, for example that weight is entirely under individual control, or attitudes towards weight, or whether it can be taught or developed in isolation of those beliefs.

The measure of stigma resistance used in the present study focused on interpersonal actions, only one of many forms of individual and collective forms of resistance (Wright et al., 1990). While the focus on personal rather than collective action was deliberate, as noted above, the stigma-challenging behaviour represented in several items may be too confrontational for some individuals, or carry too high a personal risk in certain situations, and other forms of resistance may be preferred. Thus, this measure may have underestimated stigma resistance in the sample. The measure also included two items that could be construed as assessing legitimacy beliefs, possibly inflating the correlation between legitimacy and stigma resistance. However, in the decision tree analysis, group investment, rather than legitimacy, was the primary predictor of stigma resistance. Nevertheless, future studies on weight stigma resistance may benefit from an expanded or revised measure, developed with broader stakeholder involvement in the questionnaire design.

Finally, despite efforts to attract a demographically diverse sample, the participants in this study were nevertheless predominantly female, White, highly educated, and based in the US or UK. During recruitment efforts, there was a particularly robust response from members of the size acceptance community, largely due to the author's personal connections and goodwill within this community. Given that the size acceptance movement tends to be predominantly, female, well educated, professional, and US-based, this will likely have contributed to the homogeneity of the sample, as well as explaining the strong association between education and stigma resistance, a finding that should perhaps not be over-interpreted until it has been replicated in a more diverse sample. Ethical recruitment from dieting sites was surprisingly difficult,[40] and this likely explained the imbalance in weight controllability, and thus barrier permeability, beliefs in the sample as a whole. Alternatively, significant effects may have been the result of chance findings due to multiple testing – again, replication is needed to corroborate these links. Similarly, decision-tree analysis is a data-based approach that is prone to sampling bias and order effects. As such, findings may be unstable. Only moderate replicability was identified using K-fold validation in the present study and, while the results were consistent with the theorised model, replication should be conducted in a different sample to corroborate the final stigma resistance model.

While the barriers-permeable group was only half the size of the barriers-impermeable group, statistically significant effects were often more pronounced in the

[40] Large diet companies demanded control over the data, diet bloggers frequently asked for payment to promote the study on their pages, and most potential recruitment sites simply did not respond to enquiries.

former group, particularly in predicting weight-related self-devaluation. It is possible that higher-weight individuals who believe weight to be controllable are perhaps more single-minded in their response to stigma, with more predictable effects of levels of stigma, perceived legitimacy, and group identification, whereas there may be more variation, and thus greater uncertainty around effect sizes, in the barriers-impermeable group, which is likely to comprise both individuals who are frustrated by the futility of their weight-loss efforts and those who actively reject that they should be expected to lose weight. Additionally, given the widespread difficulties associated with living in a fat body in many Western societies, there is considerable ambivalence toward the pursuit of weight loss within the size acceptance movement (LeBesco, 2014). Thus, some individuals who consider weight stigma to be illegitimate, identify emotionally with other fat people, do not devalue themselves due to their weight, and are aware that individual control over body weight is limited, nevertheless pursue weight loss, generally via surgical means, rather than engage in resistance (Meleo-Erwin, 2011; Murray, 2010).

In conclusion, the present study provides support for Corrigan and Watson's (2002) paradox of self-stigma model in a weight stigma context. Stigma resistance, conceptualised as both rejection of societal devaluation and countering this devaluation when it occurs, appears protective against weight-related self-devaluation and distress, and deficits in self-esteem, in higher-weight individuals. Different forms of resistance may be more effective when matched with characteristics of the target group (for example, politicised action is unlikely to be a useful intervention goal in current dieters), or produce different benefits. Future work should focus on refining the measure of stigma resistance and using experimental designs to identify mechanistic pathways via which resistance develops, in order to optimise the development of interventions designed to foster such resistance in higher-weight individuals.

CHAPTER 6. General discussion

6.1. Introduction

Existing research on the link between weight stigma and health tends to be limited by a number of factors, including: use of normative-weight or only treatment-seeking samples; a predominance of White, female participants; reliance on cross-sectional study design and self-report measures; and use of conceptually ambiguous and/or unvalidated measures of experienced and internalised weight stigma. The overall objective of this thesis was to extend current research on the link between weight stigma, in particular, internalised weight stigma, and the health and wellbeing of higher-weight individuals, whilst addressing some of the limitations of existing studies. Specifically, the experimental work in this thesis aimed to: (1) elucidate the independent and complementary roles played by experienced and internalised weight stigma in patterns of maladaptive eating behaviours; (2) distinguish between the unique and overlapping contributions of internalised weight stigma, body image, and global self-esteem in explaining this relationship; and (3) test a social identity model of stigma resistance versus internalisation as a response to perceived discrimination.

In this chapter, the findings from each study will be briefly reviewed, focusing on how each study contributes to these main goals and what additional insights were gained by attempting to address sample and study design limitations of previous work.
The broader implications of these findings for research and practice will be described.

Finally, strengths and limitations of the current work and directions for future research will be discussed.

6.2. Overview of findings

6.2.1. Weight stigma and eating behaviour

Study 1 investigated the impact of weight stigma on objectively measured non-physiological eating behaviour in higher-weight and normative-weight men and women. Contrary to expectations, and in contrast to the relationship consistently observed using self-report measures of non-physiological eating behaviour (Durso, Latner, & Hayashi, 2012; O'Brien et al., 2016), as well as in the present study, internalised weight stigma did not mediate the relationship between prior experienced weight stigma and objectively measured eating in the absence of hunger. It is likely that self-report measures of eating behaviour are capturing habitual tendencies, and may be displaying more generalised effects of experienced and internalised weight stigma over time. In contrast, a single instance of eating behaviour is likely to be influenced by immediate contextual factors, most importantly, perhaps, the knowledge that one is being observed. While these results suggest that findings using self-report measures ought not to be assumed to equate to actual eating behaviour, further studies using naturalistic settings would be needed to rule out the possibility that the effect is being driven by characteristics of the laboratory setting.

One unexpected finding was that, overall, higher-weight individuals exposed to the weight-stigma prime did not increase energy consumption compared with those in the control condition or with normative-weight participants. The failure to replicate previous findings that higher-weight participants eat more after exposure to a weight-stigmatising prime (Major et al., 2014; Schvey et al., 2011) may be due to differential effects based on hunger levels. This is the first study to explore the impact of weight stigma on eating in the absence of hunger, a construct that has important ecological validity. Exposure to stigmatising primes is unlikely to occur exclusively when people are hungry. Eating as a coping response to stress or changes in affect is more likely to occur outside of meal times and manifest as intake of excess snack foods, even in the absence of hunger (Fanelli Kuczmarski et al., 2017). Previous studies have also not considered internalised weight stigma as a moderator of eating in response to a stigmatising prime. Findings from the present study suggest that internalised weight stigma may be strongly related to impression management and result in lower levels of eating in the laboratory setting. Subsequent rebound effects on leaving the laboratory could not be ascertained. Future studies should use ambulatory sampling techniques such as EMA to explore the relationship between general and weight-specific stressors on objective eating behaviour.

Finally, the different pattern of effects of experienced and internalised weight stigma for higher-weight and normative-weight participants highlight the importance of not assuming equivalent mechanisms are operating. Being able to measure these constructs across the weight spectrum does not prove that they are interpreted or externalised in the same manner.

Study 2 explored the unique and complementary roles of experienced and internalised weight stigma on a composite measure of maladaptive eating behaviour in a diverse, non-treatment-seeking sample of higher-weight individuals. Although attempts were made to recruit an ethnically and culturally diverse sample of both men and women, the sample was nevertheless predominantly White and female, limiting the ability to explore differences in effects by demographic variables. While levels of experienced and/or internalised weight stigma varied by gender and region, the relationship of weight stigma variables with disordered eating behaviours did not appear to differ by gender or location, at least for participants from the UK and North America – other regions could not be tested due to insufficient numbers.

The study of the intersectional effects of weight stigma, for example, by race, gender, or socioeconomic status, is still in its infancy, although studies in US adults (Himmelstein et al., 2017) and adolescents (Neumark-Sztainer et al., 2002) have identified racial, cultural and gender difference in eating behaviour in response to weight stigma. To date, these studies have considered only behavioural responses; future work should consider the distal impact on health and wellbeing.

As in previous studies, there was a significant indirect effect of experienced weight stigma on self-reported problem eating behaviour via its association with higher levels of internalised weight stigma, as measured by the WBIS; the direct effect of experienced stigma, controlling for internalisation was non-significant. However, when controlling for variance shared with the related factors of body image and global self-esteem, the indirect effect via the residual aspects of internalised weight stigma was only marginally significant. Nevertheless, despite the lack of mediation, the internalised weight stigma factor, even with shared variance partitioned out, did independently predict greater levels of disordered eating behaviour. The fact that this direct effect was about half the magnitude as observed when using the full WBIS suggests that shared variance with body image and self-esteem is explaining a notable proportion of the effect observed in studies using the WBIS. Thus, despite the generally accepted premise that weight-related stigma, especially when internalised, is a major driver of maladaptive eating, the findings from the Studies 1 and 2 behove us consider what exactly we are measuring (see Section 6.2.2, below), and to what extent factors specific to internalisation of stigma predict maladaptive coping strategies over and above variance explained by the association between experienced weight stigma and body image and self esteem.

Studies 3 and 4 tested a theory-based mechanism via which weight stigma might result in maladaptive eating behaviour. Weight-related self-devaluation and fear of being stigmatised by others because of one's weight were explored as proximal predictors of "food addiction" via a pathway involving chronic dieting and perceived self-control around food. Finally, longitudinal data were used to determine whether self-stigma and fear of stigma from others contributed to worsening "food addiction" over time.

While a similar escalation pattern of weight-related self-devaluation and fear of enacted weight stigma was observed in both the student and community samples, with "non-food addicts" expressing the least, YFAS "diagnosed" participants the most, and self-perceived “food addicts” somewhere in between, the importance of self-devaluation and fear of stigma in discriminating among the three groups differed between the student and community samples. Fear of stigma appeared to be more important in the community sample, being both a direct and an indirect predictor of “food addiction;” in contrast, weight-related self-devaluation was a more important predictor in the student sample, and the downstream effects of fear of stigma manifested only indirectly by increasing self-devaluation. These differences could not be explained by age or BMI, suggesting that the two samples differ in more fundamental ways, possibly relating to cumulative exposure to societal stigma, which may result in a realistic fear of enacted stigma that may impinge on daily life, in the form of “symbolic interaction stigma” (Link et al., 2015) even in the absence of effected instances of stigma or of self-devaluation. Longitudinal data confirmed that fear of enacted stigma was associated with worsening “food addiction” over time. These findings provide further support for the pervasive impact of weight stigma in the lives of higher-weight individuals (Barlösius & Philipps, 2015; Lewis et al., 2011), and also highlight the importance of clearly distinguishing between different types of stigma cognitions.

However, the proposed mechanism whereby weight-related self-devaluation and fear of stigma instigated a pattern of weight-management attempts and consequent low perceived self-control around food, which was then attributed to “food addiction,” was only weakly supported. Dieting behaviour did not appear to play a major role in the development of “food addiction,” although self-efficacy was a consistently important predictor and was, in turn, predicted by weigh stigma variables. It is not immediately obvious how either fear of stigma or self-devaluation would be linked with reduced eating self-efficacy via a route that did not include dieting, and this pathway would merit further exploration.

In summary, these studies link internalised weight stigma, as assessed by commonly used measures, to a range of maladaptive eating behaviours, including "food addiction" and several types of disordered eating. However, the evidence further indicates that the WBIS is likely measuring several related constructs, and the specific contribution of each to the development and maintenance of disordered eating is as yet unclear.

6.2.2. Measuring weight stigma

The difficulties inherent in measuring experienced weight stigma are well recognised (Myers & Rosen, 1999; Seacat et al., 2016). In Study 1, a pragmatic decision to switch from a 50-item measure with situational prompts to a three-item measure that asked about stigma experience in general terms gave a clear indication of the extent to which these questioning techniques produce very different results. The general three-item measure appears to considerably underestimate experienced stigma compared with the SSI. However, studies using experience sampling techniques or EMA suggest that the SSI itself hugely underestimates the true incidence of stigma experienced by higher-weight individuals (Seacat et al., 2016; Vartanian, Pinkus, & Smyth, 2014). Ultimately, which technique or measure to use will be decided by practical issues relating to experimental design, research question, sample characteristics, and resource availability. Work is currently underway to determine whether the EWS-3 provides similar data to the more complex SSI in certain populations.

To date, less attention has been paid to measurement issues with respect to internalised weight stigma. Yet, the most widely used questionnaire measure, the WBIS, appears to be conceptually heterogeneous. In Study 1, the modified version of the scale (WBIS-M; Pearl & Puhl, 2014), which allows for internalised weight stigma to be measured across the weight spectrum, was tested for measurement invariance by weight status. Disturbingly, metric invariance was not confirmed; that is, respondents in different objective or subjective weight groups did not appear to attribute the same meaning to the underlying internalised weight stigma construct. As such, cross-group means and correlations cannot be reliably interpreted. This finding provides further evidence that simply being able to measure something in diverse populations does not guarantee that you are measuring the same thing across those populations (Schmitt & Branscombe, 2002). It further supports the suggestion that using a normative-weight sample to assess the effects of weight stigma, which, by definition, applies to individuals with non-normative body weight, cannot be meaningfully interpreted and should generally be avoided (Meadows, Daníelsdóttir, et al., 2017).

In Study 2, bifactor analysis was used to explore the unique and shared variance in internalised weight stigma (as measured by the WBIS), body image, and global self-esteem. As suggested by the very high correlations between these measures, in particular between the WBIS and measures of body image, the three scales shared a large amount of variance. In a parallel mediation model containing the general

positive self-judgment factor and all of the residualised constructs, i.e., with the variance attributable to the general factor partialled out, the construct-specific factors were all significantly predicted by experienced weight stigma, and, in turn, each predicted disordered eating behaviour. Thus, the constructs do appear to have independent relationships with experienced weight stigma and maladaptive eating; in contrast, experienced weight stigma was not a significant predictor of general positive self-judgment, which may be a more trait-like construct. However, mediation analyses suggested that much of the apparent intermediary role of internalised weight stigma (as measured by the standard WBIS questionnaire) in the relationship between experienced stigma and self-reported eating behaviour is actually accounted for by aspects of body image, global self-esteem, and general positive self-judgment.
The very high correlations between these items observed in the original WBIS validation study (Durso & Latner, 2008) ought to have raised concerns about the unique contribution of the WBIS. As the authors noted, these correlations do not preclude differential real-world effects. However, what these independent effects are cannot be reliably determined due to construct overlap.

Study 5 provided additional evidence that the original derivation of the WBIS based on an *a priori* assumption of unidimensionality combined with exclusive reliance on statistical considerations for final item inclusion, may have resulted in a scale that measures something quite distinct from the construct of weight-related self-devaluation. Recruitment of a large sample allowed for exploratory and confirmatory factor analysis to be conducted on the 19 items in the original item pool, and suggested a three-factor structure. One of these factors, which was an excellent fit to the observed data, comprised six items, all of which pertained to weight-related self-worth, and most of which were excluded from the standard 11-item scale. The bulk of the remaining items loaded onto a factor that could best be described as weight-related distress, and appears to represent a combination of underlying concepts, including fear of how one might be judged by others, desire for change, and psychological distress, all of which may be a natural response to societal weight stigma, even in the absence of self-devaluation.

In summary, the standard version of the WBIS lacks conceptual clarity. Including a variety of related questionnaire items to capture an essentially unidimensional construct, even if internalised weight stigma *were* unidimensional, is not inherently problematic or unconducive to interpretation (Cronbach, 1951; Gustafson & Aberg-Bengtsson, 2010; both cited in Rodriguez et al., 2016). While there may be merit to conceptualising internalised weight stigma more broadly than simply as weight-related self-devaluation, we would do well to at least understand what it is we are trying to measure and what is actually being captured in our data. In the first instance, the factor analysis of WBIS-19 provides a combination of factor options that can be matched to specific research questions. However, future work on internalised weight stigma may benefit from revisiting this construct, using a larger number of pool items, possibly generated with input from the target population, a large, diverse sample, and a thorough psychometric validation of the resulting scale(s).

6.2.3. Stigma resistance

Study 5 tested a social identity model of stigma response in a higher-weight population. Findings were generally in line with the predictions derived from social identity theory: low perceived legitimacy of societal weight stigma, particularly when combined with high group investment, tended to be associated with less internalised weight stigma, higher global self-esteem, and more stigma resistance. Low weight controllability beliefs, corresponding to the perception that the barriers of the group "Fat" are relatively impermeable, was also associated with more stigma resistance, consistent with previous findings across numerous marginalised groups that permeable group boundaries tends to be associated with individual social mobility, whereas impermeable boundaries are more likely to be associated with stigma resistance and efforts to change the status of the group in society (Branscombe & Ellemers, 1998; Ellemers et al., 1993; Wright et al., 1990). The findings were also consistent with the rejection-identification model (Branscombe et al., 1999; Schmitt et al., 2002), which predicts that people will invest more highly in a devalued group in response to stigma if group membership cannot be easily changed. Specifically, at higher levels of perceived stigma, higher group investment appeared to offer some protection against weight-related distress in the barriers-impermeable condition only. Thus, group investment may be a means of reducing distress in the presence of weight stigma when weight change does not seem possible.

Decision tree analysis is a novel approach to explore the issue of exactly how and when perceived stigma, legitimacy beliefs, and group identification interact to predict whether an individual internalises societal stigma, rejects and resists it, or is largely unaffected by it. Surprisingly, neither group self-definition nor barrier permeability beliefs contributed to the model that most effectively distinguished between these outcomes. Levels of group investment were the major determinant of where an individual would place on the resistance-internalisation continuum. However, the level of group investment that best separated out resisters from the other two groups was not particularly high, and even individuals with very low group investment were likely to be classed as resisters if they also perceived societal weight stigma to be illegitimate. Thus, the present findings indicate that, while most studies of collective action highlight the importance of group investment (Van Zomeren, Postmes, & Spears, 2008), it is not a necessary pre-requisite.

6.3. Implications

Internalised weight stigma, assessed by whatever measure, is consistently linked with poorer psychological wellbeing (Durso & Latner, 2008; Lillis et al., 2010), reduced health-related quality of life (Latner, Durso, & Mond, 2013; Lillis et al., 2011), and even metabolic dysfunction (Pearl et al., 2017) in higher-weight individuals. It also tends to be associated with maladaptive coping behaviours, including disordered eating (Durso, Latner, & Hayashi, 2012; Lillis et al., 2011), avoidance of exercise (Mensinger & Meadows, 2017; Pearl, Puhl, & Dovidio, 2015; Wott & Carels, 2010), and social isolation and experiential avoidance (Conradt et al., 2008; B. E. Robinson & Bacon, 1996). As such, interventions targeting internalised weight stigma may be expected to improve the health and wellbeing of higher-weight individuals.

The work in this thesis has a number of implications for such interventions. First, interventions are likely to be more effective if the target construct is more clearly defined, understood, and assessed. Second, certain aspects of weight-related self-stigma may be more amenable to interventions. For example, fear of stigma from others may be difficult to change in somebody living in a pervasively anti-fat environment, but the individual's perceived justifiability of that stigma may respond to a social justice education approach. Being able to distinguish between these, and explore their effects individually, could also facilitate more effective intervention development. Third, there is an ethical consideration in targeting internalised weight stigma as a means of harm reduction. While reducing internalised weight stigma may build resilience and provide some protection from the psychosocial impact of societal stigma, it does not address that societal stigma directly. Thus, it is the victims rather than the perpetrators that are being required to change. Further, higher-weight individuals will remain susceptible to widespread systematic inequalities, whether or not they devalue themselves. The findings from Study 5 suggest an alternative approach. Even controlling for perceived weight stigma, stigma resistance was associated with reduced weight-related self-devaluation and distress, and higher global self-esteem. Stigma resistance, as conceptualised in this study, is operationalised as more than simply not internalising societal stigma. It is a process that includes outright rejection of that devalued status, and countering it when invoked. Thus, the target of stigma challenges rather than accepts the status quo, and is no longer constrained to the role of victim.

6.4. Strengths, limitations, and future directions

Across the five studies, the present work attempts to address some of the major limitations of existing weight stigma literature, with some success. Study 1 used both self-report and objectively measured eating outcomes, and compared effects by weight status, with roughly equal numbers of participants characterised as higher-weight and normative-weight by objectively measured height and weight. Studies 2 and 5 recruited non-treatment-seeking higher-weight participants with diverse beliefs and attitudes toward weight and their bodies. Studies 3 and 4 replicated findings from a student sample in a community sample, and Study 3 collected longitudinal as well as cross-sectional data. Studies 1, 2, and 5 utilised statistical techniques to address issues around measurement of internalised weight stigma.

However, attempts to recruit culturally, ethnically, and gender-diverse samples were largely unsuccessful. Lack of gender diversity in the majority of studies limits the applicability of these findings to the general population. A majority of the work in this field is conducted in all or predominantly female samples. While women are disproportionately affected by experienced weight stigma, these experiences are also increasingly common in men, particularly at higher weights, as are issues around body image and disordered eating. Men are traditionally underserved by healthcare professionals in these fields, in part due to ignorance among primary care providers about the prevalence of problematic cognitions and behaviours in men, and partly due to unwillingness of many men to seek help for a health issue often considered to be a 'female' problem (Jones & Morgan, 2010). Further, internalised weight stigma appears to affect men and women similarly. In additional to the deleterious effects on mental health, both experienced and internalised weight stigma have been linked with metabolic ill health, a greater cause of early mortality in men than in women in most Western countries (World Health Organization, 2014). By failing to research male populations adequately, a significant proportion of the population is being effectively ignored, with implications both for their health and wellbeing, and also for our understanding of the mechanisms underpinning sociocultural influences on health. Evidence suggests that women tend to spend more time on social media and are more likely to use social media for health-related content (Allison et al., 2017; Thackeray, Crookston, & West, 2013), and Internet recruitment for health-related research disproportionately attracts female participants (e.g., Andreeva et al., 2015; Guo, Vittinghoff, Olgin, Marcus, & Pletcher, 2017). Thus, future research should not rely only on neutral wording in recruitment efforts but should actively seek male participants, for example with male-only recruitment advertisements, targeting non-health related sites likely to be of particular interest to men, and the use of quotas when using crowdsourcing platforms.

The most diverse sample was achieved using Amazon's Mechanical Turk (MTurk), in Study 4. The 614 participants in this study exhibited a good balance of gender, professional level, and weight status, and a less homogeneous race/ethnicity profile than in other studies, although White participants were still the majority. However, the sample was almost exclusively US-based, and well educated, with nearly two-thirds having at least a university degree. MTurk is highly US-centric, and other crowdsourcing platforms, such as Crowdflower and Prolific,[41] are more geographically diverse, but these other platforms also attract a highly educated demographic, and most produce only minimal racial diversity (Peer, Brandimarte, Samat, & Acquisti, 2017).

The variety in employment status was a little unexpected given the very low monetary gain associated with MTurk participation, as participants might be expected to belong predominantly to low socioeconomic groups. Yet, despite only minimal compensation, MTurk participants have been shown to provide higher-quality data than typical college samples (Hauser & Schwarz, 2016), and data quality appears to be unrelated to pay level (Buhrmester, Kwang, & Gosling, 2011; Peer et al., 2017). Although some crowdsourcing platforms may offer samples representative of the general population, there is the risk that, given the predominance of anti-fat attitudes and body dissatisfaction, more purposive sampling might be needed to provide diversity in weight-related attitudes among higher-weight participants, particularly in terms of internalised weight stigma. However, a study of the impact of experienced and internalised weight stigma on exercise attitudes and participation in 177 higher-weight women that used MTurk for sample recruitment reported a mean value just above the neutral mid-point of the 7-point WBIS, with reasonable variance (M = 4.31, SD = 1.44), suggesting that this may not be overly problematic. The UK-based Prolific, which offers pre-screening and stratified sampling based on a wide range of variables,

[41] Previously "Prolific Academic."

including ethnicity and weight status, may be a good solution for future online weight stigma research. It should be noted, though, that finding a single source of diverse participants may not be sufficient to produce higher-quality research. The validity and utility of cross-cultural research would likely be superior with input from researchers with local expertise. Also, attention should be paid to cultural differences in the interpretation of constructs and measures used.

Another limitation of the present studies, particularly with regard to Study 2 where eating was monitored in the lab following exposure to a weight-stigma or neutral prime, was the reliance on trait-level measures of internalised weight stigma collected prior to the lab-based phase of the study. Very little work has been conducted on momentary experiences of internalised weight stigma, although Pearl and Puhl (2016) demonstrated that internalised weight stigma was responsive to an experimental manipulation, being higher in participants who focused on a prior instance where they stigmatised themselves compared with those who focused on an incident where they were stigmatised by others. In the context of mental health stigma, an EMA study in 24 individuals with schizophrenia found that self-stigma was not static, but rather varied over the course of the day in response to both internal and situational cues (Ben-Zeev, Frounfelker, Morris, & Corrigan, 2012).

Karazsia and colleagues (2013) described a model that allowed for the interaction between trait and state levels of thin-ideal internalisation and body dissatisfaction. In their model, a relevant societal cue would influence state internalisation differently depending on existing trait levels of internalisation. Changes in state-level internalisation would then have downstream effects on future trait internalisation. State body dissatisfaction would be influenced directly by the original trigger and indirectly via momentary changes in internalisation. Likewise, dispositional body dissatisfaction would be altered as a result of both changes in state dissatisfaction and via changes in trait internalisation. A study design that measured both dispositional and momentary internalised weight stigma may provide insights into the mechanisms via which weight stigma exposure produces negative downstream effects.

A limitation of Study 5 was its cross-sectional design. While the social identity model of stigma resistance and the decision tree analysis present some interesting potential avenues for future research aimed at improving health and wellbeing outcomes for higher-weight individuals, many questions remain unanswered. Further work is needed to determine whether stigma resistance can be "taught" directly, or whether major changes in belief structures and attitudes would be required. Although decision tree analysis suggests that self-investment in the group "Fat" is not a pre-requisite for stigma resistance, can stigma resistance co-exist with beliefs in the likelihood and desire for weight loss? And given the known benefits of group investment (for a review, see Jetten, Haslam, Haslam, Dingle, & Jones, 2014), would resistance in the absence of investment still confer the same rewards? Additionally, the measure of stigma resistance used in the present study specifically referred to individual rather than collective forms of stigma resistance, some of which were quite confrontational in nature. It remains to be determined whether different forms of resistance would be more suitable for different individuals, and whether they would deliver the same benefits.

6.5. Concluding remarks

The aim of this thesis was threefold: to elucidate the independent and complementary roles played by experienced and internalised weight stigma in patterns of maladaptive eating behaviours; to distinguish between the unique and overlapping contributions of internalised weight stigma, body image, and global self-esteem in explaining these relationships; and to test a model of stigma resistance as a response to perceived discrimination.

Interpretation of findings regarding the influence of experienced and internalised weight stigma on eating behaviour was complicated by measurement issues with both constructs, not all of which were foreseen. One clear output of the present work is that such measurement issues may be impeding the progress of weight stigma research. In particular, more precise operationalisation of internalised weight stigma is needed to better distinguish it from related constructs, to ensure the validity of research findings, and to optimise interventions designed to address it. Finally, the empirical work in the thesis provides a framework for future work on weight stigma resistance, which represents a novel line of enquiry that has promise for improving the wellbeing of higher-weight individuals.

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APPENDICES

Appendix A. Internalised weight stigma by BMI and treatment-seeking status

The following studies were included in the comparative analysis of internalised weight stigma scores and BMI by treatment-seeking status of the study sample (see Table A1). Only studies using the WBIS or one of its derivatives to assess internalised weight stigma were included. Where participants were taking part in an intervention study, baseline data are reported. Studies including no higher-weight participants were excluded, as were studies that only assessed internalised weight stigma after some form of experimental manipulation.

Table A1. *Mean BMI, WBIS Scores, and Sample Characteristics of Studies Using the Weight Bias Internalization Scale and its Derivatives*

Authors	Sample	BMI	WBIS	Instrument
(Durso & Latner, 2008)	198 higher-weight adults. Online recruitment of weight-diverse sample via different channels. Self-identified "overweight" retained for analysis.	33.21 (8.58)	3.95 (1.28)	WBIS
(Carels et al., 2010)	54 adults participating in behavioural weight-loss programme.	36.6 (6.7)	4.6 (1.2)	WBIS
(Barber et al., 2011)	First 70 adults recruited as part of larger lifestyle intervention trial for weight loss in people with schizophrenia or schizoaffective disorder.	36.8 (7.0)	4.1 (1.2)	WBIS
(Carels et al., 2011)	53 adults participating in behavioural weight-loss programme.	37.3 (6.6)	4.4 (1.6)	WBIS
(Durso et al., 2012)	100 treatment-seeking patients meeting diagnostic criteria for Binge Eating Disorder.	40.58 (6.63)	4.75 (1.22)	WBIS
(Roberto et al., 2012)	65 morbidly obese adolescents (aged 14–18 years) seeking bariatric surgery.	46.92 (7.86)	4.29 (1.52)	WBIS[a]
(Latner et al., 2013)	120 adults participating in behavioural weight-loss programme.	35.09 (7.65)	3.86 (1.06)	WBIS

Authors	Sample	BMI	WBIS	Instrument
(Schvey, Roberto, & White, 2013)	656 higher-weight adults recruited through volunteer ads on Craig's List in several US cities. Study referred to variously as being about "dieting," "eating habits," "health behaviours," or "weight control." Sample was not limited by weight, but only higher-weight participants included in present analysis.	34.28 (7.74)	4.74 (1.40)	WBIS-19
(Burmeister & Carels, 2014)	116 higher-weight adults taking part in behavioural weight-loss programme.	38.49 (8.80)	4.58 (1.12)	WBIS
(Latner et al., 2014)	81 women recruited via weight-relevant online social media.	43.49 (15.38)	3.31 (1.60)	WBIS
(Lent et al., 2014)	170 adults seeking bariatric surgery.	47.8 (8.3)	4.54 (1.1)	WBIS
(Pearl & Puhl, 2014)	148 weight-diverse adults recruited via Amazon Mechanical Turk. No details of study description in recruitment materials.	27.97 (7.27)	3.27 (1.50)	WBIS-M
(Pearl, White, & Grilo, 2014)	245 adults recruited to "treatment research study for binge eating and obesity."	39.49 (5.92)	4.64 (1.22)	WBIS
(Hilbert et al., 2015)	1,158 higher-weight adults from large nationally representative German sample.	28.22 (3.66)	2.65 (1.19)	WBIS[a]
(Pearl, Puhl, & Dovidio, 2015)	177 women who both self-classified as "overweight" and whose self-reported height and weight produced a body mass index ≥ 25 kg/m^2, recruited via Amazon Mechanical Turk as part of a larger study, advertised to be on the topic of images and health.	32.81 (6.92)	4.31 (1.44)	WBIS
(Hübner et al., 2015)	Pre-surgical data from 178 German bariatric patients.	48.73 (7.34)	4.95 (1.19)	WBIS[a]
(Durso, Latner, & Ciao, 2016)	90 higher-weight adults participating in a behavioural weight-loss study.	35.80 (7.93)	3.93 (1.04)	WBIS[b]
(Hübner et al., 2016)	Pre-surgical data from 78 German bariatric patients.	48.86 (7.94)	5.56 (1.02)	WBIS
(Koball, Mueller, et al., 2016)	242 weight-diverse US adults with a recent visit to their primary care physicians for reasons unrelated to weight.	31.1 (9.5)	3.0 (1.5)	WBIS-M
(Lee & Dedrick, 2016)	243 university students who either self-classified as "overweight" and/or "overweight" by BMI category calculated from self-reported height and weight.	28.56 (nr)	3.93 (1.04)	WBIS[a]

Authors	Sample	BMI	WBIS	Instrument
(Mensinger & Meadows, 2017)	67 higher-weight women participating in a randomised controlled trial of two "healthy lifestyle programmes."	38.0 (3.9)	4.28 (1.04)	WBIS
(O'Brien et al., 2016)	Subset of 117 higher-weight students from a larger sample at an Australian university.	28.96 (4.65)	3.91 (1.65)	WBIS-M
(Raves, Brewis, Trainer, Han, & Wutich, 2016)	298 adults who had undergone bariatric surgery in the previous five years.	30.54 (6.54)	3.79 (0.73)	WBIS[c]
(Schvey, Sbrocco, et al., 2016)	389 higher-weight gym-goers recruited via Craig's List ads and flyers posted in local grocery stores, gyms, and public areas: "Are you overweight and at least 18 years old?	35.59 (7.66)	4.41 (1.34)	WBIS-M
(Schvey, Barmine, et al., 2016)	119 higher-weight active service personnel participating in a weight-loss study.	29.84 (1.97)	3.57 (1.32)	WBIS-M
(Webb & Hardin, 2016)	362 female university students. 17.9% "overweight", 8.8% "obese."	23.47 (4.90)	2.79 (1.00)	WBIS-M
(Himmelstein et al., 2017)	2,378 weight-diverse adults from nationally representative panel.	26.65 (5.74)	2.79 (1.31)	WBIS-M
(Innamorati et al., 2017)	386 treatment-seeking individuals at two Italian weight-loss centres.			WBIS[d]
	Outpatients (216)	29.79 (4.92)	3.61 (1.56)	
	Inpatients (170)	44.82 (8.32)	3.89 (1.53)	
(Pearl et al., 2017)	159 treatment-seeking higher weight adults.	44.1 (5.9)	3.6 (1.1)	WBIS

Note. BMI = body mass index; nr = not reported; WBIS = Weight Bias Internalization Scale; WBIS-M = Modified Weight Bias Internalization Scale; WBIS-19 = original 19 pool items used to develop the standard 11-item WBIS.
[a]Item 1 excluded. [b]Items 1 and 6 excluded. [c]Scale comprised eight items; missing items not specified. [d]Items 1 and 9 excluded.

Appendix B. Vignettes used in Study 1

It is well known that [obese people/smokers] are at increased risk of a wide range of health problems. But new scientific evidence suggests that there are costs in interpersonal relationships also.

Being [fat/a smoker] may have an especially negative impact on dating prospects. A recent experimental study asked 238 university students to rate a personal advertisement of a [man/woman] seeking a dating partner. They found that identifying the individual as [obese/a smoker] resulted in worse evaluations of the prospective dating partner by both women and men compared to an ad where [weight/smoking] wasn't mentioned. Also, including the information caused readers to assign more negative stereotypes to the individual, for example believing they were weak-willed, lazy, unintelligent, or lacking personal responsibility.

Other studies have found similar results. When 449 university students were asked to rank six pictures of hypothetical sexual partners, including [an obese partner / a smoker] and partners with various disabilities (including a partner in a wheelchair, missing an arm, with a mental illness, or described as having a history of sexually transmitted diseases), both men and women ranked the [obese person/smoker] as the least desirable sexual partner compared to the others. However, [men/women] ranked the [obese partner/smoker] as significantly less preferable than [women/men] did, suggesting that stigma may be heightened for [women/men] in sexual relationships. These findings parallel other work demonstrating that [obese] [women/men] [who smoke] are rated as being less sexually attractive, skilled, warm, and responsive, than [normal-weight/non-smoking] peers.

Martha Livingston of relationship counseling charity Relate says that more and more couples where one of the two is [fat/a smoker] are seeking help with their relationships. “The [weight/smoking] is often a cause of contention in the marriage,” she says. “Either they say something and are thought of nagging, or they don’t say anything and it just festers. But either way, relationships can suffer.”

Appendix C. Study 1: Testing measurement invariance of the WBIS-M

This appendix contains methodological description and findings of the tests of measurement invariance by weight status in the WBIS-M. Terminology is following van de Schoot, Hogtig, & Hox (2012).

Methods

Confirmatory factor analysis (CFA) was used to test the measurement invariance of the WBIS-M by weight status. Analyses were run for both objective weight status (body mass index either ≥ 25 kg/m^2 or < 25 kg/m^2) and subjective weight status (self-classified "overweight" versus "non-overweight." The configural model, sometimes called "pattern invariance" acts as the baseline model and simply tests whether the basic factor pattern is valid in both groups – in the case of the WBIS-M, a unidimensional factor. Multigroup CFA is conducted without equality constraints on any parameter. To ensure model identification, the factor mean is set to zero and the factor loading of one item is fixed to unity to provide a scale reference in both groups. Given the issues with item 1 on the WBIS, item 7 ("My weight is a major way that I judge my value as a person") was used as the scaling item due to its face validity as a measure of the underlying construct. Configural invariance indicates only that the individual items measure the same latent variable, with possibly different scales, with possibly different degrees of precision, and with possibly different amounts of error.

To test for metric, or "weak," invariance, factor loadings are constrained to be equal between the groups but the intercepts are allowed to differ. If confirmed, metric invariance indicates that the groups attribute the same meaning to the latent construct.

To test for scalar, or “strong,” invariance, both loadings and intercepts are constrainted to be equal across groups. Scalar invariance indicates that the items measure the same latent variable, on the same scale, but with possibly different degrees of precision for the two groups. If scalar invariance is not confirmed, values of the latent factor cannot be directly compared across groups.

Strict invariance requires that the latent construct is measured identically across the two groups, with the same underlying meaning of the construct, the same scale, same precision, and same amount of error for the two groups. To test for strict invariance, factor loadings, intercepts, and residual variances are constrained to be equal across the two groups. Strict invariance is not required for cross-group comparisons on the latent variable: group means may still be compared, but the latent variable is measured with different amounts of error between groups.

Results

The results for all invariance testing for high versus low weight status are presented in Table C1. For both measures of weight status, constraining factor loadings to be equal across the two groups resulted in significantly worse fit than the base model. That is, the items do not load in the same manner for higher-weight and non-higher-weight participants. Thus, metric invariance was not confirmed and further restrictions were not tested.

Table C1. *Tests for Measurement Invariance of WBIS-M by Objective and Subjective Weight Status*

Measurement invariance	χ^2 (*df*)	CFI	RMSEA [90% CI]	SRMR	$\Delta\chi^2$
Objective weight status					
Configural invariance	215.2 (88), $p < .001$	.895	.135 [.112, .158]	.051	-
Metric invariance	235.6 (98), $p < .001$	.887	.133 [.112, .155]	.086	20.4 (10), $p = .03$
Subjective weight status					
Configural invariance	196.9 (88), $p < .001$	.899	.125 [.102, .149]	.051	–
Metric invariance	231.6 (98), $p < .001$	.876	.131 [.110, .153]	.107	34.7 (10), $p < .001$

Note. CFI = Comparative Fit Index; *df* = degrees of freedom; RMSEA = root mean square error of approximation; SRMR = standardised root mean square residual.

Visual inspection of factor loadings for the two groups in the unconstrained base model indicated that items 4, 9, and 10 are notably indifferent across the two groups. Item 4 ("I wish I could drastically change my weight,") and item 9 ("I am OK being the weight that I am," reverse scored) both refer to desire for weight change, and item 10 ("Because I'm overweight, I don't feel like my true self,") refers to fat identity. By both measures of weight status, factor loadings for each item were approximately double in the lower- versus higher-weight status group. Thus, the importance of weight change, or lack of self-definition as fat, appears to be greater in defining internalised weight stigma in lower-weight individuals.

Appendix D. Study 2: Correlations of experienced weight stigma with internalised weight stigma and global self-esteem

With the exception of physical assault, all domains of the Stigmatizing Situations Inventory were significantly correlated with higher levels of internalised weight stigma and lower self-esteem. However, after controlling for BMI, only nasty comments (from all sources), embarrassment of loved ones, negative assumptions, being excluded or ignored, and job discrimination remained significantly associated with internalisation, and only interpersonal sources of stigma remained significantly associated with self-esteem (see Table D1).

Table D1. *Correlations Between Experienced Weight Stigma and Internalised Weight Stigma and Global Self-Esteem*

	WBIS		RSE	
	Bivariate	Partial	Bivariate	Partial
SSI Total	.23***	.19***	-.28***	-.23***
SSI domains				
Comments from children	.22***	.21***	-.28***	-.25***
Others making negative assumptions	.17**	.15**	-.24***	-.21***
Physical barriers	.14**	.08	-.21***	-.10⁺
Being stared at	.11*	.08	-.22***	-.18**
Inappropriate comments from doctors	.05	.02	-.09⁺	-.04
Nasty comments from family	.19***	.18***	-.17**	-.15**
Nasty comments from others	.17**	.13*	-.25***	-.21***
Being avoided, excluded, or ignored	.29***	.28***	-.32***	-.29***
Loved ones embarrassed by your size	.24***	.23***	-.20***	-.19***
Job discrimination	.15**	.12*	-.13*	-.11*
Being physically attacked	.05	.03	-.14**	-.09

Note. *N* = 379. Bivariate correlations are Spearman's ρ. Partial correlations control for body mass index. RSE = Rosenberg Self-Esteem scale; SSI = Stigmatizing Situations Inventory; WBIS = Weight Bias Internalization Scale.

Appendix E. Study 2: Bifactor analysis of measures of internalised weight stigma, body image, and global self-esteem

This appendix contains methods and results of full CFA exploration of the overlap between three scales leading up to the development of the bifactor model. Main findings pertaining to the bifactor model itself are included in the body text, but reproduced here for completeness as some additional analyses are also presented.

Methods

Bifactor analysis is a form of confirmatory factor analysis that allows for the parsing of variance into unique and joint components (Brunner et al., 2012; Chen et al., 2006; Rindskopf & Rose, 1988). It gets its name from the fact that scale items are allowed to load onto two factors – their own specific construct and a general factor that captures any underlying commonality between the specific components. Rather than simply testing a bifactor structure, it is usual to test a number of competing models that represent alternative explanations for the variance observed in the data.

Four competing models were tested using confirmatory factor analysis following the guidelines outlined in Brunner et al (2012). The first model was a one-factor model in which a proposed negative self-judgment construct was regressed on all items of the WBIS, RSE, and Appearance Evaluation scales simultaneously (Figure E1).

The one-factor model represents a situation where individual differences in scores on items across all three scales are influenced solely by differences in a single common latent factor – negative self-judgment, plus item-level residual error, with no scale-specific contribution (Fig E1.A). The residual error for each item, which represents variance not accounted for by the negative self-judgment factor, comprises item-specific variance and random measurement error.

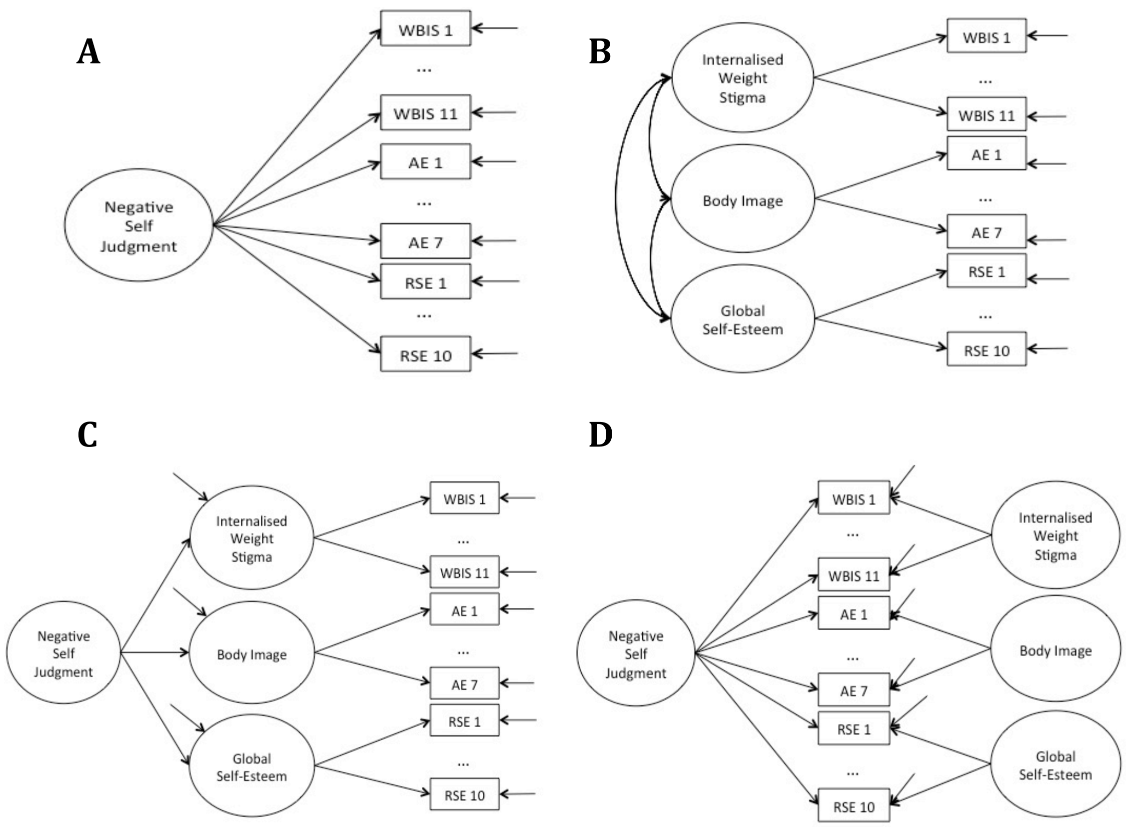

Figure E1. Schematic representation of the four alternative models. For clarity, only first and final scale items are shown for each measure, with remaining items represented by ellipses. A. One-factor model. B. First-order model. C. Second-order model. D. Bifactor model. AE = Appearance Evaluation scale; RSE = Rosenberg Self-Esteem Scale; WBIS = Weight Bias Internalization Scale.

The second model tested was a first-order CFA in which the items of each scale load only onto a scale-specific factor representing each individual construct. That is, each item is assumed to be influenced by a first-order, construct-specific factor – namely internalised weight stigma, body image, or global self-esteem, plus item-level residual error. This model does not include a general negative self-judgement factor and therefore does not account for shared variance between the three constructs. The three specific factors are allowed to correlate freely (Figure E1.B).

The third model, a second-order CFA, allows the three construct-specific factors to load onto a higher-order negative self-judgment factor (Figure E1.C). This model therefore includes both scale-specific variance and inter-scale shared variance attributable to the common latent factor. Variance of the first-order factors is now comprised partly of shared variance linked to the superordinate negative self-judgment construct and partly of scale-specific variance beyond the contribution of the higher-order factor. This model essentially imposes structural requirements onto the previously freely loading inter-factor correlations in the first-order model (Figure E1.B). That is, the second-order model constrains the correlations between the first-order factors to be zero and instead replaces them with factor loadings onto the second-order construct. Thus, the second-order general construct is theorised to explain the correlations – i.e. the common variance – between the scale-specific factors; the scales are correlated *because* they share a common cause. While the first-order and second-order models represent conceptually distinct models, they are statistically equivalent in this case, and therefore not discriminable (Rindskopf & Rose, 1988).[42] Note that the arrangement of factors in this hierarchical structure implies that the second-order factor influences the first-order variables, which, in

[42] The first-order model (Figure E1.B) provides six pieces of information to estimate the variances of the three latent factors and the three inter-factor covariances; the second-order model (Figure E1.C) utilises the same six pieces of information but creates three factor loadings onto the second-order factor and three variances of the residual errors (disturbances) of the first-order factors. The variance of the second-order factor is not calculated as it is constrained to equal 1 to facilitate model identification. There is therefore no change in the number of model parameters between the first-order and second-order models.

turn, influence the individual scale items. That is, the second-order negative self-judgment factor has an *indirect* effect on item scores, via its influence on the first-order constructs. The influence of first-order constructs on the individual item scores is likewise partially accounted for by the influence of the second-order negative self-judgment factor on the first-order factors.

The final model tested was a bifactor model, in which both a general factor and three construct-specific factors were included – note all four factors are now first-order factors. Distinguishing the bifactor model from the second-order model, the bifactor model allows for the commonality among the scale items explained by the general negative self-judgment factor to be partialled out, with the scale-specific factors representing only the unique shared variance among the respective scale items on each scale, beyond that accounted for by the common underlying factor (Figure E1.D). This is achieved by specifying the inter-factor correlations to equal zero, thus forcing the common variance in the model (i.e. excluding the item-specific residual variance) to be split between four orthogonal factors. Note, in the bifactor model, variance in item scores are explained by the *direct* influence of the general factor, the influence of specific constructs, independent of the general factor, plus item-level residual variance not accounted for by either the underlying negative self-judgment factors or the scale-specific factors.

All analyses were conducted using maximum likelihood (ML) estimation using Mplus version 8 (Muthén & Muthén, 1998–2017). Although ML estimation assumes multivariate normal distribution of the measured variables in the population, it is robust to mild to moderate normality violations (Curran, West, & Finch, 1996; Fan &

Wang, 1998). Descriptive statistics indicated approximately normal distribution of indicators, with only mild values of skew and kurtosis (absolute values ≤ .99 and ≤ 1.4). Starting values were allocated to factor loadings and the variance of latent factors was fixed to unity to facilitate model identification.

Model fit

Goodness of model fit to the observed data was assessed using the same two-index reporting method outlined above. However, CFI tends to decline with increasing number of indicators in the model (Kenny & McCoach, 2003). In the present analysis, the maximum number of variables per factor was 28, thus, following Chen (2012), a less stringent cut-off of .90 was used for the CFI to indicate goodness of fit.

Comparison of model fit (i.e. selection of superior models) was assessed using fit indices (CFI, SRMR) plus χ^2 difference tests for nested models (one-factor versus bifactor, first-order versus second-order, and second-order versus bifactor models). A reduction in χ^2 greater than the critical value for the change in degrees of freedom indicates a significantly better model fit. Information criteria (Akaike Information Criterion [AIC], Bayes Information Criterion [BIC], and sample size-adjusted Bayes Information Criterion [SSA-BIC]) were used to compare non-nested models (one-factor versus first-order and first-order versus bifactor models).[43] No specific guidelines are available for comparing information criteria values between models, other than lower values indicate improvement in model fit; however, differences of greater than 10 can be considered to correspond to "very strong evidence" of superior

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[43] Information criteria can also be compared for nested models.

model fit (Burnham & Anderson, 2004; Raftery, 1995).

Model reliability

Model-based scale reliabilities were calculated following Rodriguez et al (2016). The overall reliability statistic, ω is defined as the total amount of variance attributable to *all* the constructs underlying the total scale score, i.e. general plus scale-specific factors, divided by the total observed variance, i.e. the variance attributable to all the latent factors in the model plus item-level residual unexplained variance (see Figure E2.A).[44] The reliability statistic ωH represents the amount of total variance attributed to variance on the general factor (Figure E2.B), ωS refers to the proportion of total variance explained by specific factors and the general factor associated with the items of that specific factor (so, for example, the loadings of the eleven items in the WBIS scale onto the general factor, Figure E2.C), and ωHS refers to the proportion of total variance attributable to specific factors after partitioning out the variance explained by the general factor (Figure E2.D). As with other reliability statistics, the value of ω can range from 0 to 1.

Two additional statistics were calculated: the explained common variance and the percent of uncontaminated correlations (Reise, Bonifay, & Haviland, 2013; Rodriguez et al., 2016). The explained common variance (ECV) indicates the proportion of the *common* variance (i.e. excluding unique item-level residual variance) that is accounted for by the general factor. It provides an indication of the extent to which the items can

[44] This statistic is the latent-variable equivalent of Cronbach's α. Note, nomenclature for omega statistics varies across different authors.

usefully be considered as representing a unidimensional construct, even in the presence of significant variance explained by specific constructs.

$$\omega = \frac{(\Sigma\ \text{NEG}\ \lambda s)^2 + (\Sigma\ \text{IWS}\ \lambda s)^2 + (\Sigma\ \text{BI}\ \lambda s)^2 + (\Sigma\ \text{SE}\ \lambda s)^2}{(\Sigma\ \text{NEG}\ \lambda s)^2 + (\Sigma\ \text{IWS}\ \lambda s)^2 + (\Sigma\ \text{BI}\ \lambda s)^2 + (\Sigma\ \text{SE}\ \lambda s)^2 + \Sigma\ \text{residual errors}} \quad \text{(A)}$$

$$\omega H = \frac{(\Sigma\ \text{NEG}\ \lambda s)^2}{(\Sigma\ \text{NEG}\ \lambda s)^2 + (\Sigma\ \text{IWS}\ \lambda s)^2 + (\Sigma\ \text{BI}\ \lambda s)^2 + (\Sigma\ \text{SE}\ \lambda s)^2 + \Sigma\ \text{residual errors}} \quad \text{(B)}$$

$$\omega S = \frac{(\Sigma\ \text{NEG}\ \lambda 1 - \lambda 11)^2 + (\Sigma\ \text{IWS}\ \lambda s)^2}{(\Sigma\ \text{NEG}\ \lambda s)^2 + (\Sigma\ \text{IWS}\ \lambda s)^2 + (\Sigma\ \text{BI}\ \lambda s)^2 + (\Sigma\ \text{SE}\ \lambda s)^2 + \Sigma\ \text{residual errors}} \quad \text{(C)}$$

$$\omega HS = \frac{(\Sigma\ \text{IWS}\ \lambda s)^2}{(\Sigma\ \text{NEG}\ \lambda s)^2 + (\Sigma\ \text{IWS}\ \lambda s)^2 + (\Sigma\ \text{BI}\ \lambda s)^2 + (\Sigma\ \text{SE}\ \lambda s)^2 + \Sigma\ \text{residual errors}} \quad \text{(D)}$$

Figure E2. Calculation of reliability statistics. Equations for ωS and ωHS are shown for the IWS scale, as an example. Reliability of the other scales were calculated in the same manner. BI = body image factor; IWS = internalised weight stigma factor; NEG = negative self-judgment factor; SE = self-esteem factor.

The percentage of uncontaminated correlations (PUC) is a measure of the extent to which inter-item correlations are actually due to variance on the general underlying dimension, and is based on the number of construct-specific factors and the number of items on each factor. It is calculated simply as the number of correlations between items from different construct-specific factors, over the total number of correlations for all items. For a given number of items, the shared variance attributable to the general factor will depend to some extent on how the items are distributed between factors – many factors with few items per factor would bias the apparent contribution of the general underlying factor upwards. Together, the ECV, PUC, and reliability of the general factor (ωH) give an indication of the penalty for forcing a genuinely multidimensional structure onto a single general factor. As a general guideline, if PUC is less than .80, general ECV above .60 and ωH above .70 suggests that even when interpretable construct-specific variance is present, a primarily unidimensional interpretation cannot be discounted (Reise et al., 2013). A similar conclusion can be drawn if both the ECV and PUC are above .70 (Rodriguez et al., 2016).

Results

Preliminary analyses

Some previous studies using the WBIS have found that the first item on the questionnaire, "As an overweight person, I feel that I am just as competent as anyone," loaded poorly onto the one-factor structure and had very low (Durso, Latner, & Ciao, 2016), or even negative (Hilbert et al., 2014; M. S. Lee & Dedrick, 2016), item-total score correlation; however, other analyses have not found this item to be problematic (e.g. Durso & Latner, 2008; Gomez & Baile, 2015). Thus, as a first step, separate CFA models were tested for each individual scale to ensure that the items adequately represented the constructs of interest. All three models were an acceptable fit to the data (see Table E1).

Table E4. *Model Fit Indices for Individual Scale Confirmatory Factor Analysis*

Measure	χ^2	*df*	CFI	SRMR
Weight Bias Internalization Scale	272	44	.92	.048
Appearance Evaluation	143	14	.91	.052
Rosenberg Self-Esteem scale	246	35	.90	.053

Note. All χ^2 $p < .001$. CFI = Comparative Fit Index; *df* = degrees of freedom; SRMR = standardised root mean squared residual.

For the WBIS, the first item had a lower factor loading (standardised $\lambda = .48$) compared with the other ten items in the scale (standardised $\lambda = .68$ –.91, median .73). However, this loading was above the generally accepted cut-off of .3 for meaningful factor loading in a sample of this size (Stevens, 2002; cited in Field, 2013), and was statistically significant ($p < .001$), indicating that the item adequately captured the target construct in the present sample. Re-running the model with item 1 excluded resulted in only a small improvement in model fit (CFI = .93, SRMR = .04).[45] Thus, all eleven items were included in subsequent analyses. Factor loadings on the Appearance Evaluation scale ranged from .57 to .84, median = .76. Factor loadings on the RSE ranged from .61 to .84, median = .69.

One-factor model

Model fit statistics for the four models are displayed in Table E2. The one-factor model was only a moderate fit for the data. Additionally, reliability of the one-factor negative self-judgment construct was only .36. Thus, the observed association between the items was not adequately explained by the influence of a single negative self-judgment factor.

Table E2. *Model Fit Indices and Information Criteria for Alternative Model Formulations*

Model	χ^2	*df*	CFI	SRMR	AIC	BIC	SSA-BIC
One-factor model	2041	350	.767	.078	28685	29016	28749
First-order factor model	1357	347	.860	.065	28007	28350	28074
Second-order factor model	1357	347	.860	.065	28007	28350	28074
Bifactor model	1049	322	.900	.062	27749	28190	27835

Note. All χ^2 $p < .001$. AIC = Akaike's Information Criterion; BIC = Bayes Information Criterion; CFI = Comparative Fit Index; *df* = degrees of freedom; SRMR = standardised root mean squared residual; SSA-BIC = sample-size adjusted Bayes Information Criterion.

[45] Analysis conducted in SPSS indicated the item-total correlation for item 1 was .48.

First-order factor model

The first-order factor model was a markedly better fit for the data than the one-factor model, having lower AIC (difference = 678), lower BIC (difference = 666), and lower sample-size adjusted BIC (difference = 675). Additionally, the model fit indices CFI and SRMR were improved compared with the one-factor model.

As established in preliminary CFA of individual constructs, the three constructs were well specified and model-based reliabilities for the three factors were high: IWS ω = .93, body image (BI) ω = .89, and global self-esteem (SE) ω = .91. However, inter-factor correlations were extremely high (IWS with BI and SE, r = -.88 and -.78, respectively; BI with SE, r = .70; all $p < .001$), suggesting a large amount of common variance between the three constructs.

Second-order factor model

As noted above, this model is statistically identical to the first-order model; model fit indices are therefore the same for both models, as are, by definition, the scale reliabilities of the first-order factors. However, the scale reliability for the second-order negative self-judgment factor was only moderate (ω = .697), suggesting that this conceptualisation of the model only moderately explains the total variance in the observed data.

Bifactor model

The bifactor model was a good fit for the data, and significantly better than the second-order model ($\Delta\chi^2(25) = 308$, $p < .0001$). Model fit indices and information criteria also indicated superior model fit. However, model fit of the bifactor model was also significantly superior to the one-factor model ($\Delta\chi^2(28) = 902$, $p < .0001$), indicating that the individual scales do explain a significant proportion of individual scale variance, beyond that accounted for by an underlying general factor.

Items on the WBIS loaded negatively onto the general construct, whereas items on the Appearance Evaluation and RSE scales loaded positively. Thus the general construct appears to represent an underlying *positive* self-judgment factor. Consistent with the hypothesised underlying general construct, items on the WBIS and Appearance Evaluation scale loaded strongly onto the general factor and only weakly onto their specific factors once shared variance was partialled out (see Table E3; also included in main text). Indeed, it could be questioned whether the internalised weight stigma and body image scales provide interpretable unique variance after controlling for the general underlying factor (Reise et al., 2013; Reise, Moore, & Haviland, 2010). Only two items on the appearance evaluation factor and three on the internalised weight stigma factor had a loading above .4. Overall, over three-quarters of the variance in WBIS scores was explained by the underlying positive self-judgment factor, with just 15% accounted for by factor-specific commonality. The remainder was attributed to unique item-level variance. Less than 10% of the variance in six of the WBIS scale items – namely, questions 1, 2, 4, 9, 10, and 11– was attributable to the construct-specific factor. Similarly, only two of the seven items on the Appearance Evaluation demonstrated more than 10% of variance attributable to the factor-specific construct, and over 80% of the variance in scale scores was attributable to variation in the underlying general factor.

Table E3. *Standardised Factor Loadings, Proportion of Variance Associated With General and Specific Factors, Scale Reliabilities, Explained Common Variance And Percent Uncontaminated Correlations for Bifactor Model*

	Standardised factor loadings				% Variance explained		
Item numbers[a]	POS	IWS	BI	SE	% General	% Specific	% Residual
Weight Bias Internalization Scale (WBIS)							
-WBIS1[b]	-.484	.099[†]			23.4%	1.0%	75.6%
+WBIS2[c]	-.685	.232			47.0%	5.4%	47.6%
+WBIS3[d]	-.543	.436			29.5%	19.0%	51.5%
+WBIS4[e]	-.757	.225			57.3%	5.1%	37.6%
+WBIS5[f]	-.718	.452			51.6%	20.4%	28.0%
+WBIS6[b,f]	-.786	.463			61.8%	21.4%	16.8%
+WBIS7[b]	-.715	.383			51.1%	14.7%	34.2%
+WBIS8[b]	-.580	.342			33.7%	11.7%	54.6%
-WBIS9[e]	-.768	.066[†]			59.0%	0.4%	40.6%
+WBIS10[g]	-.699	.196			48.9%	3.8%	47.3%
+WBIS11[b,c,d]	-.706	.246			49.8%	6.1%	44.1%
Scale total					78.1%	15.1%	6.8%
Appearance Evaluation scale (AE)							
+S/O: AE1	.728		.214		53.1%	4.6%	42.4%
+S: AE2	.850		.038[†]		72.3%	0.1%	27.5%
+O: AE3	.474		.491		22.5%	24.1%	53.4%
+S: AE4	.817		.029[†]		66.7%	0.1%	33.2%
+S: AE5	.778		.101[†]		60.6%	1.0%	38.4%
-S: AE6	.584		.289		34.1%	8.4%	57.5%
-S/O: AE7	.699		.588		48.8%	34.6%	16.6%
Scale total					82.4%	8.4%	9.2%
Rosenberg Self Esteem Scale (RSE)							
+RSE1	.756			.220	57.2%	4.8%	38.0%
-RSE2	.432			.537	18.6%	28.8%	52.5%
+RSE3	.435			.471	18.9%	22.2%	58.9%
+RSE4	.406			.444	16.5%	19.7%	63.8%
-RSE5	.447			.601	20.0%	36.2%	43.8%
-RSE6	.402			.605	16.2%	36.7%	47.2%
+RSE7	.500			.573	25.0%	32.9%	42.1%
-RSE8	.502			.372	25.2%	13.8%	61.0%
-RSE9	.546			.642	29.8%	41.2%	29.0%
+RSE10	.698			.438	48.7%	19.2%	32.2%
Scale total					47.8%	43.7%	8.5%
ω / ω-S	.966	.932	.908	.915			
ω-H / ω-HS	.864	.141	.076	.437			
ECV	.724						
PUC	.680						

Note. BI = body image factor; IWS = internalised weight stigma factor; POS = general positive self-judgment factor; SE = global self-esteem factor.

[a]Numbers represent item numbers on each scale, as originally published. +/- before item numbers indicates valence of items. Those with negative valence are designed to be reverse scored on their original scale construct. S/O indicates whether the item refers to the respondent's own views (S, self) or their impressions of other people's views (O, other). [b]Item content appears to pertain to weight-related self-worth. [c]Item content appears to pertain to body image. [d]Item content appears to pertain to others' attitudes toward higher-weight individuals. [e]Item content appears to pertain to desire to change weight. [f]Item content appears to pertain to distress at weight status; [g]Item content appears to pertain to fat identity.

[†]Non-significant factor loading ($p \geq .05$).

Scale reliabilities also indicated high construct-specific reliabilities overall (ω-S > .9) but extremely low reliable score variance explained by the construct-specific internalised weight stigma and body image factors after controlling for the general factor (ω-HS .14 and .08, respectively). Thus, the apparently reliability of the individual scales is inflated by the presence of reliable variance that is actually explained by a more general underlying factor.

Additionally, two of the eleven items on the WBIS and three of the seven items on the Appearance Evaluation scale did not load significantly onto their specific factors after controlling for general underlying positive self-judgment. However, it was noted that these items were the only two reverse-scored items on the WBIS (i.e. higher scores indicated lower internalised weight stigma) and three of the five positively worded items on the Appearance Evaluation scale (i.e. higher scores indicated greater appearance satisfaction). The implications of this finding will be discussed further below.

Also of note was the content validity of the items that did and did not remain strong predictors of the construct-specific internalised weight stigma factor. Excluding the reverse-scored items, one of which pertained to self-worth and the other to desire to change, five items loaded onto the factor with standardised loadings above .3. Two related to self-worth, one to concern about others' attitudes, one to psychological distress, and one was a combination of self-worth and distress ("I hate myself for being overweight.") Items pertaining to desire to change, fat identity, and body image, did not fare so well.

The RSE was a more robust measure. Items loaded evenly onto the general and scale-specific factors, with variance on nine out of the ten items being attributable to factor-specific commonality after controlling for general positive self-judgment. Further, half of the items loaded > .5 onto the self-esteem factor, and the self-esteem factor had reasonable scale-specific reliability, even when controlling for the general factor.

The ECV and PUC statistics also provided evidence that despite statistically relevant construct-specific factors (indicated by superior fit of the bifactor model to the one-factor model), the observed data can be largely interpreted as representing a common underlying factor – positive self-judgment.

Given the disparate results for the global self-esteem construct compared with the other two constructs, it was possible that the WBIS and Appearance Evaluation scale might be better represented by an underlying body- or appearance-related general factor, as opposed to a global self-judgment factor. Thus, a *post hoc* analysis was conducted using only the scores on these scales, and excluding the RSE. However, scale reliabilities were almost unchanged, and the proportion of variance explained by the general appearance and construct-specific factors and the amount of residual variance not explained by the model, was very similar to the original three-scale bifactor model.

Appendix F. Self-perceived food addiction: Prevalence, predictors, and prognosis

Sections of the following paper are included in Chapter 4 of the present thesis.

Meadows, A., Nolan, L., Higgs, S. (2017). Self-perceived food addiction: Prevalence, predictors, and prognosis. *Appetite, 114*, 282–298. http://doi.org/10.1016/j.appet.2017.03.051

Angela Meadows was responsible for designing the study, collecting data, planning and conducting analyses, and writing the manuscript. Professor Suzanne Higgs provided guidance with the study design, was involved in discussions of the analyses, and was responsible for reading and revising drafts of the manuscript. Professor Laurence J. Nolan provided comments on a final draft of the manuscript.

Appendix G. Studies 3 and 4: Alternative serial mediation models predicting "food addiction"

Table G1. *Alternative Serial Mediation Models Predicting "Food Addiction" in a Student Sample*

	B	*SE*	β	95% CI (*B*)	*p*
YFAS Symptom count					
Total effect	.13	.01	.13	[.10, .15]	< .00
Direct effect	.04	.02	.14	[.00, .07]	.03
Indirect effects					
Self → Fear → YFAS symptom count	.01	.01	.04	[-.01, .04]	.42
Self → Chronic dieting → YFAS symptom count	.02	.01	.09	[.01, .04]	.00
Self → Eating self-efficacy → YFAS symptom count	.05	.01	.19	[.04, .07]	< .00
Self → Fear → Chronic dieting → YFAS symptom count	.00	.00	.01	[-.00, .01]	.42
Self → Fear → Eating self-efficacy → YFAS symptom count	-.01	.01	-.04	[-.02, .00]	.07
Self → Chronic dieting → Eating self-efficacy → YFAS symptom count	.01	.00	.05	[.01, .02]	< .00
Self → Fear → Chronic dieting → Eating Self-Efficacy → YFAS symptom count	.00	.00	.00	[-.00, .00]	.41
YFAS**+**					
Total effect	.10	.01	.57	[.08, .11]	< .00
Direct effect	.05	.02	.27	[.01, .09]	.03
Indirect effects					
Self → Fear → YFAS+	.01	.02	.04	[-.03, .04]	.70
Self → Chronic dieting → YFAS+	.02	.01	.14	[.01, .04]	.01
Self → Eating self-efficacy → YFAS+	.02	.01	.10	[.01, .03]	.01
Self → Fear → Chronic dieting → YFAS+	.00	.00	.01	[-.00, .01]	.43
Self → Fear → Eating self-efficacy → YFAS+	-.00	.00	-.02	[-.01, .00]	.14
Self → Chronic dieting → Eating self-efficacy → YFAS+	.00	.00	.03	[.00, .01]	.03
Self → Fear → Chronic dieting → Eating Self-Efficacy → YFAS+	.00	.00	.00	[.00, .00]	.45

	B	SE	β	95% CI (B)	p
SPFA**+**					
Total effect	.05	.01	.29	[.03, .07]	< .00
Direct effect	-.03	.02	-.15	[-.06, .01]	.41
Indirect effects					
Self → Fear → SPFA+	.04	.01	.22	[.01, .06]	.01
Self → Chronic dieting → SPFA+	.00	.01	.02	[-.01, .02]	.67
Self → Eating self-efficacy → SPFA+	.03	.01	.20	[.02, .05]	< .00
Self → Fear → Chronic dieting → SPFA+	.00	.00	.00	[-.00, .00]	.79
Self → Fear → Eating self-efficacy → SPFA+	-.01	.00	-.04	[-.02, .00]	.08
Self → Chronic dieting → Eating self-efficacy → SPFA+	.01	.00	.05	[.00, .01]	.00
Self → Fear → Chronic dieting → Eating Self-Efficacy → SPFA+	.00	.00	.00	[-.00, .00]	.41

Note. All models controlled for gender, ethnicity, and BMI. SPFA+ pertains to participants who self-classified as “food addicted” but who did *not* receive a positive “diagnosis” on the YFAS, thus YFAS+ participants are excluded from this analysis. Standard errors and 95% confidence intervals derived from 10,000 bootstrap sampled. B = unstandardised regression coefficient; β = standardised regression coefficient; Fear = fear of enacted weight stigma; Self =Weight-related self-devaluation; SPFA = self-perceived food addiction; YFAS = Yale Food Addiction Scale.

Table G2. *Alternative Serial Mediation Models Predicting "Food Addiction" in a Community Sample*

	B	*SE*	β	95% CI (*B*)	*p*
YFAS Symptom count					
Total effect	.13	.01	.47	[.11, .15]	< .00
Direct effect	.00	.02	.01	[-.03, .03]	.87
Indirect effects					
Self → Fear → YFAS symptom count	.03	.01	.09	[.00, .05]	.04
Self → Chronic dieting → YFAS symptom count	.02	.01	.06	[.01, .03]	.00
Self → Eating self-efficacy → YFAS symptom count	.05	.01	.17	[.03, .07]	< .00
Self → Fear → Chronic dieting → YFAS symptom count	.01	.00	.02	[.00, .01]	.02
Self → Fear → Eating self-efficacy → YFAS symptom count	.02	.01	.08	[.01, .03]	< .00
Self → Chronic dieting → Eating self-efficacy → YFAS symptom count	.01	.00	.03	[.00, .02]	.00
Self → Fear → Chronic dieting → Eating Self-Efficacy → YFAS symptom count	.00	.00	.01	[.00, .03]	.02
YFAS+					
Total effect	.08	.01	.48	[.06, .10]	< .00
Direct effect	.00	.01	.00	[-.03, .03]	.97
Indirect effects					
Self → Fear → YFAS+	.03	.01	.16	[.01, .05]	.01
Self → Chronic dieting → YFAS+	.00	.01	.01	[-.01, .01]	.71
Self → Eating self-efficacy → YFAS+	.03	.01	.18	[.02, .04]	< .00
Self → Fear → Chronic dieting → YFAS+	.00	.00	.00	[-.00, .00]	.72
Self → Fear → Eating self-efficacy → YFAS+	.01	.00	.08	[.01, .02]	.00
Self → Chronic dieting → Eating self-efficacy → YFAS+	.01	.00	.03	[.00, .01]	.01
Self → Fear → Chronic dieting → Eating Self-Efficacy → YFAS+	.00	.00	.01	[.00, .00]	.03

	B	SE	β	95% CI (B)	p
SPFA+					
Total effect	.05	.01	.28	[.03, .06]	< .00
Direct effect	.00	.02	.01	[-.03, .03]	.91
Indirect effects					
Self → Fear → SPFA+	-.02	.01	-.11	[-.04, .00]	.08
Self → Chronic dieting → SPFA+	.01	.00	.06	[.00, .02]	.03
Self → Eating self-efficacy → SPFA+	.03	.01	.18	[.02, .04]	< .00
Self → Fear → Chronic dieting → SPFA+	.00	.00	.02	[.00, .01]	.09
Self → Fear → Eating self-efficacy → SPFA+	.01	.00	.09	[.01, .02]	< .00
Self → Chronic dieting → Eating self-efficacy → SPFA+	.01	.00	.03	[.00, .01]	.00
Self → Fear → Chronic dieting → Eating Self-Efficacy → SPFA+	.00	.00	.01	[.00, .00]	.02

Note. All models controlled for gender, ethnicity, and BMI. SPFA+ pertains to participants who self-classified as “food addicted” but who did *not* receive a positive “diagnosis” on the YFAS, thus YFAS+ participants are excluded from this analysis. Standard errors and 95% confidence intervals derived from 10,000 bootstrap sampled. B = unstandardised regression coefficient; β = standardised regression coefficient; Fear = fear of enacted weight stigma; Self =Weight-related self-devaluation; SPFA = self-perceived food addiction; YFAS = Yale Food Addiction Scale.

Appendix H. Study 5: Differences in study variables by BMI status

Twenty-six participants (2.7%) had a BMI less than 25 kg/m^2 based on self-reported height and weight. Independent samples *t*-tests showed that these participants had significantly lower scores on measures of internalised weight stigma, group solidarity, and stigma resistance, and higher scores on perceived legitimacy of societal weight stigma, and weight-controllability beliefs than did the remaining participants (see Table H1).

Table H1. *Differences in Mean Scores on Study Variables by Weight Status*

	BMI ≥ 25 kg/m^2	BMI < 25 kg/m^2			
Variable	*M (SD)*	*M (SD)*	*t*	*p*	*Cohen's d*[b]
Global self-esteem	17.5 (5.9)	17.2 (4.7)	0.3	.77	–
Perceived weight stigma	3.5 (0.8)	3.2 (0.8)	1.5	.14	–
WBIS-19	3.6 (1.1)	4.1 (1.0)	-2.3	.02	0.48
Perceived legitimacy[a]	1.8 (0.9)	2.8 (1.4)	-3.5	.00	0.85
Ingroup identification	3.2 (1.0)	3.0 (0.9)	1.3	.27	–
Group investment	3.3 (1.2)	3.0 (1.0)	1.6	.17	–
Group solidarity	3.9 (1.7)	3.0 (1.4)	2.9	.00	0.58
Group satisfaction	2.7 (1.2)	2.5 (1.1)	0.8	.45	–
Group centrality	3.6 (1.7)	4.0 (1.4)	-1.2	.25	–
Group self-definition	3.1 (1.2)	3.1 (1.1)	-0.0	.98	–
Group self-stereotyping	3.4 (1.3)	3.2 (1.4)	1.0	.30	–
Group homogeneity	2.7 (1.3)	2.9 (1.3)	-1.1	.26	–
Stigma resistance	4.7 (1.4)	4.0 (1.2)	2.5	.01	0.54
Weight controllability	3.0 (1.7)	4.3 (1.5)	-3.6	.00	0.81

Note. BMI ≥ 25 kg/m^2 *N* = 886, BMI < 25 kg/m^2 *N* = 26. BMI = body mass index; WBIS-19 = 19-item version of Weight Bias Internalization Scale.
[a] Five-item scale. [b]Absolute values of Cohen's *d* statistic.

Appendix I. Study 5: Differences in study variables by demographics

Differences by gender

Female participants reported higher levels of stigma consciousness, overall group investment, group solidarity, and stigma resistance, and lower self-devaluation, perceived legitimacy of weight stigma, and weight controllability beliefs.

Table I1. *Differences in Mean Scores on Study Variables by Gender*

	Male	Female			
Variable	*M (SD)*	*M (SD)*	*t*	*p*	*Cohen's d*[a]
Global self-esteem	17.0 (5.5)	17.5 (5.9)	-0.8	.45	–
Perceived weight stigma	3.0 (0.8)	3.5 (0.8)	-5.9	< .00	0.63
Weight-related self-devaluation	2.3 (1.1)	2.1 (1.0)	1.7	.09	–
Weight-related distress	4.7 (1.3)	4.7 (1.4)	0.4	.66	–
Perceived legitimacy	2.6 (1.1)	1.8 (0.8)	6.0	< .00	0.83
Ingroup identification	2.9 (1.1)	3.2 (1.0)	-2.8	.01	0.29
Group investment	2.9 (1.3)	3.3 (1.1)	-3.0	.00	0.33
Group solidarity	3.1 (1.5)	4.0 (1.6)	-5.2	< .00	0.58
Group satisfaction	2.6 (1.4)	2.6 (1.1)	-0.2	.84	–
Group centrality	3.4 (1.8)	3.7 (1.7)	-1.5	.14	–
Group self-definition	2.9 (1.2)	3.1 (1.2)	-1.0	.30	–
Group self-stereotyping	3.3 (1.4)	3.5 (1.3)	-1.1	.28	–
Group homogeneity	2.6 (1.3)	2.7 (1.3)	-0.7	.47	–
Stigma resistance	3.7 (1.4)	4.7 (1.3)	-7.0	< .00	0.74
Weight controllability	4.5 (1.8)	2.9 (1.7)	8.3	< .00	0.91

Note. Data presented for final sample with gender information available. Female N = 796, Male N = 90.
[a] Absolute values of Cohen's *d* statistic.

Differences by age

Age was positively associated with self-esteem (r = .20, p < .00), and negatively related to weight stigma consciousness (r = -.10, p = .00), weight-related self-devaluation (r = -.06, p = .09), weight-related distress (r = .09, p = .01), and weight controllability beliefs (r = -.13, p < .00). Age was not significantly correlated with perceived legitimacy (r = .01, p = .87), overall group identification (r = -.02, p = .52), group investment (r = -.02, p = .51), group self-definition (r = -.01, p = .77), or weight stigma resistance (r = .01, p = .67).

Differences by education and profession

Higher levels of education were associated with increased global self-esteem, group investment, and stigma resistance, and lower weight-related self-devaluation and distress, perceived legitimacy, and weight controllability beliefs (see Table I2).

Table I2. *Univariate Analysis of Variance of Scores on Study Variables by Education Level*

Variable	Some HS N = 28	HS N = 77	Voc N = 73	UG N = 332	PG N = 262	Doc N = 109	F^c
Self-esteem	14.7 (7.0)	15.1 (5.9)	16.9 (5.7)	16.9 (5.7)	18.3 (5.3)	20.0 (5.9)	7.6***
Perceived stigma	3.4 (1.0)	3.6 (0.9)	3.4 (0.8)	3.6 (0.8)	3.4 (0.8)	3.5 (0.9)	0.9
Self-devaluation[a]	3.1 (1.4)	2.3 (1.1)	2.4 (1.0)	2.1 (1.0)	2.1 (0.9)	1.9 (0.9)	4.3**
Distress[b]	5.2 (1.7)	4.9 (1.4)	5.0 (1.2)	4.6 (1.4)	4.6 (1.4)	4.4 (1.4)	3.3**
Legitimacy	2.0 (0.9)	1.8 (0.8)	2.0 (0.8)	1.9 (0.9)	1.9 (0.9)	1.8 (0.8)	1.2
Group identity	3.1 (1.0)	3.2 (1.2)	3.0 (0.9)	3.3 (1.0)	3.2 (1.0)	3.3 (1.0)	1.6
Investment	3.1 (1.1)	3.3 (1.4)	2.9 (0.9)	3.3 (1.2)	3.3 (1.2)	3.5 (1.2)	2.7*
Self-definition	3.4 (1.5)	2.9 (1.3)	3.1 (1.2)	3.1 (1.1)	3.0 (1.1)	3.0 (1.2)	0.5
Stigma resistance	4.3 (1.5)	4.7 (1.5)	4.3 (1.2)	4.7 (1.4)	4.7 (1.3)	4.8 (1.4)	3.4**
Controllability	3.4 (1.8)	3.0 (1.7)	3.3 (1.7)	3.0 (1.8)	3.1 (1.8)	2.8 (1.8)	1.1

Note. N = 900. Data are means (standard deviations). N = 19 who indicated education level = "Other" not included in table. Some HS = Some high school/secondary school/O levels/GCSEs; HS = High school/secondary school/A levels; Voc = Vocational qualification; UG = Undergraduate/college degree; PG = Graduate degree, Master's degree, postgraduate diploma/certificate; Doc = Doctoral/professional qualification.

[a] Weight-related self-devaluation. [b]Weight-related distress. [c]Welch's robust F.

* p < .05; ** p < .01; *** p < .001.

Differences by region

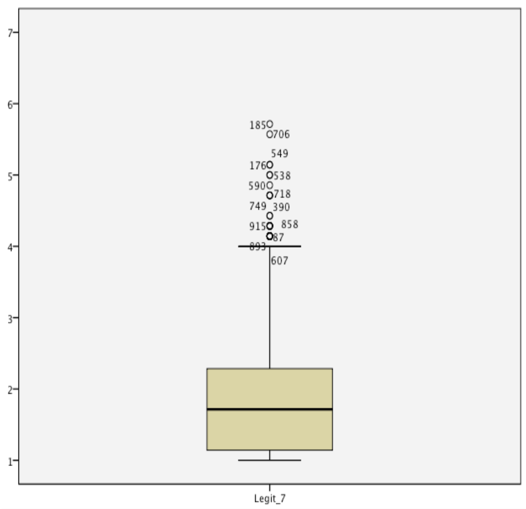
Regional differences between the UK and North America (both $N > 300$) indicated significant differences on all measures, with UK participants reporting lower levels of self-esteem, stigma consciousness, all aspects of group identity, and stigma resistance, and higher levels on measures of internalised weight stigma, perceived legitimacy, and weight controllability beliefs. Other regions yielded too few participants to reliably compare.

Table I3. *Differences on Study Variables Between Participants from the UK and North America*

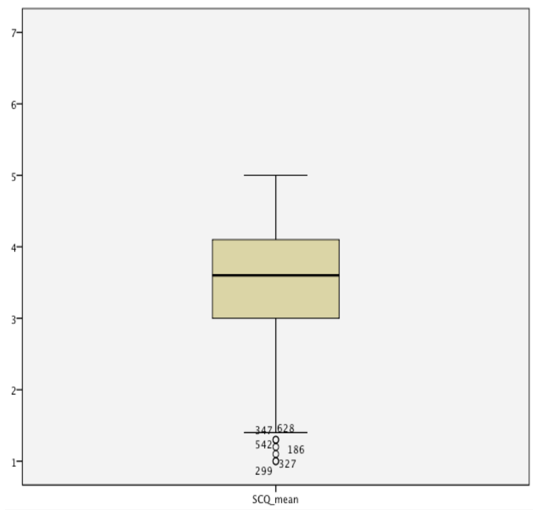
	UK $N = 322$	North America $N = 477$			
Variable	*M (SD)*	*M (SD)*	*t*	*p*	d^a
Global self-esteem	16.8 (5.7)	17.8 (6.0)	-2.3	.02	.17
Perceived weight stigma	3.4 (0.8)	3.6 (0.8)	-4.5	< .00	.25
Weight-related self-devaluation	2.3 (1.1)	2.0 (1.0)	4.7	< .00	.29
Weight-related distress	4.9 (1.4)	4.5 (1.4)	4.5	< .00	.29
Perceived legitimacy	2.0 (0.9)	1.8 (0.9)	4.6	< .00	.22
Ingroup identification	3.0 (1.0)	3.4 (1.0)	-6.0	< .00	.40
Group investment	3.0 (1.2)	3.5 (1.2)	-5.5	< .00	.42
Group solidarity	3.5 (1.6)	4.3 (1.6)	-6.4	< .00	.50
Group satisfaction	2.5 (1.2)	2.8 (1.2)	-3.5	.00	.25
Group centrality	3.4 (1.7)	3.9 (1.8)	-3.3	.00	.29
Group self-definition	2.9 (1.1)	3.2 (1.2)	-4.3	< .00	.26
Group self-stereotyping	3.3 (1.3)	3.6 (1.3)	-3.5	< .00	.23
Group homogeneity	2.4 (1.3)	2.8 (1.3)	-4.2	< .00	.31
Stigma resistance	4.4 (1.3)	4.9 (1.4)	-5.3	< .00	.37
Weight controllability	3.5 (1.7)	2.7 (1.6)	6.1	< .00	.48

[a]Absolute values of Cohen's *d* statistic.

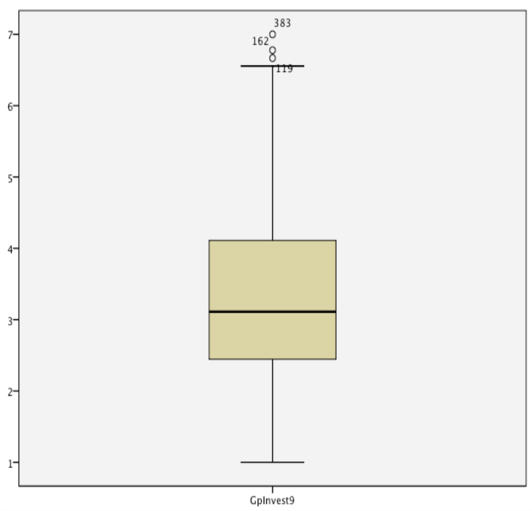
Appendix J. Study 5: Skewness of key variables



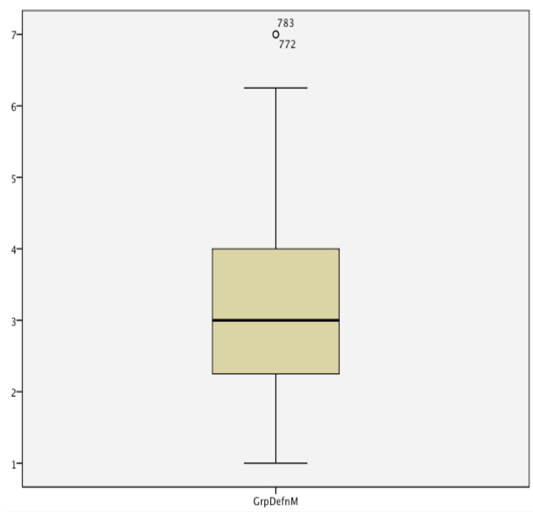
Perceived legitimacy



Perceived weight stigma



Group investment



Group self-definition

Appendix K. Study 5: Regression analyses for all outcomes

Table K1. *Perceived Stigma, Legitimacy, and Group Identification as Predictors of Weight-Related Self-Devaluation*

	Barriers permeable				Barriers impermeable			
	B	*SE*	*t*	*p*	*B*	*SE*	*t*	*p*
Group identification variable = Investment								
Perceived stigma	0.2	0.6	-0.3	.73	0.3	0.4	0.8	.45
Legitimacy	-0.3	0.8	-0.3	.73	-0.6	1.0	-0.6	.57
Group investment	0.0	0.7	0.0	.99	-0.1	0.4	-0.3	.79
Interaction 1	0.2	0.3	0.8	.40	0.2	0.3	0.8	.45
Interaction 2	-0.0	0.2	-0.0	.98	-0.7	0.1	-0.6	.57
Interaction 3	0.1	0.3	0.5	.61	0.2	0.3	0.5	.59
Interaction 4	-0.0	0.1	-0.5	.63	-0.0	0.1	-0.1	.91
Group identification variable = Self-definition								
Perceived stigma	-0.9	0.5	-1.7	.09	-0.1	0.5	-0.1	.88
Legitimacy	-1.4	0.6	-2.4	.02	-0.2	1.1	-0.2	.85
Group self-definition	-1.0	0.6	-1.8	.08	-0.1	0.5	-0.1	.89
Interaction 1	0.6	0.2	3.4	.00	0.2	0.3	0.6	.55
Interaction 2	0.3	0.2	2.1	.03	-0.0	0.2	-0.0	.97
Interaction 3	0.5	0.2	2.4	.02	-0.0	0.3	-0.1	.93
Interaction 4	-0.2	0.1	-2.7	.01	0.0	0.1	0.4	.72

Note. All models include a constant. Interaction 1: Perceived stigma × Perceived legitimacy. Interaction 2: Perceived stigma × Group identification. Interaction 3: Perceived legitimacy × Group identification. Interaction 4: Perceived stigma × Perceived legitimacy × Group identification.

Table K2. *Perceived Stigma, Legitimacy, and Group Identification as Predictors of Weight-Related Distress*

	Barriers permeable				Barriers impermeable			
	B	*SE*	*t*	*p*	*B*	*SE*	*t*	*p*
Group identification variable = Investment								
Perceived stigma	0.2	0.5	0.3	.74	1.5	0.5	3.1	.00
Legitimacy	-0.7	0.6	-1.1	.27	0.6	1.0	0.6	.53
Group investment	-1.1	0.4	-2.5	.01	-0.2	0.5	-0.5	.64
Interaction 1	0.2	0.2	0.9	.35	-0.3	0.3	-1.1	.28
Interaction 2	0.2	0.1	1.2	.24	-0.2	0.1	-1.8	.07
Interaction 3	0.2	0.2	1.1	.25	-0.0	0.3	-0.1	.90
Interaction 4	-0.0	0.1	-0.5	.60	0.1	0.1	1.2	.23
Group identification variable = Self-definition								
Perceived stigma	0.4	0.6	0.6	.58	1.0	0.6	1.7	.10
Legitimacy	-0.4	0.7	-0.6	.57	1.5	1.2	1.2	.22
Group self-definition	-0.3	0.7	-0.5	.61	0.7	0.7	1.0	.30
Interaction 1	0.2	0.2	1.0	.33	-0.1	0.3	-0.4	.68
Interaction 2	0.1	0.2	0.6	.58	-0.2	0.2	-1.0	.30
Interaction 3	0.2	0.2	0.7	.47	-0.3	0.3	-1.0	.34
Interaction 4	-0.1	0.1	-0.8	.41	0.1	0.1	.93	.36

Note. All models include a constant. Interaction 1: Perceived stigma × Perceived legitimacy. Interaction 2: Perceived stigma × Group identification. Interaction 3: Perceived legitimacy × Group identification. Interaction 4: Perceived stigma × Perceived legitimacy × Group identification.

Table K3. *Perceived Stigma, Legitimacy, and Group Identification as Predictors of Global Self-Esteem*

	Barriers permeable				Barriers impermeable			
	B	*SE*	*t*	*p*	*B*	*SE*	*t*	*p*
Group identification variable = Investment								
Perceived stigma	-2.2	2.6	-0.8	.41	-5.8	2.5	-2.3	.02
Legitimacy	2.7	3.5	0.8	.44	-1.6	5.3	-0.3	.77
Group investment	3.0	2.6	1.2	.24	0.9	2.3	0.4	.71
Interaction 1	-0.7	1.0	-0.7	.48	0.6	1.6	0.4	.71
Interaction 2	-0.4	0.9	-0.5	.61	0.4	0.7	0.6	.56
Interaction 3	-1.3	1.2	-1.1	.28	-0.6	1.6	-0.4	.70
Interaction 4	0.3	0.4	0.7	.48	-0.0	0.5	-0.0	.97
Group identification variable = Self-definition								
Perceived stigma	-2.0	3.2	-0.6	.54	-4.9	2.8	-1.7	.08
Legitimacy	3.2	3.9	0.8	.41	-5.4	5.6	-1.0	.34
Group self-definition	2.0	3.5	0.6	.57	-1.3	2.9	-0.4	.66
Interaction 1	-1.1	1.1	-0.9	.35	1.1	1.7	0.7	.50
Interaction 2	-0.4	1.0	-0.4	.68	0.5	0.8	0.6	.58
Interaction 3	-1.3	1.2	-1.1	.29	0.9	1.6	0.5	.59
Interaction 4	0.3	0.4	0.9	.36	-0.3	0.5	-0.7	.47

Note. All models include a constant. Interaction 1: Perceived stigma × Perceived legitimacy. Interaction 2: Perceived stigma × Group identification. Interaction 3: Perceived legitimacy × Group identification. Interaction 4: Perceived stigma × Perceived legitimacy × Group identification.

Table K4. *Perceived Stigma, Legitimacy, and Group Identification as Predictors of Stigma Resistance*

	Barriers permeable				Barriers impermeable			
	B	*SE*	*t*	*p*	*B*	*SE*	*t*	*p*
Group identification variable = Investment								
Perceived stigma	-0.5	0.9	-0.6	.55	0.4	0.3	1.1	.26
Legitimacy	-1.3	1.0	-1.3	.18	0.8	0.7	1.0	.30
Group investment	-0.0	1.3	-0.0	.97	1.1	0.4	3.0	.00
Interaction 1	0.2	0.3	0.9	.38	-0.4	0.2	-1.9	.06
Interaction 2	0.2	0.4	0.6	.55	-0.1	0.1	-1.5	.13
Interaction 3	0.3	0.4	0.8	.45	-0.6	0.2	-2.4	.02
Interaction 4	-0.1	0.1	-1.0	.32	0.1	0.1	2.2	.03
Group identification variable = Self-definition								
Perceived stigma	0.0	0.7	0.0	1.0	0.0	0.3	0.0	.97
Legitimacy	-0.9	0.7	-1.2	.23	-1.2	0.7	-1.9	.07
Group self-definition	0.2	0.7	0.2	.83	-0.1	0.4	-0.3	.79
Interaction 1	0.0	0.2	0.1	.96	-0.0	0.2	-0.2	.84
Interaction 2	0.0	0.2	-0.0	1.0	0.0	0.1	0.4	.72
Interaction 3	0.1	0.2	0.3	.78	0.1	0.2	0.3	.78
Interaction 4	-0.0	0.7	-0.2	.81	0.0	0.1	0.0	.99

Note. All models include a constant. Interaction 1: Perceived stigma × Perceived legitimacy. Interaction 2: Perceived stigma × Group identification. Interaction 3: Perceived legitimacy × Group identification. Interaction 4: Perceived stigma × Perceived legitimacy × Group identification.

Appendix L. Statement of ethical approval

All research reported in this thesis received approval from the Science, Technology, Engineering and Mathematics Ethics Committee at the University of Birmingham, ethical review number: ERN_ 13-0945.

Appendix M. Participant Information Sheet (example from Study 5)

Research on Life Experiences of "Overweight" Individuals

What is the study about?

In this study, we will be asking about the life experiences of higher-weight individuals. We know that different people prefer to describe their weight in different ways. During this survey, all questions asking about weight will use the phrase 'overweight/fat' to describe higher weight individuals. This wording is not intended to cause offence, and does not convey any judgment on the part of the researchers.

The aim of the study is to investigate how being 'overweight/fat' affects people's life experiences, and whether people with different personality types are affected in different ways.

Who is taking part?

Participants are adult men and women who consider themselves 'overweight', 'obese', or 'fat'.

What will I have to do?

This is an online study. You will be asked to fill out some questions about yourself, your personality type, your thoughts about body weight, and your life experiences. This should take no more than 15 minutes in total.

What are the risks?

There is minimal risk in the study. It is possible that you may feel uncomfortable in answering some of the questions. If you feel particularly uncomfortable with any of the questions, you may choose not to answer them and simply move on.

What are the benefits?

You will be entered into a prize draw to win a £50 Amazon gift voucher (or equivalent in your local currency). The information you provide will also contribute to a better understanding of the life experiences of overweight/fat people, and contribute to the wider psychological knowledge.

What if I do not wish to continue at any stage?

You are free to withdraw from the study at any time. If you withdraw from the study your data will be destroyed. You will still be entered into the prize draw. To withdraw, simply close your browser window. Once the survey has been completed and your final responses submitted, it will not be possible to withdraw.

What happens to the information?

The information which you supply and which may be collected as part of the research project will only be accessed by authorised personnel. The information will be retained by the University of Birmingham and will only be used for the purpose of research and statistical and audit purposes. The information will be processed by the University of Birmingham in accordance with the provisions of the Data Protection Act 1998.

All data will be anonymised using randomised unique ID codes. No identifiable personal data will be published.

What if I have some questions about the study?

Please feel free to contact the lead researcher, Angela Meadows, with any questions you would like answered prior to taking part. Her email address is: [redacted]

If you have any further questions after participating in this study you can email [redacted]

Appendix N. Online consent form

Consent Form

I have read the participant information and any questions that I have about the study have been answered.

[Radio buttons: Yes/No]

I understand that I can ask further questions anytime during the participation of this study and I am free to withdraw at any time. I also understand that I can decline to answer any questions in the study that I do not want to answer.

[Radio buttons: Yes/No]

I agree to take part with the understanding that any data collected is completely confidential. I understand that the information will be stored in manual and electronic files but is subject to the provisions of the Data Protection Act.

[Radio buttons: Yes/No]

Do you consent to take part in this study?

[Radio buttons: Yes/No]

If you have any concerns or questions, please e-mail me at [redacted]
This study was approved by the University of Birmingham Ethical Review Committee. For questions concerning the Ethics you may contact [redacted]

Appendix O. Anti-Fat Attitudes Questionnaire (AFAQ) – Dislike subscale

Appendix P. Binge Eating Scale (BES)

344

Appendix Q. Barratt Impulsiveness Scale-15 (BIS-15)

Appendix R. Center for Epidemiologic Studies Depression Scale (CES-D)

Appendix S. Dutch Eating Behaviour Questionnaire (DEBQ)

Appendix T. Eating Attitudes Test-26 (EAT-26)

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Appendix U. Eating Disorders Diagnostic Scale (EDDS)

Appendix V. Eating Self-Efficacy Scale (ESES)

Appendix W. Experienced weight stigma (EWS-3)

Appendix X. Food Cravings Questionnaire – Trait (FCQ-T)

Appendix Y. Multicomponent Ingroup Identification Scale

Appendix Z. Need for Cognition Scale (NCS)

Appendix AA. Perceived legitimacy of weight stigma

Appendix AB. Restraint Scale

Appendix AC. Rosenberg Self-Esteem scale

Appendix AD. Stigma Consciousness Questionnaire (SCQ)

Appendix AE. Stigma Resistance scale

Appendix AF. Stigmatizing Situations Inventory (SSI)

Appendix AG. (Modified) Weight Bias Internalization Scale (WBIS/WBIS-M)

Appendix AH. 19-item Weight Bias Internalization Scale (WBIS-19)

Appendix AI. Weight controllability beliefs

Appendix AJ. Weight Self-Stigma Questionnaire (WSSQ)

Appendix AK. Yale Food Addiction Scale (YFAS)

Appendix AL. Licence to use MBSRQ