



THE UNIVERSITY OF
WAIKATO
Te Whare Wānanga o Waikato

Research Commons

<http://researchcommons.waikato.ac.nz/>

Research Commons at the University of Waikato

Copyright Statement:

The digital copy of this thesis is protected by the Copyright Act 1994 (New Zealand).

The thesis may be consulted by you, provided you comply with the provisions of the Act and the following conditions of use:

- Any use you make of these documents or images must be for research or private study purposes only, and you may not make them available to any other person.
- Authors control the copyright of their thesis. You will recognise the author's right to be identified as the author of the thesis, and due acknowledgement will be made to the author where appropriate.
- You will obtain the author's permission before publishing any material from the thesis.

ACT and Food Craving in a Non-Clinical Population

A thesis

submitted in partial fulfillment

of the requirements for the degree

of

Master of Applied Psychology in Behaviour Analysis

at

The University of Waikato

by

Jacqueline Sarah Tritt



THE UNIVERSITY OF
WAIKATO
Te Whare Wānanga o Waikato

2015

ABSTRACT

A food craving is an intense urge to consume a desired food; the craving is specific and cannot be satiated by any other food. Forman and colleagues (2007) found, that for individuals with a Power of Food Scale score of 42 or higher, an acceptance-based workshop decreased an individual's food craving and snack food consumption. I aimed to replicate Forman et al.'s (2007) findings using a single-subject multiple-baseline experimental design and expanded the food used in the study from chocolate to a range of preferred snack foods. Eleven participants completed the Power of Food Scale questionnaire, Food Craving Questionnaire-State version, daily single-item Craving Dimension ratings, and measured daily consumption snack food weights. Findings replicated Forman et al.'s (2007) results. When individual analysis was applied, a gender difference was suggested with male data displaying more change in consumption levels and craving ratings compared to the female consumption levels and craving ratings data.

ACKNOWLEDGEMENTS

First and foremost, I would like to give a huge thank you to my supervisors Prof Mary Foster and Dr Rebecca Sargisson, without your knowledge, support and patience none of this would have been possible. Thank you also, to my colleague and friend, Dr Alayna Haberlin, for your hilarious on-going support and belief in me. A big thank you to all of the individuals, who participated in the study, without you, this thesis, would not have made it to completion. To my Mum, Dad and Erin, for your on-going support and understanding, to all of my friends, for your unwavering belief in me, and to James, thank you, your support and confidence in me to complete this thesis has been invaluable. Lastly, a big thank you to the Langford family, for the wonderful working and living arrangement we have had this year, which has made all of this financially possible for me.

CONTENTS

Abstract	i
Acknowledgements	ii
Contents	iii
List of Tables	iv
List of Figures	v
List of Appendices	vi
Literature Review	1
The Present Study	29
Method	32
Results	39
Discussion	63
Conclusion	76
References	77
Appendix	84

LIST OF TABLES

	Page
Table 1: Individual participant demographical information including; gender, age, ethnicity, BMI score, Power of Food Scale Score, Smoking status, and snack food preference category.	34
Table 2: Baseline and post-workshop summary of single-item Craving Dimension ratings results for male participants, female participants and combined participant ratings results.	44

LIST OF FIGURES

	Page
<i>Figure 1:</i> Snack food consumption pre and post-workshop for male participants.	40
<i>Figure 2:</i> Snack food consumption pre and post-workshop for female participants.	42
<i>Figure 3:</i> Combined Group 1 and Group 2 Male single-item Craving Dimension Frequency Rating plotted against days.	46
<i>Figure 4:</i> Combined Group 1 and Group 2 Female single-item Craving Dimension Frequency Rating plotted against days.	47
<i>Figure 5:</i> Combined Group 1 and Group 2 Male single-item Craving Dimension Temptation Rating plotted against days.	48
<i>Figure 6:</i> Combined Group 1 and Group 2 Female single-item Craving Dimension Temptation Rating plotted against days.	49
<i>Figure 7:</i> Combined Group 1 and Group 2 Male single-item Craving Dimension Intensity Rating plotted against days.	51
<i>Figure 8:</i> Combined Group 1 and Group 2 Female single-item Craving Dimension Intensity Rating plotted against days.	52
<i>Figure 9:</i> Combined Group 1 and Group 2 Male single-item Craving Dimension Resistance Rating plotted against days.	54
<i>Figure 10:</i> Combined Group 1 and Group 2 Female single-item Craving Dimension Resistance Rating plotted against days.	55
<i>Figure 11:</i> Combined Group 1 and Group 2 Male single-item Craving Dimension Distress Rating plotted against days.	57
<i>Figure 12:</i> Combined Group 1 and Group 2 Female single-item Craving Dimension Distress Rating plotted against days.	58
<i>Figure 13:</i> Male Participants Food Craving Questionnaire-State Scores.	59
<i>Figure 14:</i> Female Participants Food Craving Questionnaire-State Scores.	60
<i>Figure 15:</i> Male Participants Power of Food Scale Scores.	61
<i>Figure 16:</i> Female Participants Power of Food Scale Scores.	62

LIST OF APPENDICES

	Page
Appendix 1	84
Appendix 2	85
Appendix 3	86
Appendix 4	87
Appendix 5	88
Appendix 6	90
Appendix 7	91
Appendix 8	92

ACT and Food Craving in a Non-Clinical Population

Literature Review

A food craving is an intense urge to consume a desired food; the craving is specific and cannot be satiated by any other food. A food craving is a subjective experience and food cravings are most often measured through participant self-report, reported by their intensity, frequency, and specificity (Rozin, Levine, & Stoess, 1991). Food craving in non-clinical populations is common (Hill & Heaton-Brown, 1994), and chocolate is the most frequently craved food.

The social significance of empirically researching food consumption, eating behaviour, and obesity is extremely high, as developed countries across the world are experiencing soaring obesity rates and hunger is increasingly driven by pleasure rather than need (Lowe & Butryn, 2007). Food craving is a common experience for an individual living in a developed country and may contribute to an individual's propensity to over consume food and contribute to the obesity epidemic (Lowe & Butryn, 2007). There is much debate as to how to describe a food craving, why food cravings occur, why they are experienced more intensely by some individuals than by others, and the most effective way to support an individual to manage a food craving. Historically, food craving was described from a homeostatic approach citing nutrient deficiency as a physiological trigger for the body to correct the deficit. In contrast, current research combines physiological, cognitive, and emotional perspectives, with the understanding that individuals living in developed countries have abundant access to a high fat-, salt-, and sugar-, satiated food environment. Although the

exact nature of a food craving has not been completely understood, researchers uniformly agree that a food craving is a subjective experience particular to the individual, incorporating their eating and learning history (Rogers & Smit, 2000). Finding ways of decreasing food cravings has important social significance, given that food craving is associated with overeating and obesity (Bailey, Ciarrochi, & Harris, 2014).

Acceptance and Commitment Therapy (ACT) is increasingly demonstrating effective results in changing behaviour with regard to food craving, eating behaviour and across a variety of psychological pathologies (Alberts, Thewissen, & Middelweerd, 2013; Forman, Hoffman, Juarascio, Butryn, & Herbert, 2013; Lillis, Hayes, Bunting, & Masuda, 2009). I will discuss food craving and the efficacy of ACT in relation to dealing with food craving in this review.

My aim in this review is to evaluate current literature in relation to food craving and acceptance-based strategies for managing food craving within healthy weight, overweight, and obese populations. Search requests for ‘food craving’, ‘ACT’, and ‘Acceptance and Commitment Therapy’ were made in PsychInfo, Pubmed and Medline databases. I excluded articles if they were not sourced from a peer-reviewed journal publication. Additionally, I did not include articles that focused primarily on eating disorders, substance abuse, mental health disorders, or the experience of food craving during pregnancy.

What is a Food Craving?

Food Craving is described as an intense urge to consume a desired food (Hill, Weaver, & Blundell, 1991; Rogers & Smit, 2000). Individuals are selective

in their food craving; the craving specifies a particular food and cannot be satisfied by any other substituted food (Hill et al., 1991). Chocolate is the most frequently self-reported food associated with food craving (Benton, Greenfield, & Morgan, 1998; Hetherington & MacDiarmid, 1993; Hill et al., 1991; Weingarten & Elston, 1991). A food craving is a covert behaviour, it cannot be directly observed, nor can it be measured (Weingarten & Elston, 1990). An individual may crave a particular food but not consume the food in response to a food craving; alternatively, an individual may consume a craved food without experiencing a food craving (Hill, 2007). Current literature cites food craving as a key component of Hedonic hunger (Hofmann, van Koningsbruggen, Stroebe, Ramanathan, & Aarts, 2010; Lowe & Butryn, 2007) which refers to hunger when an individual is eating for pleasure but not necessarily for physiological need. Hedonic hunger is elicited by food cues in the environment and involves food craving, emotional eating, and overconsumption (Hill, 2007). Traditionally, food craving in women has been associated with pregnancy and a women's menstrual-cycle (Weingarten & Elston, 1990). Additionally, food craving is associated with obesity, Binge-Eating Disorder (BED), eating disorders, and substance-use disorders (VanBuskirk & Potenza, 2010).

Self-reported food craving in a non-clinical population of both overweight and healthy-weight men and women is common and not restricted to individuals with pathological eating disorders (Hill & Heaton-Brown, 1994). A retrospective questionnaire study conducted in New Zealand with 101 female participants ranging in age from 18 to 45 years old found that only 58% of participants had experienced food craving (Gendall, Joyce, & Sullivan, 1997). In contrast to Weingarten and Elston, Gendall et al. (1997) first asked participants

about their food experiences using language such as intensity, frequency, and desire before specifically using the word 'craving'. Gendall et al. (1997) questioned the subjectivity of food craving definitions and highlighted the importance for research studies to ensure consistency of participants' comprehension of the term 'food craving'. To date, researchers have predominantly used a definition similar to intense urges to consume a desired food (Hill et al., 1991). However, the definition is still subjective in relation to how it is observed or measured.

Due to the subjective nature of observing and measuring a food craving by participant self-report, deconstructing an exact description of a food craving is considered incomplete amongst researchers (Weingarten & Elston, 1990). Generally, a food craving is described in terms of its intensity, its frequency, and the specificity of the urge. The term 'craving' remains more of a general language construct rather than a scientific term (Weingarten & Elston, 1990). Common measures of food craving include participant self-report using a Likert Scale or similar rating system, questionnaire responses, or some more objective measures such as food consumption measurements and, less commonly, the speed of consumption or physiological responses such as heart rate.

One frequently used subjective measure is the Power of Food Scale (PFS). The PFS is a 21-item self-report questionnaire, which uses a 5-point Likert scale. The PFS assesses the impact that a palatable food environment has on an individual across three constructs; food present, food available, and food tasted. The PFS has good test-retest reliability (4-month test-retest reliability = .79) and sufficient internal reliability (Cronbach's alpha = .94) (Lowe et al., 2009). It is commonly used in evaluating food craving to provide a score for how

susceptible a participant is to a palatable food environment. In other words, how likely is it that an individual will respond to food cues in their environment with hunger, liking, and food craving (Lowe et al., 2009).

Other frequently used subjective measures include the Food Craving Questionnaire Trait (FCQ-T) version and the Food Craving Questionnaire State (FCQ-S) version, both developed by Cepeda-Benito, Gleaves, Williams, and Erath (2001) to specifically measure food craving. Researchers use the FCQ-T to examine food craving in relation to a particular population or individual and the FCQ-S considers food craving in response to an individual reacting to a stressful situation (Cepeda-Benito et al., 2001).

Describing the conscious experience or the phenomenology of what actually occurs during a food craving has received relatively little research attention. Tiggemann and Kemps (2005) conducted a study of 130 Australian University students evaluating the role mental imagery plays during the experience of a food craving. Participants completed three questionnaires designed to gain insight into retrospectively recalling a food craving, inducing the experience of a current food craving, considering the individual's dietary restraint, imagery ability, and trait-based food craving. Mental imagery was reported to play a significant role in the experience of a food craving, both when recalling a past experience of a food craving and when a current food craving was induced. Vividness of the imagery was a significant factor during the induction scene, more so than hunger, and closely following vividness of the image was taste and smell perception (Tiggemann & Kemps, 2005). Limitations of the study included accuracy of participant recall when describing their food craving within the framework of the self-report questionnaires. However, given the limited ability to scientifically

observe and measure a food craving, Tiggermann & Kemp provided some interesting preliminary data on a food craving experience with respect to mental imagery.

Why does food craving occur? Physiological and Pharmacological viewpoints

Early research into the experience of food craving focused on the physiological basis of craving and was termed the homeostatic viewpoint. The homeostatic perspective is that if the body is deficient in a particular nutrient, food craving for a particular type of food will correct the deficiency (Rodin, Mancuso, Granger, & Nelbach, 1991). Although this viewpoint has not entirely been disregarded, it has been universally disputed due to the fact that, in today's society, foods laden with fats, salt, and sugar are the most frequently craved foods, with high nutrient foods associated with strong health benefits being craved the least (Rodin et al., 1991). Early research into why food craving occurred considered a correlation between food craving and a female menstrual cycle. Rodin et al. (1991) studied 32 healthy women to evaluate estradiol levels and the nature, type, and frequency of food craving. There was no correlation found between estradiol levels and food craving (Rodin et al., 1991). The implication is that food craving occurs for all women regardless of their estradiol levels and the types of foods they crave remain consistent across time (Rodin et al., 1991).

Why cravings occur and, in particular, why craving for chocolate occurs has been the subject of research from a physiological and pharmacological perspective. Researchers have asked whether there is a nutrient property in

chocolate that the body needs and therefore craves. Michener and Rozin (1994) explored the satiation response for chocolate craving by comparing actual chocolate and chocolate substitute consumption. Thirty-four participants were asked to self-report if chocolate craving had been satiated following consumption of different chocolate and chocolate substitute items. The results demonstrated that satiation of chocolate craving required the aroma, sweetness, and texture of actual chocolate and that no substitute had the same effect. Michener and Rozin's findings lend support to the possibility that satiation of a chocolate craving occurs from a sensory experience rather than a pharmacological or physiological need (Michener & Rozin, 1994). From a homeostasis perspective, if the individual were craving chocolate due to deprivation in a particular nutrient contained within chocolate, then the chocolate substitute simulating the exact nutrient content would have been sufficient to satiate the craving. In regards to chocolate, the sensory experience may contribute to why food craving occurs; the taste and smell of chocolate may be reinforced because it is a pleasant experience that produces positive taste satiation as a consequence of ingestion.

Food Addiction

Addiction includes an ongoing loss of control, dependence, irrational and or harmful compulsive behaviour and psychological and physiological effects of withdrawal from the substance or drug (Altman et al., 1996). Dependence is associated with withdrawal and tolerance effects, sensitization to a drug or substance, and craving (Altman et al., 1996). Food addiction has been described as the result of intense craving for a particular food that is driven from the need

to alter mood, energy levels, or seek a pleasurable experience (von Deneen & Liu, 2011).

Some individuals report that consuming chocolate is addictive, however, the majority of individuals who consume chocolate do not report experiencing addiction (Hetherington & MacDiarmid, 1993). Chocolate tastes good, it fulfills sensory needs such as taste, touch, and smell, is highly palatable, and taste satiation can only be achieved with actual chocolate consumption. Rogers and Smit (2000) suggest that there is no compelling evidence that food substances such as theobromine and xanthine found in chocolate are physically addictive. So, an individual's behaviour in relation to preferred foods may feel intense and out of control, however, the experience may be more accurately described as a craving for a particular food rather than an addiction to that particular food.

Additionally, Mumford et al. (1994) has found that, in regards to chocolate addiction, the quantities needed for psychoactive compounds such as theobromine and caffeine to cause addictive behaviour far outweigh the quantities ingested by even the most extreme chocolate consumer. Similarly, there was no relationship between the psychoactive compound xanthine found in chocolate and for other foods containing xanthine (Rozin et al., 1991). Further research demonstrated that many other psychoactive compounds found in chocolate are found in other freely available foods with only chocolate associated with craving and self-reported addiction (Rogers & Smit, 2000).

Considering the concept of food addiction from a smoking addiction perspective, Styn, Bovbjerg, Lipsky and Erblich (2013) evaluated cue-induced nicotine craving and cue-induced chocolate craving amongst a population of 164 healthy smokers. Cigarette and chocolate craving both increased significantly

following the cue-induced procedure. Preliminary suggestions were that nicotine and chocolate craving may involve similar neurobiological pathways in the brain possibly involving the same reward circuitry as cue-induced craving for substances like alcohol and cocaine (Styn et al., 2013). A limitation of the study included failure to assess whether or not the participants were in a state of chocolate deprivation during the experimental session as this may have influenced craving intensity or individual propensity to react to the induced cues during the study. The findings of the study provide marginal support for the idea that food may contain addictive properties for some individuals; however, the study also lends support to the theory that consumption of chocolate is susceptible to cue-induced effects.

Dieting, Hedonic Hunger, Disinhibition, Restraint and Food Craving

There seem to be a complexity of contributing factors needed for an individual to experience a food craving. Research has provided increasing evidence that an individual who restricts a particular food with low intermittent consumption will increase their likelihood of experiencing food craving for that particular food; in contrast an individual who abstains completely from consumption of a particular food will diminish the likelihood of a food craving for that food (Hill, 2007).

Food-craving research has predominantly focused on evaluating food craving and hedonic eating behaviour by classifying individuals as restrained or unrestrained eaters. A restrained eater is an individual who diets to lose or maintain weight loss; an unrestrained eater is someone who does not diet to control food intake (Fedoroff, Polivy, & Herman, 2003). Restrained eaters

consume more of a food than unrestrained eaters when pre-exposure to that particular food occurs. Restrained eaters show greater liking, hunger, and craving for a food if pre-exposure to that food occurs via smell or visual food cues (Fedoroff et al., 1997). Following previous findings, Fedoroff et al. (2003) investigated whether or not pre-exposure to a food elicited specific food craving or general food craving. The study included 132 women who were pre-exposed to olfactory and visual food cues for pizza or chocolate chip cookies or had no pre-exposure. Participants were then presented with either the food they were pre-exposed to or the alternative food. Restrained eaters consumed more of a food than unrestrained eaters as long as the food presented was the food that was used for the pre-exposure. Restrained eaters consumed less of a food than unrestrained eaters when the food presented had not been used for pre-exposure. Restrained eaters experienced liking, hunger, and food craving to a greater degree than unrestrained eaters for food that was used for pre-exposure. Thus, Fedoroff et al. (2003) replicated Fedoroff et al.'s (1997) findings, providing further evidence that restrained eaters are more sensitive to food cues than unrestrained eaters and that they tend to over-consume food when they experience food cues prior to consumption. Food cues in the environment warrant further investigation to clarify their role in food craving.

Building on previous reactive cue-conditioning research, Stirling and Yeomans (2004) evaluated restrained versus unrestrained eating in a female population with respect to the availability of palatable food in the environment. Dietary restraint was categorized as an individual restricting food intake for the purpose of weight loss or maintenance. Previous research demonstrated that restricting particular foods considered forbidden to the individual actually

increases an individual's desire for the forbidden foods (Hill et al., 1991). Using a prospective questionnaire and food intake procedure, 60 participants were classified as either having high restraint (HR) or low restraint (LR) based on Three Factor Eating Questionnaire (TFEQ) scores (Stirling & Yeomans, 2004). Participants were randomly assigned to a temptation group or a control group. The temptation group was asked to carry chocolates with them for 24 hours but not to eat them; this was followed up by a taste test and questionnaire. The control group completed only the taste test and questionnaire. Both the HR and LR groups were affected by the temptation phase; the HR group, however, ate almost twice as much chocolate as the LR group in the following taste test and reported more difficulties in resisting the chocolate during the temptation phase.

Using an Ecological Momentary Assessment (EMA), Thomas, Doshi, Crosby, and Lowe (2011) measured disinhibition levels, restraint levels and hedonic hunger responses with normal weight women in relation to the availability of energy-dense food in the individuals' natural environment. Disinhibition was defined as overconsumption of food due to cue effects or emotional distress. An EMA is a palm-held device that enables the participant to record their craving as it occurs. The EMA was used to assist the integrity of participant self-report (Thomas et al., 2011). Researchers hypothesized that individuals who scored high on the TFEQ with restraint, disinhibition, and hunger, and scored high on the PFS, would over-consume food due to an individual's susceptibility to food cues in their environment. Thomas et al. failed to demonstrate support for the hypothesis and suggested other situational factors such as mood, stress, setting factors, and activity levels may have influenced the results. However, participants with a higher Body Mass Index (BMI) tended to

over-consume food when there were more palatable food options available to them and did not overeat when there were only a few options available (Thomas et al., 2011).

Further investigating pre-exposure cue effects, Hofmann, van Koningsbruggen, Stroebe, Ramanathan, and Aarts (2010) suggested that restrained eaters experience more intense reactions to highly palatable food cues than do unrestrained eaters. Pre-exposure effects where the stimulus interval (ISI) ranged from 100ms to 1500ms were evaluated, hypothesizing that intense reactions to food pre-exposure would elicit intrusive thoughts about food, and cause the restrained eater to abandon their dieting goals. Eighty university students both male and female participated in a two-part experimental study involving visual pre-exposure to highly, and not as highly, palatable foods. Participants also completed food-related and non-food-related word tasks and the FCQ-S questionnaire over an ISI ranging from 100ms to 1500ms. Restrained eaters experienced more intense hedonic reactions to highly palatable foods when they had pre-exposure to that food this reaction remained across a delay. When the restrained eaters were not pre-exposed to the highly palatable foods, they experienced hunger reactions to a lesser extent than the unrestrained eaters (Hofmann et al., 2010). Hofmann et al.'s findings provide further support for the theory that restrained eaters are more reactive to external food cues in their environment than unrestrained eaters, and that, without exposure to food cues, restrained eaters can successfully stick to their dieting goals in the short-term (Hofmann et al., 2010).

Reactivity to external food cues in the environment affects different individuals in differing ways. Thomas et al. (2013) evaluated disinhibition,

restraint, hunger, and response to food images with 58 non-clinical participants who classified themselves as obese-prone (OP) or obese-resistant (OR).

Participants were underfed or over fed across three study phases and completed the TFEQ and PFS. OP individuals reported higher levels of hunger, disinhibition, and restraint on the TFEQ, higher levels of food craving, higher levels of hedonic hunger, or greater susceptibility to a palatable food environment as measured by the PFS, and higher levels of desire to eat in response to food images than OR individuals (Thomas et al., 2013). Thus, OP individuals demonstrate different behaviour in relation to food craving, food images, and hunger to OR individuals.

Environmental Effects

The environment plays a large role in an individual's reaction to external food cues and whether or not the individual will make a healthy choice when experiencing food craving or hunger. Wansink, Painter, and Lee (2006) examined proximity and visibility as factors in actual and estimated consumption of chocolate. They corroborated previous findings that proximity to chocolate increases consumption. Additionally, the study demonstrated additive effects of proximity and visibility, which further increased chocolate consumption. Participants underestimated consumption when the chocolate was in reach and overestimated consumption when the chocolate was out of reach (Wansink et al., 2006).

Environmental cues, such as television advertisements or displays in a supermarket, for high-sugar and high-fat foods, increase the likelihood of an individual consuming these foods, this in turn leads to an individual overeating

and excess energy consumption (von Deneen & Liu, 2011; Wadden & Foster, 2000). Environmental food cues elicit food craving, particularly in restrained eaters and individuals who score highly on the PFS (Hofmann et al., 2010). However, environmental food cues do not fully account for why food craving occurs, certainly the degree of external food cues in an individual's environment contributes to an individual's craving frequency, intensity, and specificity but there are many individuals who are exposed to the same external food cues and do not experience food craving to the same extent. The restraint versus unrestraint eating theory suggests that these individuals are unrestrained eaters. However, studies demonstrating a positive correlation between eating restraint and food craving have had mixed results (Hill, 2007). Another perspective is the role of emotion and mood in eating behaviour and whether an individual's emotional state correlates with food craving.

Emotional Responses and Mood Effects

Studies have shown both positive and negative mood change from the ingestion of chocolate (Hill et al., 1991; Parker, Parker, & Brotchie, 2006; Rozin et al., 1991). Mood affect is a change in an individual's emotional state in response to a stimulus change. Negative mood affect has been associated with guilt following consumption of chocolate and, in contrast, feelings of increased positive mood affect have been associated with consuming chocolate when stressed or overwhelmed (Benton et al., 1998). Emotional eating occurs when an individual consumes chocolate in response to events that elicit positive or negative emotional reactions (Rogers & Smit, 2000). Considering that emotional eating resulting in negative or positive mood affect is related to chocolate

consumption, it might be plausible that eating chocolate in response to an emotional event is a learned behaviour (Hill et al., 1991). Chocolate is generally considered a treat food, thus, it is plausible that an individual initially consumed chocolate for its pleasant smell or for the energy chocolate provides.

Inadvertently, eating chocolate gave the individual a short-term feeling of pleasure. If the experience of consuming chocolate were positive and reinforcing chocolate consumption might occur again and the eating behaviour surrounding chocolate would become a learned experience. Therefore, even though an individual may consume chocolate during periods of low mood, it is most likely to access the reinforcing properties of the chocolate rather than to explicitly regulate mood (Parker et al., 2006).

It is not just chocolate and sweet foods that are restricted during dieting. Foods high in carbohydrates have also been targeted as 'bad' foods or foods to avoid by dieters. Craving of foods rich in carbohydrates have been linked with Seasonal Affect Disorder (SAD), Depressive Disorders and Premenstrual Syndrome (PMS) (Wurtman & Wurtman, 1994). One study compared mood changes for individuals who experienced carbohydrate craving and individuals who did not. Wurtman and Wurtman (1994) demonstrated that following carbohydrate consumption, carbohydrate cravers reported a decrease in depressed mood whereas non-cravers reported feeling tired. Carbohydrate craving has also been described as carbohydrate addiction, however, researchers have not yet provided a conclusive explanation for why carbohydrate craving occurs (Weingarten & Elston, 1990).

Christensen and Pettijohn (2001) examined the relation between carbohydrate craving and mood changes. Participants, self-classified as either

protein cravers or carbohydrate cravers, identified their most frequently craved foods and rated the intensity of their craving. It was hypothesized that self-reported carbohydrate cravers would report experiencing greater negative affect states prior to a carbohydrate craving than a protein craver. The hypothesis mirrored previous research evaluating the idea that individuals' experiencing dysphoric moods crave carbohydrates to compensate for low levels of serotonin (Christensen & Pettijohn, 2001). Results demonstrated that 72% of participants were carbohydrate cravers. Additionally, carbohydrate cravers reported greater negative affect states prior to a craving and more positive affect state after consumption of the specified food. In contrast, protein cravers reported much lower levels of negative mood affect. Christensen and Pettijohn demonstrated that carbohydrate craving occurs in a non-clinical population and affects more women than men.

Acceptance and Commitment Therapy (ACT)

Historically, control-based weight-loss programs, regimented calorie counting, food-group restriction, bariatric surgery, and intensive exercise programs have been the treatment options for individuals to manage weight-loss and food craving. Behavioural treatment for weight-loss and food craving includes a set of principles and strategies designed to support overweight and obese individuals to change problem eating, exercise and health behaviours (Wadden & Foster, 2000).

Behavioural interventions, incorporating an Acceptance-based approach developed from ACT principles, may be effective not only for weight loss but for managing food craving and emotional over-eating within an environment rich in

palatable food choices (Forman, Butryn, Hoffman, & Herbert, 2009).

Acceptance-based weight-loss interventions are being developed based on the increasing amount of empirically validated research supporting ACT and acceptance-based treatments across people with a variety of psychopathological diagnoses.

The underpinning philosophy of ACT comes from Functional Contextualism, in which an event is considered as ongoing within a context, the nature and function of the event is of primary importance, scientific goals are determined, and truth criterion is emphasized (Hayes, 2004). In contrast to previous cognitive behavioural therapies, ACT focuses on function rather than form of the presenting behaviour. In an ACT programme, unlike control-based therapies for weight loss, the individual is encouraged to accept any negative thoughts they experience rather than to fight, avoid, or control them. Experiential avoidance is a strong component of many psychological problems and ACT encourages the individual to accept rather than avoid internal conflict. Using principles from Relational Frame Theory (RFT), acceptance and commitment therapists work on increasing psychological flexibility and use cognitive defusion and mindfulness to help an individual accept negative thoughts, creating values and goals to guide behaviour (Hayes, Luoma, Bond, Masuda, & Lillis, 2006).

RFT emphasizes relationships between language and cognitive stimuli; each time a relationship is made more information can be learned and the functions of the related stimuli may change (Blackledge, 2003). For example, a child may see their parent jump and scream when they see a spider, the child will learn that spiders are scary, spiders crawl very fast, and therefore the child may

also infer that other insects that crawl very fast are also scary. Relational responding considers discrimination between stimuli, however, the key aspect of relational responding is the information learnt from the relationship of the stimuli rather than from the stimuli individually. Derived relational responding is when information from stimulus relations is not directly learnt or contacted but it is derived from the relations. In the example above, the derived relation is that all insects that crawl fast are also scary, even though the child has never seen their parent jump or scream in reaction to other crawling insects. This aspect of RFT is in contrast to historical workings of respondents and operants in that, traditionally, direct contingencies need to have been contacted. In derived relational responding direct contingencies or teaching does not occur.

There are two main types of derived relational responding; mutual entailment, and combinatorial entailment. Mutual entailment occurs when the first stimulus relates to the second stimulus in a particular way and therefore the second stimulus relates to the first stimulus in a complimentary way. For example, if Stimulus A relates to Stimulus B then Stimulus B relates to Stimulus A. Combinatorial entailment is a more complex relational equation, relational responding occurs when relationships exist between two stimuli that have not been directly related to each other. For example, if Stimulus A relates to Stimulus B and Stimulus B relates to Stimulus C then Stimulus A relates to Stimulus C (Blackledge, 2003). Transformation of stimulus function occurs with combinatorial entailment in the respect that once derived relational responding has occurred, functions of the two stimuli involved in the relationship may be altered depending on what relationship was derived (Blackledge, 2003). This is extremely common in language constructs and is particularly relevant to the fear

and phobia literature, for example an individual may have an extreme snake phobia without ever coming into contact directly with a snake. In regards to food craving an individual may attach certain functions to food such as ‘chocolate will make you fat’ or ‘lollies will rot my teeth’ without actually ever coming into direct contact with the contingency outcome. Language in a verbal community is complex and involves constant mutual entailment, combinatorial entailment and derived relational responding processes. Many of these processes are arbitrarily applied by social reinforcement, or a lack of social reinforcement, within a verbal community depending on cultural bias.

An ACT therapist describes a person as having a ‘thinking self’ and ‘observing self’ (Bailey et al., 2014). Physically, an individual experiences the world through their physiological senses; seeing, touching, hearing, tasting and smelling. The ‘thinking self’ is an individual’s inner voice. The ‘thinking self’ makes constant judgments about the individual, the world, what is seen, heard, touched. It may be positive or negative, kind or unkind; it may state truth or untruth. In contrast, the ‘observing self’ is a curious scientist who observes the individual, sees what they see, hears what they hear, and touches what they touch. The ‘observing self’ does not make judgments, it only observes and describes what is happening in the here and now (Bailey et al., 2014). ACT treatment components include Values, Willingness, Cognitive Defusion, Awareness, Acceptance, and Mindfulness.

Values guide all aspects of ACT treatment; an individual identifies their own unique values unbiased by any other person. Identifying values empowers an individual and the values act as a guide for positive behaviour decisions (Harris, 2008). Values are not goals; goals have an end-point and are achievable

in a measurable sense. Values can be observed as behaviour and an individual can act in the service of a value, but a value is not measurable.

Willingness is a conscious decision to allow any discomfort to occur without fighting the discomfort or trying to avoid it (Harris, 2008). Although the discomfort could include intense or uncomfortable emotional and physical experiences, the individual willingly decides to allow the experience to be there. In relation to food craving, craving can occur at any time, an individual does not need to be hungry to experience a food craving; a food craving may be triggered by a memory, a smell or through auditory or visual cues. From an ACT perspective, it is not important what triggered the food craving but that the individual willingly allows the discomfort of a food craving to occur, without fighting to trying to avoid the experience, without feeling the need to neither act on it nor not act on it (Bailey et al., 2014).

Cognitive Fusion occurs when an individual takes their negative thoughts and feelings literally. If the individual's thoughts and feelings are predominantly negative or self-critical then the individual may not behave in a way that is kind nor compassionate to themselves or others (Harris, 2009). Cognitive Defusion occurs when an individual is able to create distance between their negative and self-critical thoughts and feelings and their self. Negative and self-critical thoughts may be thought of as a fog or a storm. When an individual experiences Cognitive Fusion the fog is thick, the storm is intense, and when an individual creates distance the fog dissipates, or the storm starts to lessen (Bailey et al., 2014).

Experiential avoidance involves avoiding thoughts and feelings, distraction, giving up, walking away, overthinking, punishing yourself, substance

abuse, emotional overeating, and so on (Bailey et al., 2014). Experiential avoidance is an autopilot response, it occurs unconsciously when an individual experiences an uncomfortable emotional situation. In relation to food craving, an individual may restrict access to foods considered fattening. Negative thoughts and self-critical feelings suggest ‘chocolate makes me fat’, ‘I feel guilty when I eat chocolate’. The forbidden food is then removed from the immediate environment. This strategy may work in the short term; the individual may experience food craving but not act on it due to limited access. However, it is likely that external food cues will elicit craving for the food within a social context. A rebound effect may occur where the forbidden will be over consumed due to the restriction. Negative emotional affect will most likely follow the over consumption (Bailey et al., 2014). Cognitive Defusion creates distance between negative thoughts and the self, enabling an individual to make a behaviour choice in the service of values rather than an impulsive decision based on food craving.

Mindfulness is core component of ACT and acceptance-based interventions. Mindfulness is defined as experiencing the present moment, right here right now, with conscious thought and awareness without judgment (Alberts, Thewissen, & Raes, 2012; Harris, 2008). All human behaviour can be conducted mindfully. Every component, strategy, and technique used in ACT is done with mindful awareness, and consciousness. Mindfulness often involves breathing and visualization exercises very similar to meditation techniques from Buddhist origins (Harris, 2008).

Mindfulness incorporates acceptance, awareness, and meditation practises that help teach an individual to pause, take a breath and to experience the present moment, with full conscious awareness (Bailey et al., 2014).

Acceptance is when an individual accepts and acknowledges their experience (Harris, 2008). The individual allows their ‘observing self’ to observe their body with the intrigue of a scientist holding a magnifying glass. The ‘observing self’ labels and describes experiences with mindful awareness. By learning, experiencing and practicing acceptance an individual is able to make room for their negative and self-critical thoughts and feelings within their body and these thoughts and feelings will begin to have less emotional impact on the individual (Harris, 2009). Awareness is when an individual willingly experiences an emotional situation in the moment, is able to experience thoughts and feelings for what they are, just thoughts and feelings, nothing more nothing less, true or untrue, and to behave in a way is in line with their values (Harris, 2008).

The practices and philosophies of ACT not only lend themselves successfully to obesity interventions, weight-loss goals, and management of food craving but ACT is increasingly demonstrating effective results across anxiety disorders (Eifert et al., 2009), psychosis (Gaudio & Herbert, 2006), parents of ASD children (Blackledge & Hayes, 2006), eating disorders, substance abuse and Post Traumatic Stress Disorder (Batten & Hayes, 2005).

ACT versus CBT in relation to Eating Behaviour

In relation to pathological eating behaviour Cognitive Therapy (CT) is currently considered the most effective treatment option. Juarascio, Forman, and Herbert (2010), however, found that ACT was more successful at reducing problem eating behavior than CT. The key components of ACT, such as accepting negative thoughts and determining individual values, were considered to have contributed to the successful outcome (Juarascio et al., 2010).

Weight-loss programs tend to lack efficacy due to their failure to address the self-stigma of obesity (Lillis et al., 2009). Increasing the effectiveness of a weight-loss program may be achieved by using acceptance and mindfulness strategies. Lillis et al. (2009) found that ACT participants lost more weight than control participants, showed reduced levels of self-stigma, and had a higher perceived quality of life based on outcome measures, adding support to the effectiveness of ACT as a therapy for weight loss and weight-loss maintenance. Additionally, ACT workshops are low cost, which will allow a greater number of individuals to access the therapy, adding further social significance to the findings (Lillis et al., 2009).

Emotional over eating and binge eating are thought to occur in reaction to an individual experiencing heightened emotional states by providing distraction and experiential avoidance as a coping mechanism (Lillis, Hayes, & Levin, 2011). In practise, this becomes a cycle of negative guilt and the result is increased weight gain. Binge eating could be considered a form of experiential avoidance and the processes of ACT intervention target experiential avoidance at the core of its treatment. Gifford et al. (2004) looked at the role experiential avoidance and psychological inflexibility plays in weight loss. Results demonstrated that participants who attended a one-day ACT workshop showed greater reduction in experiential avoidance with weight loss compared to control participants, who did not attend the workshop. A parallel was drawn between the role experiential avoidance plays in both smoking cessation and weight loss, indicating the ability to identify common clinical pathways for psychological inflexibility and experiential avoidance (Gifford et al., 2004). Maintaining weight loss is an important factor in weight-loss treatment and future research

needs to consider whether acceptance-based treatments can mediate weight loss and reductions in experiential avoidance over the long term.

ACT versus CBT in relation to Food craving

In contrast to acceptance-based interventions, control-based weight-loss interventions encourage the individual to achieve weight loss through controlling their environment, limiting access to high-calorie foods and restricting calorie intake. It has been argued that current control-based interventions offer inadequate long-term behaviour change, as an individual may not have the coping ability to control their environment on completion of the weight-loss program (Niemeier, Leahey, Palm Reed, Brown, & Wing, 2012). People who use control-based strategies achieve some weight loss during the intervention period, due to strict rule following of calorie intake, avoidance of high-calorie food, and resistance of food craving. The avoidant and resistant nature of control-based strategies may in fact contribute to a rebound effect of weight gain following completion of a control-based weight-loss intervention (Forman et al., 2007).

The core processes of ACT identify and support behaviour change with food intake, they encourage healthy choices in line with individual values and to experience a food craving without resisting or giving in to the craving. Psychological inflexibility and experiential avoidance are decreased with Mindfulness, Acceptance, and the development of values and goals specific to the individual (Bailey et al., 2014). Cognitive Defusion and metaphor are used to understand relational framing, to support the individual to develop new relationships with negative thoughts and internal conflict. Emotional binge eating and disinhibited food craving are strong indicators of an individuals' risk for

obesity and current research suggests that ACT may provide successful weight-loss treatment and long-term weight maintenance (Alberts, Thewissen, & Raes, 2012).

Research evaluating mindfulness-based interventions has primarily focused on short-term interventions. Alberts, Mulkens, Smeets, and Thewissen (2010) conducted a mindfulness-based intervention, primarily evaluating the efficacy of acceptance, to reduce the impact of food craving across a 7-week program. Alberts et al. demonstrated that with a longer intervention period the intervention group had significantly fewer food cravings compared to the control group, that loss of control in relation to food cues was reduced, that obsessively thinking about food was reduced, and that the perceived reinforcing value of the food (positive outcome expectancy) was reduced. Their findings support the effectiveness of a mindfulness-based intervention for overweight and obese individuals in reduction of food craving and perceived control of external food cues.

Further research by Alberts et al. (2012) evaluated the impact of a mindfulness-based intervention in relation to disordered eating behaviour. Food craving, BMI, dichotomous thinking, restraint, and body image concern were all evaluated for a mindfulness-based intervention group and a control no-intervention group across an 8-week period. Alberts et al. demonstrated that the intervention group increased mindfulness skills significantly more so than the control group. The intervention group decreased levels of dichotomous thinking, food craving, emotional eating, body dissatisfaction, and external eating significantly more so than the control group. There was no significant decrease for the treatment intervention group compared to the control group with

restrained eating, BMI, or weight, and Alberts et al. suggested that these components may take a longer time frame to alter in relation to a mindfulness-based intervention. Mindfulness-based intervention in relation to disordered eating behaviour is a promising treatment that works on internal self-regulatory processes that support positive change in dichotomous thinking and food craving.

Researchers describe behavioural intervention based on ACT principles as either a mindfulness-based intervention or an acceptance-based intervention (Alberts et al., 2010; Lillis et al., 2009). Although the labels are different, theoretically, both focus on acceptance and mindfulness practices, and acceptance-based intervention is the more common term. Lacaille et al. (2014) investigated components of an acceptance-based treatment program, to establish if components of the program were more effective than other components in relation to reducing food craving. The component conditions were awareness, awareness and acceptance, awareness and disidentification, awareness, acceptance and disidentification, with a control condition, distraction. Results were not entirely conclusive. Mindfulness skills for all participants increased even skills not directly taught. The awareness and disidentification condition was the only condition that participants demonstrated greater acquisition of skills, than participants in the control condition, with skills that had been taught through the intervention. Considered with caution, the study provides some evidence that disidentification reduced trait chocolate craving and that acceptance-based intervention should prioritize disidentification strategies over acceptance for an individual managing food craving. Disidentification is an interchangeable term with cognitive defusion.

Thought Suppression is a conscious decision to suppress or ignore, it is the denial of thoughts that are not helpful or unwanted similar to experiential avoidance (Hooper, Sandoz, Ashton, Clarke, & McHugh, 2012). Thought Suppression is a strategy used in control-based programs for the management of food craving. Hooper et al. (2012) evaluated the impact of cognitive defusion as an acceptance-based strategy and thought suppression as a control-based strategy in relation to food craving and consumption. Findings indicated that cognitive defusion within an acceptance-based program warrants further investigation with food craving management and weight loss.

At the core of acceptance is the change in relationship to the internal state as opposed to any alteration or denial of the internal state (Alberts, Thewissen & Middelweerd, 2013). In an evaluation of food craving regulation, Alberts et al. (2013) compared the immediate consequences of exposure to highly-palatable food with an acceptance-based intervention group, a suppression-based intervention group and a no-intervention control group. The control group experienced decreased craving, the suppression group experienced no change in craving and the acceptance group experienced a slight increase in craving (Alberts et al., 2013). Acceptance strategies may provide long-term beneficial support with managing food craving, but in the short-term people will need support to manage the possible increase in craving, similar to an extinction burst. Acceptance-based intervention for craving incorporates conditioning where repeated exposure without acting on a craving reduces craving intensity and therefore food cues diminish responding.

Extending Stirling and Yeoman's (2004) research evaluating food craving and weight loss using an analogue paradigm, Forman et al. (2007)

compared the effectiveness of an acceptance-based intervention and a control-based intervention for individuals' coping with food craving. Participants were randomly allocated to the acceptance-based group, the control-based group, or a non-intervention group, and completed the Power of Food Scale (PFS), Food Craving Questionnaire-State (FCQ-S) and 5 single-item craving dimension rating questions, at three time points across the study. The craving dimension questions assessed intensity, frequency, resistance, temptation, and distress. The intervention, delivered in a workshop, included core ACT processes, and the control-based intervention was based on the Learn manual (Womble et al., 2004). Participants were given a transparent box of chocolates to carry with them for a 48-hour period and instructed to resist consuming any chocolate from the box or elsewhere. It was hypothesised that an individual's susceptibility to food craving, or their PFS score, would predict chocolate consumption and that exposure to an acceptance-based intervention would moderate this susceptibility. Secondly, it was predicted that a higher PFS score would be correlated with greater single-item craving dimension ratings and therefore increased chocolate consumption. The results included the following; 91% of participants resisted consuming the chocolate, of the participants who did consume chocolate, support for the hypothesis was demonstrated in higher scores across craving dimensions. Additionally, higher PFS scores correlated with the individual experiencing greater craving and consuming more chocolate. Furthermore, for individuals with a higher PFS score, an acceptance-based intervention was more effective in managing food craving. For individuals with a lower PFS score, a control-based intervention was more effective in managing food craving (Forman et al., 2007). Limitations of the study include the analog structure of the experimental design,

and the lack of measures between an individual experiencing food craving and actual food consumption. However, the results of the study provide preliminary evidence that an individual's susceptibility to environmental food cues, as measured by the PFS, is an important factor in weight-loss treatment and management of food craving. Acceptance-based intervention offers effective craving management strategies for individuals with high PFS scores.

Forman, Hoffman, Juarascio, Butryn, and Herbert (2013) aimed to replicate and extend Forman et al.'s (2007) study to an obese and overweight population who craved sweets. It was conceivable that individuals with higher PFS scores and more susceptibility to a palatable food environment would potentially be overweight or obese (Forman et al., 2007). Forman et al.'s (2013) results support previous findings by Forman et al. (2007) that acceptance-based intervention reduced food craving and corresponding food consumption, providing further support for the effectiveness of an acceptance-based intervention with overweight and obese individuals, who are the most relevant population in regard to weight-loss and craving management research. The major limitations of the study were the absence of a non-intervention control group and long-term follow up. Further research is warranted in the treatment application of acceptance-based intervention in the areas of weight-loss and weight maintenance with particular focus on food craving management and the impact a palatable food environment has on the individual.

The Present Study

Using a concurrent multiple baseline design, I aimed to replicate the acceptance-based intervention results of Forman et al.'s (2007) study which

considered the effectiveness of an acceptance-based intervention in comparison to a control-based intervention for individuals coping with food craving. Forman et al. (2007) found that for participants with a PFS of 42 or higher an acceptance-based intervention was more effective than a control-based intervention at managing food craving and consumption. The current study chose to focus on acceptance-based rather than control-based intervention given increasing support for the effectiveness of acceptance-based intervention in relation to food craving and consumption in recent research (Alberts et al., 2010; Forman et al., 2013).

My study differed from Forman et al.'s (2007) in a number of ways. Firstly, food craving and consumption were evaluated pre- and post acceptance-based workshop using a single-subject multiple-baseline experimental design rather than a group design. Individuals experience food craving in very different ways. To evaluate food craving, research to date has used group design and participant self-report. Food craving and consumption research with an acceptance-based workshop has never, to date, used single-subject multiple-baseline experimental design. Under a group design, food craving and consumption outcomes are evaluated using average data, and often just pre- and post-intervention measures. Averages may mask the way an individual's food craving changes. Food craving changes are not normally examined over a period of time for an individual. The rationale for choosing a single-subject multiple-baseline experimental design and the purpose of the current study was to evaluate whether Forman et al.'s (2007) acceptance-based intervention results could be replicated using a single-subject multiple-baseline experimental design, recent research has demonstrated strong findings in other research areas using single-subject multiple-baseline experimental design (Moeyaert, Ugille, Ferron,

Beretvas, & Van den Noortgate, 2014; Woidneck, Morrison, & Twohig, 2014). Applying a single-subject multiple-baseline experimental design to evaluate whether Forman et al.'s (2007) acceptance-based intervention results could be replicated involved taking a measure of cravings daily over a period of time before the workshop, and continuing to monitor cravings after the workshop. In addition, what is craved for each individual can be different. Thus a further aim was to take this into account and consider food craving and snack food consumption that was relevant to each individual.

Dependent measures were consistent with Forman et al.'s (2007) study and included food consumption, the PFS, the FCQ-S, and the single-item Craving Dimension Ratings. Participants in the current study completed the PFS and FCQ-S pre-baseline, post-baseline, before the workshop began and post-workshop, at the completion of the study. These measures were used in order to allow comparison with previous data. The measure used for the multiple baseline design was a single-item Craving Dimension Rating. These, together with food consumption data, were recorded by participant's daily during baseline and post workshop phases. The incorporation of a baseline phase in the experimental design is a key feature of single-subject design and allows comparison of the dependent measures before and after the workshop. From these data, visual analysis can detect if there was or was not a change in behaviour following the workshop. Forman et al. (2007) found that an acceptance-based intervention was more effective in moderating food consumption and craving for participants with a PFS of 42 or higher. Therefore, participants were required to have a PFS score of 42 or higher to participate in the current study.

To simulate an environment rich in available and palatable food, Forman et al. (2007) provided participants with a transparent box of Chocolate Kisses. I extended Forman et al.'s procedure by providing participants with their preferred snack foods, indicated individually via a snack food preference questionnaire. Although chocolate has been cited as the most commonly craved food, there is evidence to suggest that foods high in sugar, salt, and fat are craved by some individuals as often as chocolate (Hill, 2007; von Deneen & Liu, 2011).

Participants in Forman et al.'s (2007) acceptance-based intervention condition attended a 30-min workshop that included intervention based on the principles of ACT (Hayes et al., 2006). The workshop content included; Cognitive Defusion, creating distance between an individual's thoughts and their behaviour; Acceptance that a craving may occur but there is no need to act on it; Willingness to accept the physical sensations that a craving elicits but to allow them to pass; and Awareness of the difference between hunger and a craving and the different sensations that the individual experiences. I provided a one-hour individual workshop following completion the baseline phase. My acceptance-based workshop included similar content to the Forman et al. (2007) workshop based on the principles of ACT (Hayes et al., 2006). Additionally, I ran a mindfulness exercise, which included breathing, observing, labeling, and identification of values, based on content from the Weight Escape workshop (Bailey et al., 2014). The length of the workshop in the current study reflected the added mindfulness content.

The participants did not record specific food cravings, therefore a direct correlation between food craving and food consumption was not possible from the data collected. Graphical analysis of snack food consumption, single-item

Craving Dimension Ratings, and responses to the PFS and the FCQ-S before and after the workshop were used here. Research has generally found more women than men self-report food craving (Hill, 2007). Forman et al. (2007) combined male and female results. This multiple baseline experimental design allowed the data from individuals, to be compared, and allow a comparison across gender.

Method

Ethics

Prior to advertising for participants, ethical approval was granted from the University of Waikato School of Psychology Research and Ethics Committee. (#14:71).

Participants

Participants were recruited through advertisements located around the University of Waikato campus. The advertisement (Appendix A) provided brief information about ACT and food craving and an email address for individuals to express interest in the study. Nineteen people responded to the research advertisements. Eighteen people completed the Power of Food Scale questionnaire, of which 15 people met the Power of Food Scale inclusion criteria score of 42 or higher. One person declined to proceed further due to diet restrictions, two people declined to proceed further due to upcoming travel arrangements and two people ceased contact with the researcher. Twelve people started the research study and 11 people completed the study (Table 1).

Participants were of various ages and ethnicities (Table 1). All but one participant had a healthy Body Mass Index (BMI) between 20 and 25; one

participant had a BMI greater than 25, which is considered overweight. All participants chose a mixed snack food preference of sweet and savoury food items and all participants were non-smokers.

Measures

Participants completed the test battery at the pre-baseline, post-baseline, before the workshop commenced, and post-workshop at the completion of the study.

Power of Food Scale (PFS)

The PFS is a 21-item self-report questionnaire, which uses a 5-point Likert scale, 1 = don't agree at all, 5 = strongly agree (Appendix B). The PFS

Table 1

Details of participants who partially or fully completed baseline and intervention

Participants/Gender	Age	Ethnicity	BMI	POFS	Completed
Male 1	41	British	20	48	Y
Male 2	39	Caucasian	25	48	Y
Male 3	33	NZ European	24	53	Y
Female 1	34	NZ European	24	44	Y
Female 2	25	Irish	24	68	Y
Female 3	32	Irish	21	58	Y
Male 4	36	Caucasian	25	52	Y
Male 5	36	NZ European	28	63	Y
Male 6	26	Irish	25	59	Y
Female 4	34	NZ European	22	77	Y
Female 5	35	Dutch Australian	25	89	Y
Female 6	34	NZ European	22	44	N

considers the impact that a plentiful and available food environment has on an individual in regards to food craving and food consumption. The PFS has good test-retest reliability (4-month test-retest reliability = .79) and sufficient internal reliability (Cronbach's alpha = .94) (Lowe et al., 2009). For the current study, I used the PFS to measure the impact that external environmental food cues had on an individual's food craving experience. A total score was generated for the individual.

Craving

The Food Craving Questionnaire-State Version (FCQ-S) developed by Cepeda-Benito, Gleaves, Williams, and Erath (2001) is a 15-item questionnaire that evaluates an individual's food craving experience from an emotional perspective, and measures state-based fluctuations in an individual's motivation to consume desired foods (Appendix C). The FCQ-S has good construct validity and high internal consistency (.88-.94) (Cepeda-Benito et al., 2001). The FCQ-S uses a 5-point Likert scale (1 = strongly disagree; 5 = strongly agree) and can either specify a particular food such as chocolate or can be used in a general way with no particular food specified. The FCQ-S questionnaire in the current study did not specify a particular food. A total score was generated for the individual.

Daily Measures

Craving was measured daily using 5 single-item Craving Dimension ratings that were replicated from Forman et al.'s (2007) study (Appendix D). Craving frequency included ("How much did you think about your specified snack food?"), craving temptation included ("How tempted were you to eat

your specified snack food?’’), craving intensity included (‘‘How much did you want your specified snack food?’’), difficulty resisting included (‘‘How difficult did you find resisting your specified snack food?’’), and craving distress included (‘‘If you had cravings for your specified snack food, how distressing did you find them?’’). The single-item Craving Dimension rating uses a 5-point Likert scale (1 = not at all; 5 = extremely). The single-item Craving Dimensions were analyzed separately (Forman et al., 2007). Due to the single-subject multiple baseline experimental design, daily single-item Craving Dimension ratings were provided by the participant and allowed visual analysis of changes in dimension ratings across the phases of the experiment.

Snack food consumption

Participants provided the daily weight in grams of the snack food they consumed from the provided snack foods (Appendix D). Snack foods were considered to be any foods the participant had listed on their snack food preference questionnaire, for example if the participant had listed ‘barbecue Kettle Fries’ on their snack food preference questionnaire then all ‘chip’ varieties were included as snack food for that participant. Participants were given up to 10 snack food choices that the researcher provided. Participants answered a daily yes/no integrity question stating whether or not they had consumed snack food outside of the study parameters (Appendix D).

Study Design

I used a concurrent multiple-baseline design where groups of three male participants began the study at the same time and groups of three female

participants began the study at the same time. Baseline data were collected for a minimum of 5 days until data were stable or a worsening trend was detected. When the snack food consumption baseline data were considered stable (data showed a consistent trend) the participant individually attended the workshop. Additionally, the test battery that included the PFS and the FCQ-S were completed by participant's pre-baseline, post-baseline, before the workshop commenced, and post-workshop at the completion of the study.

Procedure

Initial Phase

Once ethics approval had been confirmed advertising for participants commenced. The advertisement (Appendix A) asked for individuals who experienced food craving and had an interest in participating in the study to contact the researcher by email. Once an individual contacted the researcher, they were emailed a participant information sheet (Appendix E), asked to complete the PFS (Appendix B), and advised that the researcher would be back in touch by email. Participants who met the inclusion criteria (18–60 years old; experienced food craving; obtained a score of 42 or greater in the PFS) and were not excluded due to pregnancy or dietary restrictions were invited to participate in the study. Participants were provided a copy of the consent form (Appendix F), a snack preference assessment (Appendix G), and a demographic information questionnaire (Appendix H), to complete and email back to the researcher. A mutually convenient time and location was discussed to meet and commence the baseline phase. From the outset the participant was advised that they could withdraw from the study at any time without penalty or question.

Pre-baseline phase

I met with participants individually. Participants started the baseline phase of the study concurrently in male or female groups of three. Once the consent form was discussed and signed, participants completed the FCQ-S. I provided participants a transparent snack box filled with their preferred snack food and informed them that, for the duration of the baseline phase of the study, to consume snack food only from the box provided and not to obtain snacks elsewhere. I advised the participants that they could have their snack box refilled at any stage. The box was approximately the size of a standard lunchbox and filled to capacity.

I advised participants to eat their snack foods as they liked and to respond to their food craving in the same way that they normally would to having food available in their environment. I asked participants to keep the snack box with them at all times. I asked participants to complete the single-item Craving Dimension questions daily, to provide the weight in grams of snack food consumption daily, and to answer a yes/no integrity question to check procedural integrity. I asked participants to email or text this information to me daily.

The baseline phase for each participant continued until data showed a stable trend, or an increasing trend in snack food consumption. Post-baseline, participants individually attended the workshop at different times depending on the stability of their data.

Acceptance-based workshop and post-workshop phase

I asked participants to individually attend an acceptance-based intervention workshop. Post-baseline and at the beginning of the workshop, I

asked participants to complete the PFS, and the FCQ-S. I ran the workshop from a script so that each participant received exactly the same content. I adapted the workshop content from The Weight Escape program (Bailey et al., 2014). The acceptance-based workshop content included ACT principles such as Awareness, Acceptance, Willingness, Cognitive Defusion, Values, and Mindfulness and provided behaviour strategies to cope with food craving.

On completion of the workshop, I re-filled the participants snack food boxes and asked the participants to do their best to resist their food craving and not to consume any snack food. I asked participants to complete the single-item Craving Dimension questions daily, to provide the weight in grams of snack food consumption daily, and to answer a yes/no integrity question daily. I asked that participants emailed or texted this information to me daily.

The post-workshop phase continued until the participants snack food consumption data displayed a stable trend, or a worsening trend. At the completion of the post-workshop phase, I asked each participant to complete the PFS and FCQ-S for the final time. I offered a voluntary debrief with me via a phone call in regards to any questions the participant may have about the study, food craving, or where they could find out more information about acceptance-based strategies and ACT.

Results

Snack food consumption

Of the 12 individuals who participated in the study, 11 completed both the baseline and post-workshop phases. Results include completed participant

data only. Figure 1 displays the snack food consumption pre and post workshop for the male participants.

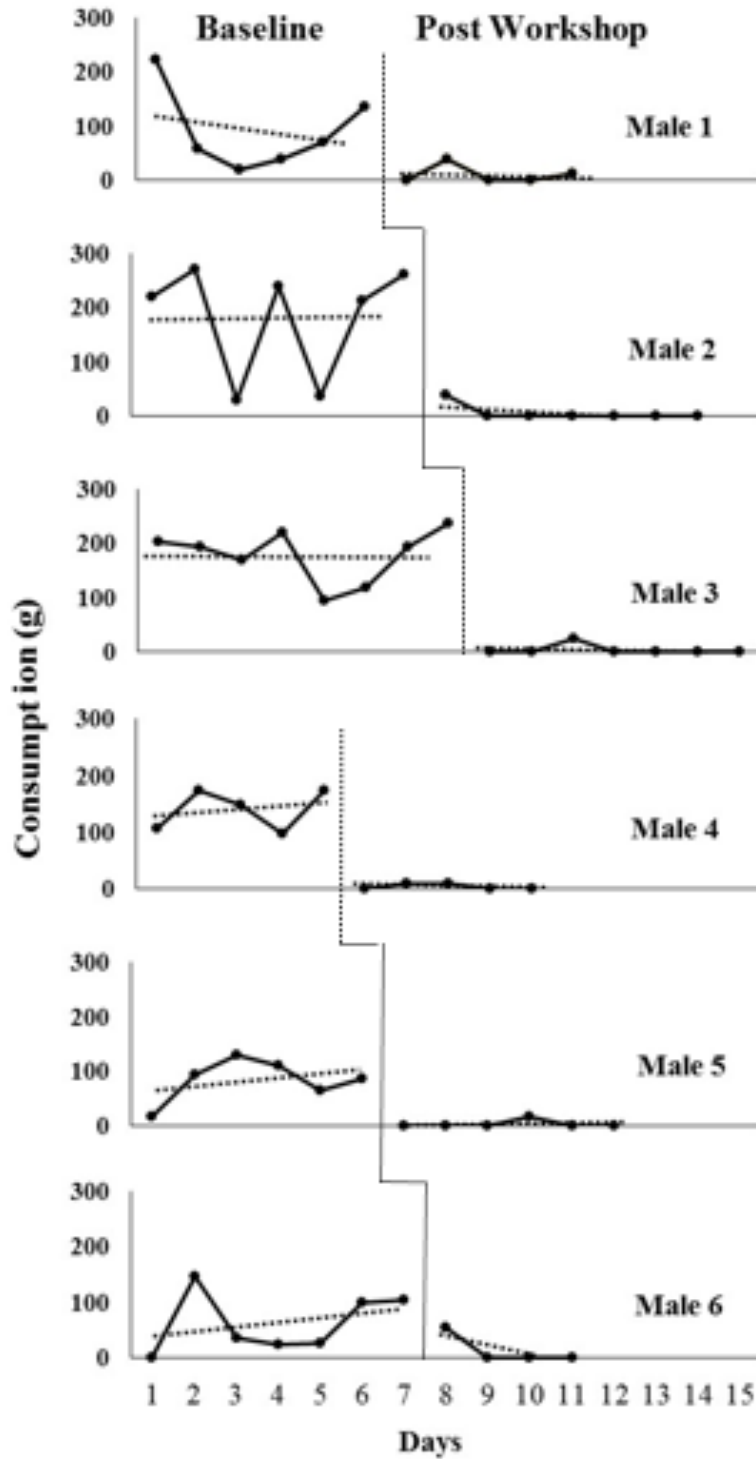


Figure 1. Combined Male weight in grams of food consumed plotted against days.

Figure 1 demonstrates that, during baseline, male participants 2 and 3 displayed variable consumption that was consistently greater than zero and neither increasing nor decreasing during baseline. Male participants 4, 5, and 6 displayed variable consumption that was consistently greater than zero and increased during baseline. Male participant 1, displayed variable consumption that was consistently greater than zero and decreased during baseline. Post-workshop, the snack food consumption levels for all of the male participants dropped to almost zero consumption and on the few occasions that the male participants did consume snack food, the amount consumed was less than during baseline. Overall, male participants experienced a change in snack food consumption following the workshop.

Figure 2 displays the snack food consumption pre and post workshop for the female participants. Figure 2 demonstrates that, female participants 1, 2, and 3 displayed variable consumption that was consistently greater than zero and increased during baseline. Female participants 4, and 5 displayed variable consumption that was consistently greater than zero and neither increased nor decreased during baseline. Post-workshop, female participants 1, and 2 dropped to almost zero consumption and on the one occasion that Female 1 did consume snack food, the amount consumed was equal to the lowest baseline level. Post-workshop, female participants 3, and 4 dropped snack food consumption lower than baseline levels with decreasing variable consumption. Post-workshop, female participant 5 dropped snack food consumption lower than baseline levels with increasing variable consumption. Overall, female participants experienced a change in snack food consumption following the workshop.

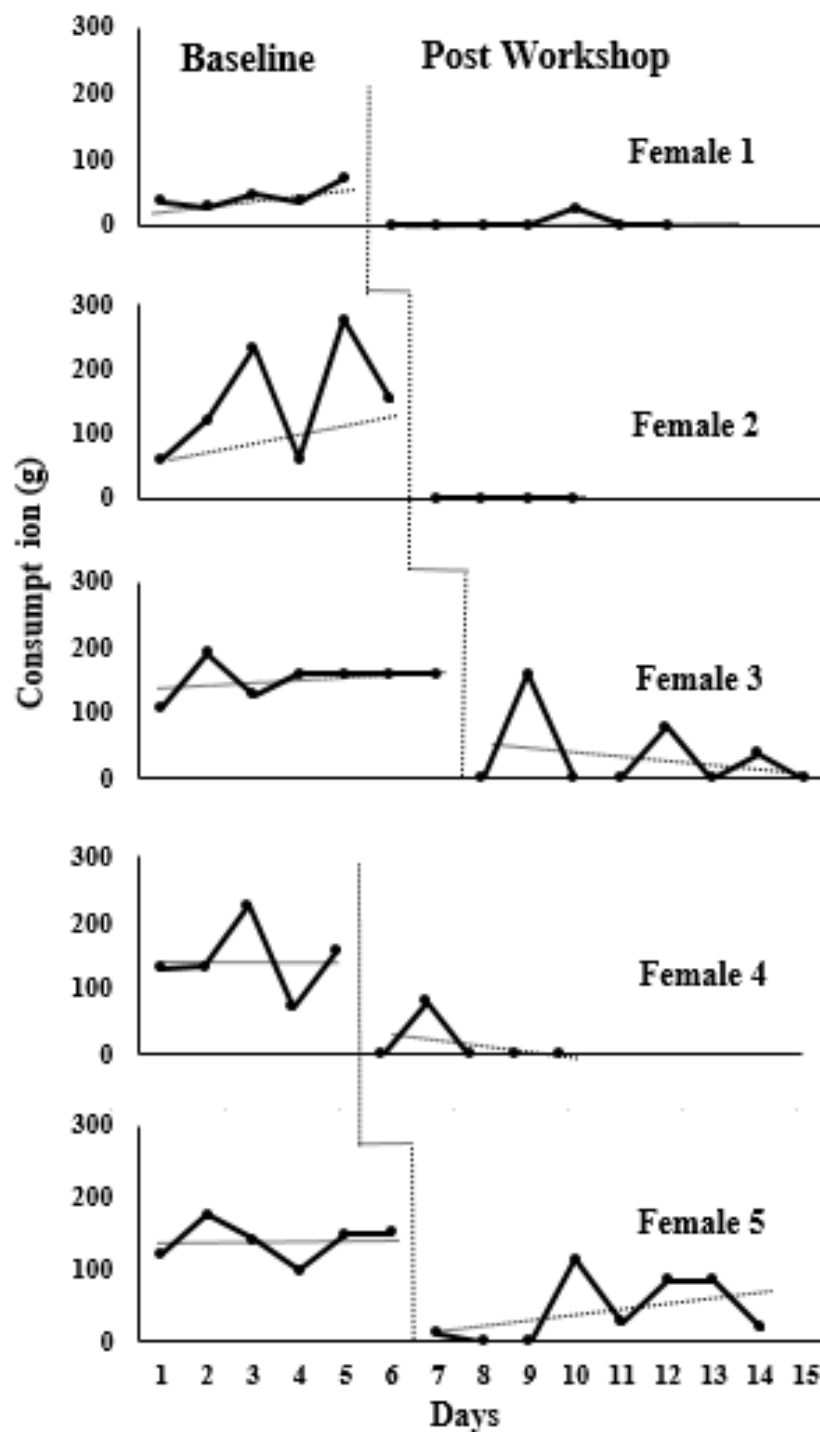


Figure 2. Combined female weight in grams of food consumed plotted against days.

Integrity Question

Five out of six male participants answered 'no' to the daily integrity question (did you consume snack food outside of the study parameters?) on 100% of the opportunities across baseline and the intervention phase. Male 6 answered 'yes' on one occasion, however, he stated the weight of the chocolate bar purchased outside of the study snack food provided and included it in his daily consumption weight. All five female participants answered 'no' to the daily integrity question on 100% of the opportunities across baseline and the intervention phase.

Craving

Table 2 displays the mean results for the Single Item Craving Dimension ratings, specifically, the minimum, maximum, mean, and standard deviation for the male and female participants, averaged across males and females.

For male participants, the mean rating for each of the five dimensions decreased between baseline and post-workshop. The standard deviations decreased between baseline and post-workshop for frequency, resistance, and distress scores but increased for temptation and intensity scores. Mean scores for frequency, intensity, resistance, and distress decreased, after the workshop. After the workshop, male participants reported being able to resist cravings more effectively, and experienced less distress when resisting cravings than prior to the workshop. Mean temptation scores decreased, demonstrating that male participants, on average were less tempted by snack food after the workshop.

Table 2
Summary of Single Item Craving Dimension Ratings

	Baseline				Post Workshop			
	Min	Max	Mean	SD	Min	Max	Mean	SD
Male								
Frequency	1	4	2.64	0.90	1	3	1.94	0.74
Temptation	1	4	2.61	0.81	1	4	2.06	1.18
Intensity	1	5	2.46	0.82	1	4	1.94	1.13
Resistance	1	5	2.46	1.00	1	4	1.94	0.89
Distress	1	4	1.31	0.69	1	3	1.26	0.51
Female								
Frequency	1	4	2.45	1.12	1	4	2.31	1.20
Temptation	1	5	2.79	1.11	1	4	2.47	1.11
Intensity	1	5	2.52	1.21	1	5	2.53	1.29
Resistance	1	4	2.57	1.15	1	5	2.53	1.32
Distress	1	4	1.83	1.04	1	4	1.97	0.90
Overall								
Frequency	1	4	2.49	1.10	1	4	2.11	1.05
Temptation	1	5	2.61	0.98	1	4	2.16	1.12
Intensity	1	5	2.42	0.98	1	5	2.18	1.25
Resistance	1	5	2.39	1.01	1	5	2.20	1.22
Distress	1	4	1.42	0.84	1	4	1.62	0.85

For female participants, the mean rating for frequency, temptation, and resistance dimension scores decreased between baseline and post-workshop. The mean rating for intensity and distress dimension scores increased between baseline and post-workshop. The standard deviation decreased between baseline and post-workshop for distress, stayed the same for temptation and increased for frequency, intensity, and resistance. Post-workshop, female participants on average experienced fewer cravings, were less tempted by snack food, and were able to resist cravings more effectively than prior to the workshop. However,

when female participants did experience cravings post-workshop, they experienced the craving with more intensity and experienced more distress. Female results were more variable than the male results.

When male and female data are combined, the mean rating for each of the five dimensions decreased from baseline to post workshop. The standard deviations decreased between baseline and post-workshop for frequency, but increased for temptation, intensity, resistance, and distress scores.

Figures 3 and 4 display individual data for the single-item Craving Dimension Rating Frequency. Craving frequency for Males 1, 2, 3, 5, and 6 were variable in baseline; variable frequency decreased slightly post-workshop, and overlapped with baseline frequency. Male 4 experienced stable craving frequency in baseline, frequency decreased post-workshop, with no baseline overlap. Craving frequency for Females 1 and 5 were variable in baseline, variable craving frequency post-workshop overlapped with baseline frequency. Female 2 experienced decreasing frequency in baseline, variable craving frequency post-workshop overlapped with the highest baseline rating. Female 4 experienced stable, low craving frequency in baseline, frequency increased post-workshop, at levels higher than baseline. A repeated-measures *t* test showed that the mean single-item Craving Dimension Frequency ratings for men and women combined did not differ significantly after the workshop, although the mean rating were lower after the workshop, ($M = 2.21$, $SD = .08$) compared to before the workshop ($M = 2.57$, $SD = .02$; $t(10) = 1.38$, $p = .2$, $d = 0.37$). A reasonably small effect size was obtained.

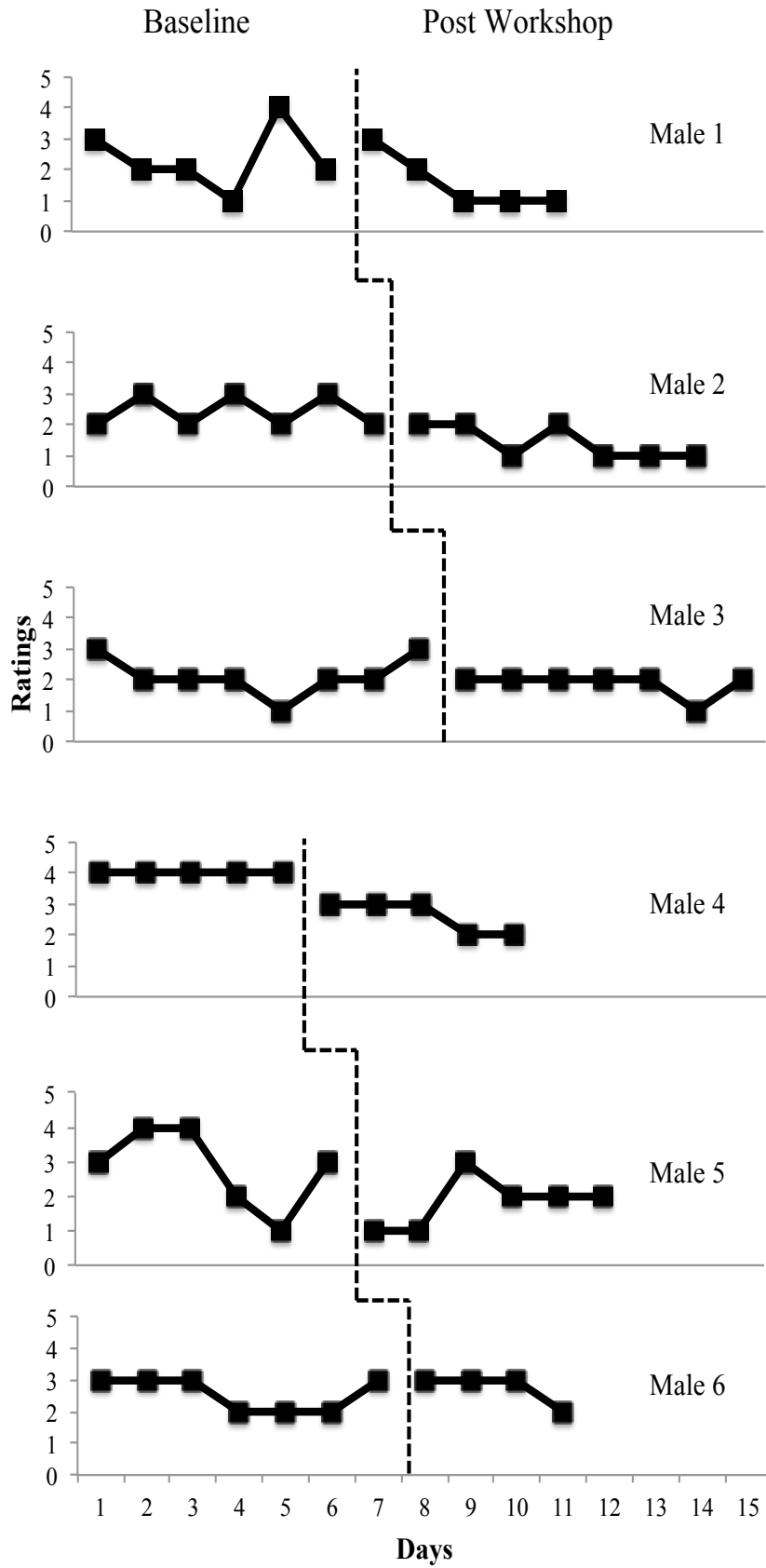


Figure 3. Combined Group 1 and Group 2 Male Single Item Craving Dimension Frequency Ratings plotted against days

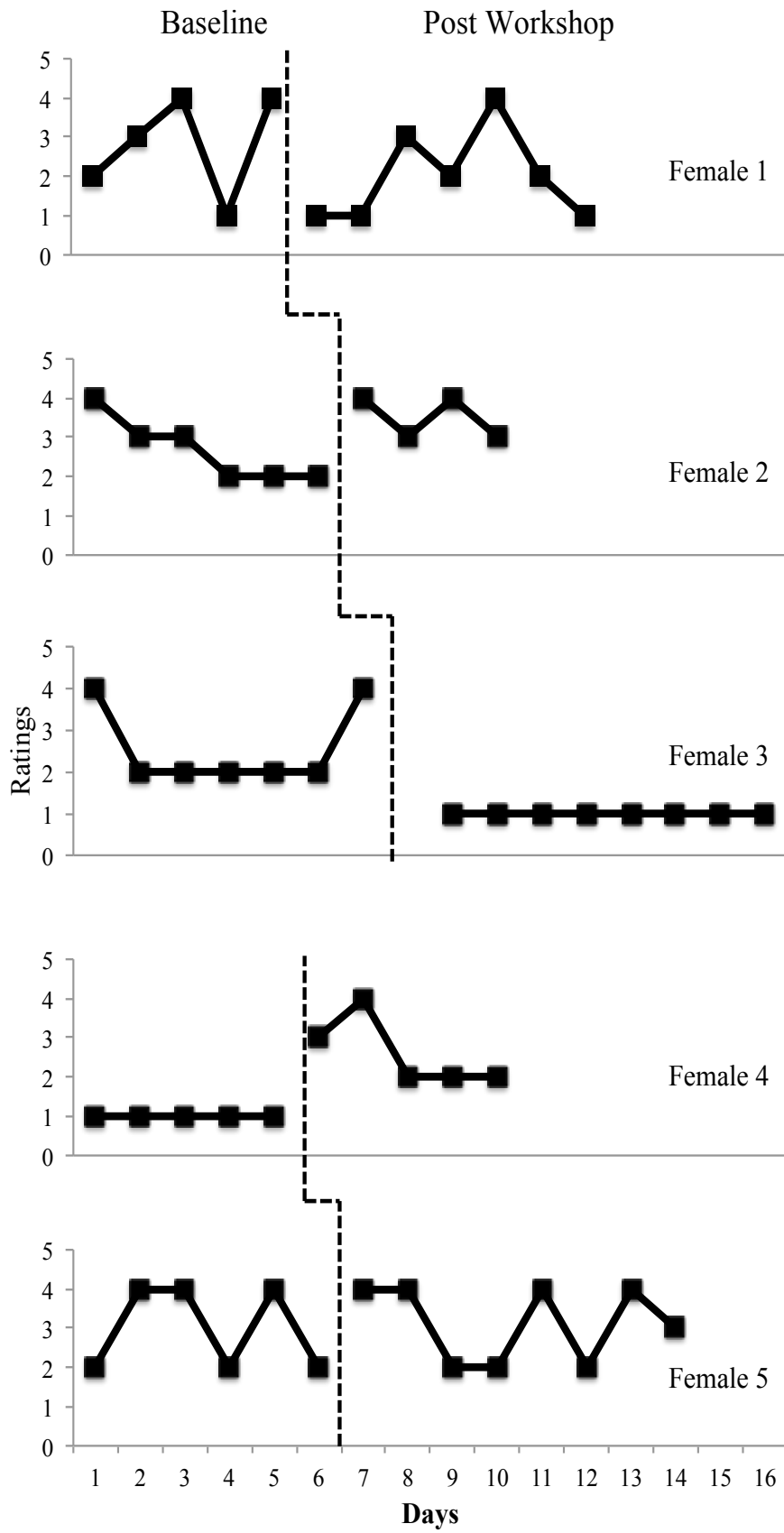


Figure 4. Combined Group 1 and Group 2 Female Single Item Craving Dimension Frequency Ratings plotted against days

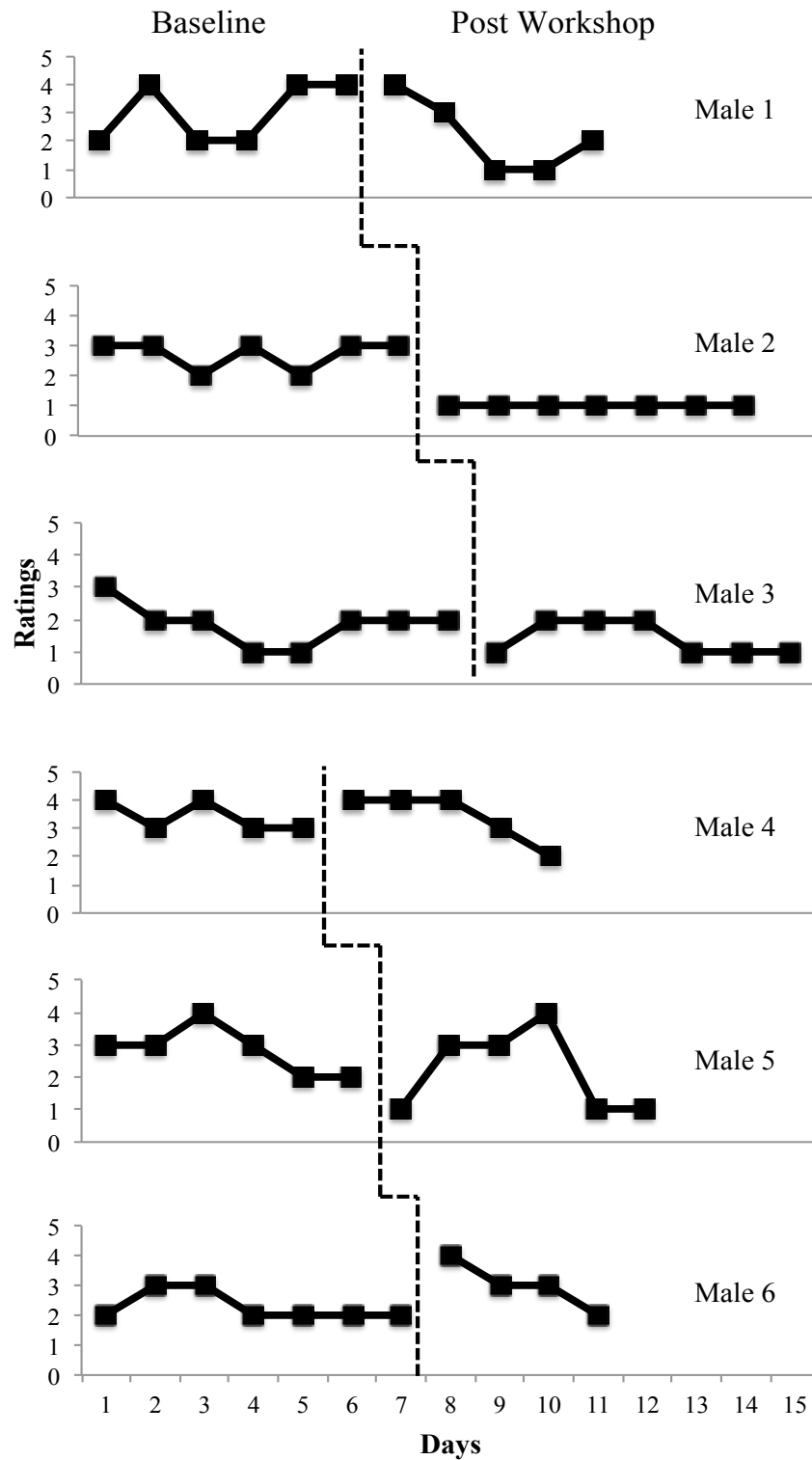


Figure 5. Combined Group 1 and Group 2 Male Single Item Craving Dimension Temptation Ratings plotted against days

Figures 5 and 6 display individual data for the single-item Craving Dimension Rating Temptation.

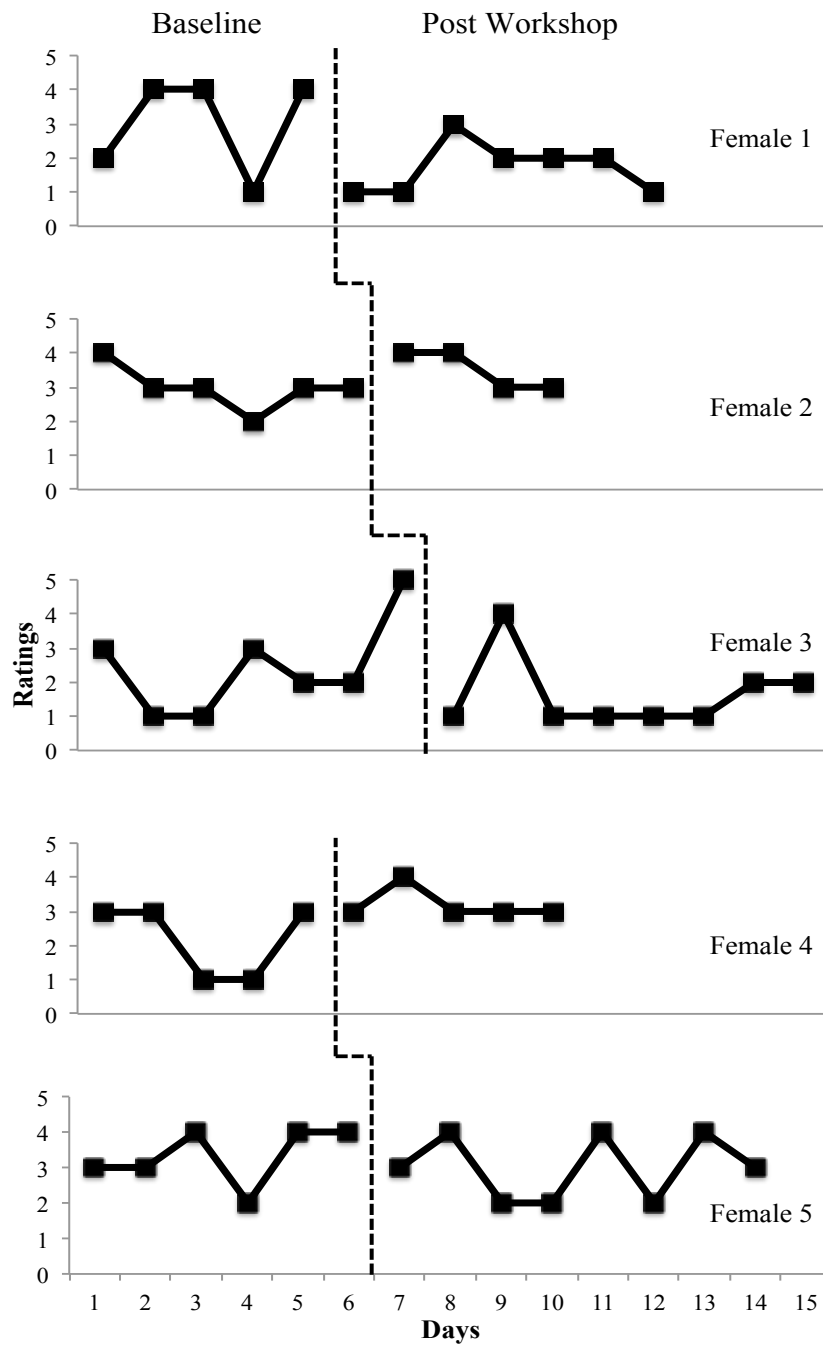


Figure 6. Combined Group 1 and Group 2 Female Single Item Craving Dimension Temptation Ratings plotted against days

Craving temptation ratings for Males 1 and 4 were variable in baseline, post-workshop, temptation ratings initially overlapped with baseline levels then decreased. Males 3 and 5 experienced decreasing temptation through baseline;

post-workshop, temptation ratings were variable and overlapped with baseline levels. Male 2 experienced variable temptation ratings in baseline, temptation decreased post-workshop, to a stable level lower than baseline. Male 6 initially experienced increasing temptation, which then stabilized through baseline, post-workshop, temptation increased above baseline levels then decreased. The craving temptation ratings for Females 1, 4, and 5, were variable in baseline, post-workshop, variable temptation ratings overlapped with baseline levels. Female 3 experienced variable and increasing temptation through baseline, post-workshop, variable temptation ratings overlapped with baseline levels. Female 2 experienced decreasing temptation through baseline, post-workshop, temptation increased initially to baseline levels before decreasing. A repeated-measures *t* test showed that the mean single-item Craving Dimension Temptation ratings for men and women combined did not differ significantly after the workshop, although the mean rating decreased after the workshop ($M = 2.39, SD = .08$) compared to before the workshop ($M = 2.73, SD = .02; t(10) = 1.38, p = .2, d = 0.41$). A reasonably small effect size was obtained.

Figures 7 and 8 display individual data for the single-item Craving Dimension Rating Intensity. Craving intensity for Males 1 and 5, were variable in baseline, post-workshop, variability intensity ratings overlapped with baseline levels. Male 2 experienced variable craving intensity in baseline, which then decreased, post-workshop, to a stable level lower than baseline ratings. Craving intensity ratings for Males 3 and 4 were variable in baseline, post-workshop; intensity decreased, overlapping with baseline intensity ratings. Male 6

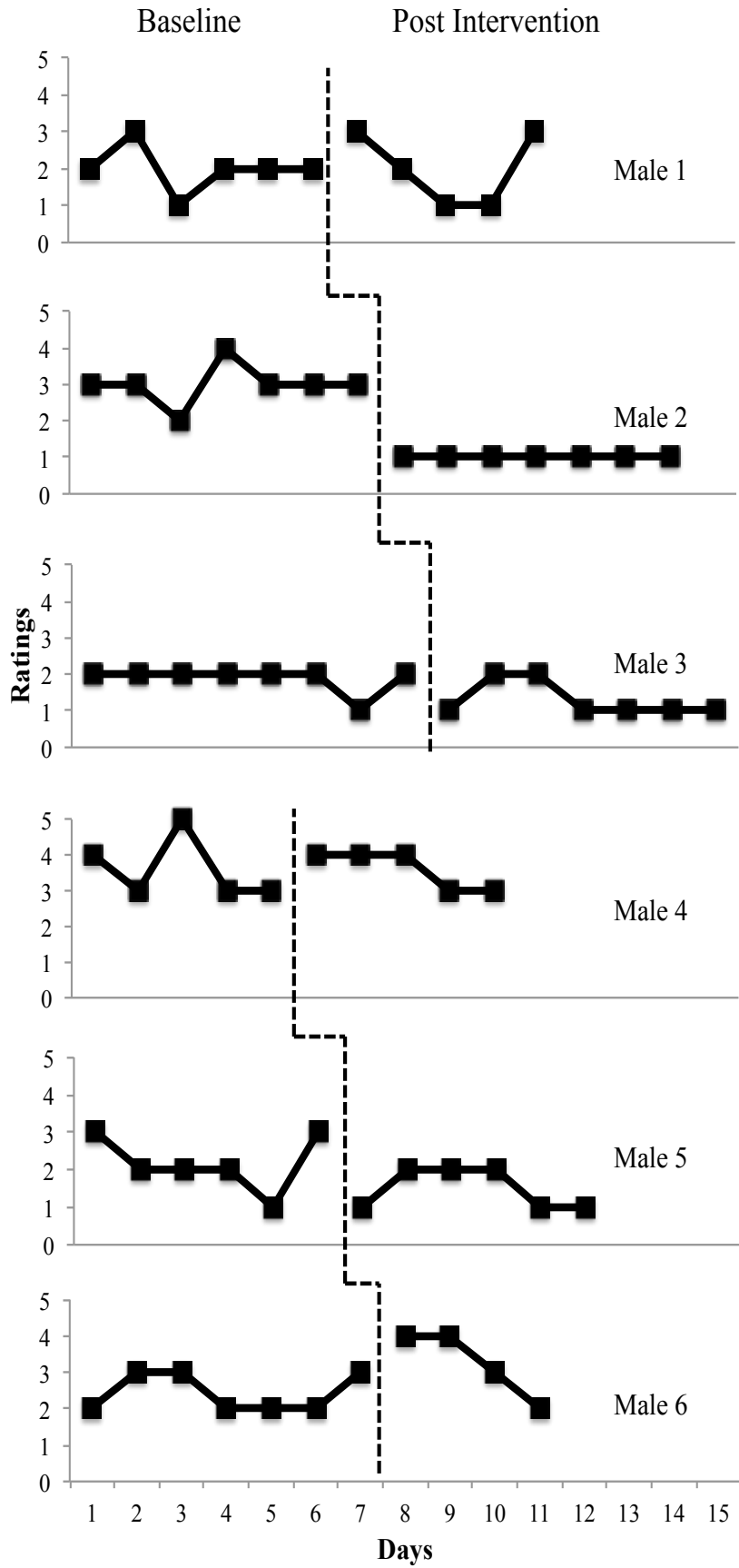


Figure 7. Combined Group 1 and Group 2 Male Single Item Craving Dimension Intensity Ratings plotted against days

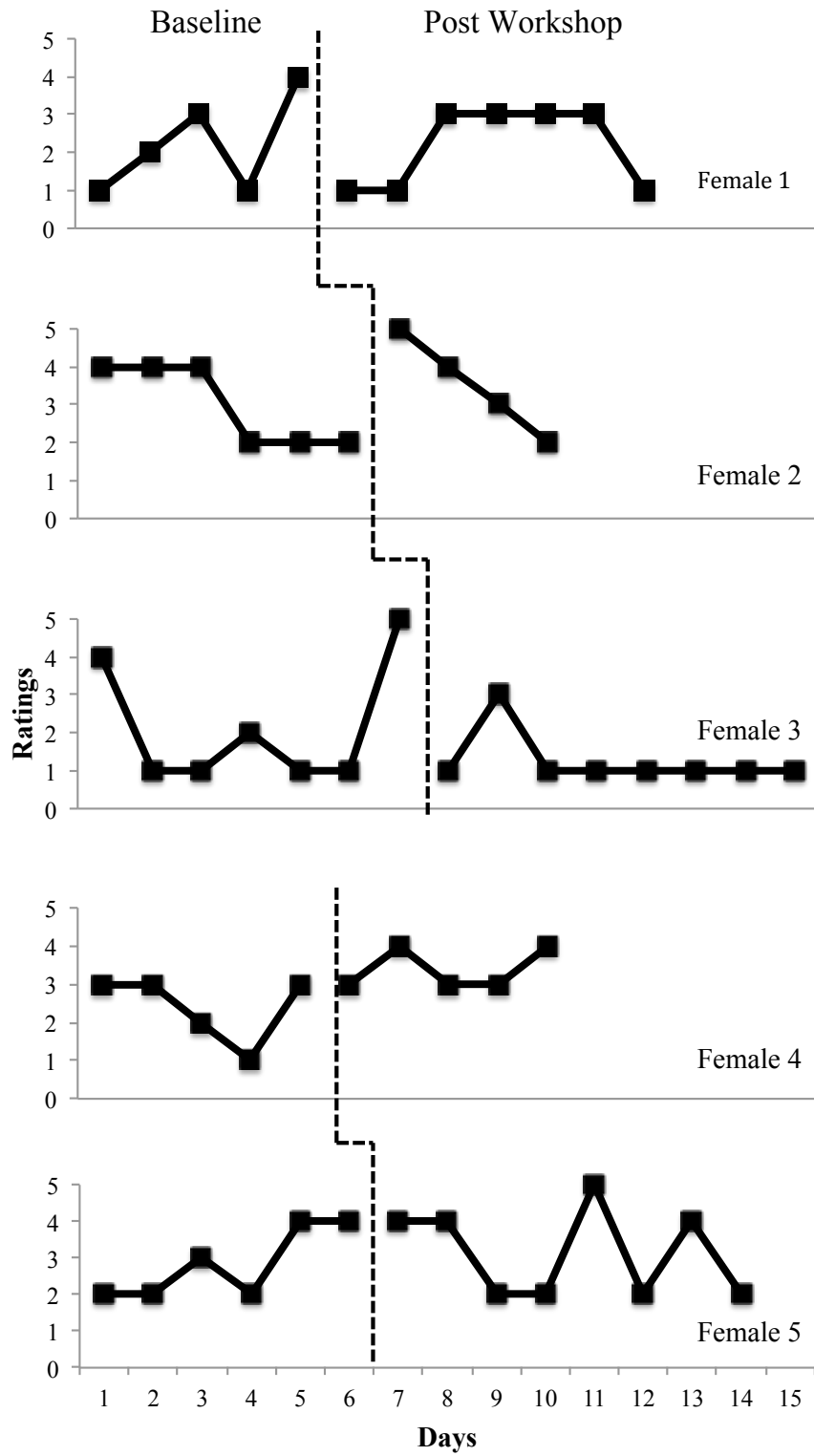


Figure 8. Combined Group 1 and Group 2 Female Single Item Craving Dimension Intensity Ratings plotted against days

experienced variable craving intensity in baseline, post-workshop; intensity increased initially higher than baseline levels before decreasing. Craving intensity ratings for Females 1, 3, and 5 were variable in baseline, post-workshop, craving intensity were variable and overlapped with baseline intensity ratings. Female 2 experienced decreasing intensity through baseline, post-workshop; intensity increased initially higher than baseline levels before decreasing. Female 4 experienced variable craving intensity in baseline, post-workshop; intensity increased higher than baseline levels. A repeated-measures t test showed that the mean single-item Craving Dimension Intensity ratings for men and women combined did not differ significantly after the workshop, although the mean rating decreased after the workshop ($M = 2.37$, $SD = .10$) compared to before the workshop ($M = 2.51$, $SD = .03$; $t(10) = .56$, $p = .59$, $d = 0.16$). A small effect size was obtained.

Figures 9 and 10 display individual data for the single-item Craving Dimension Rating Resistance. Craving resistance experienced for Male 1 was variable in baseline, post-workshop; resistance increased initially higher than baseline ratings before decreasing. Craving resistance for Males 2 and 5 were variable in baseline, resistance decreased post-workshop, to a stable level almost consistently lower than baseline resistance. Craving resistance for Males 3 and 4 were variable in baseline, post-workshop, variable resistance overlapped with baseline ratings. Male 6 experienced stable resistance in baseline, post-workshop; resistance increased initially higher than baseline, then decreased. Craving resistance for Females 1 and 5 were variable in baseline, post-workshop, variability resistance overlapped with baseline ratings. Female 2 experienced decreasing resistance through baseline, post-workshop; resistance increased to

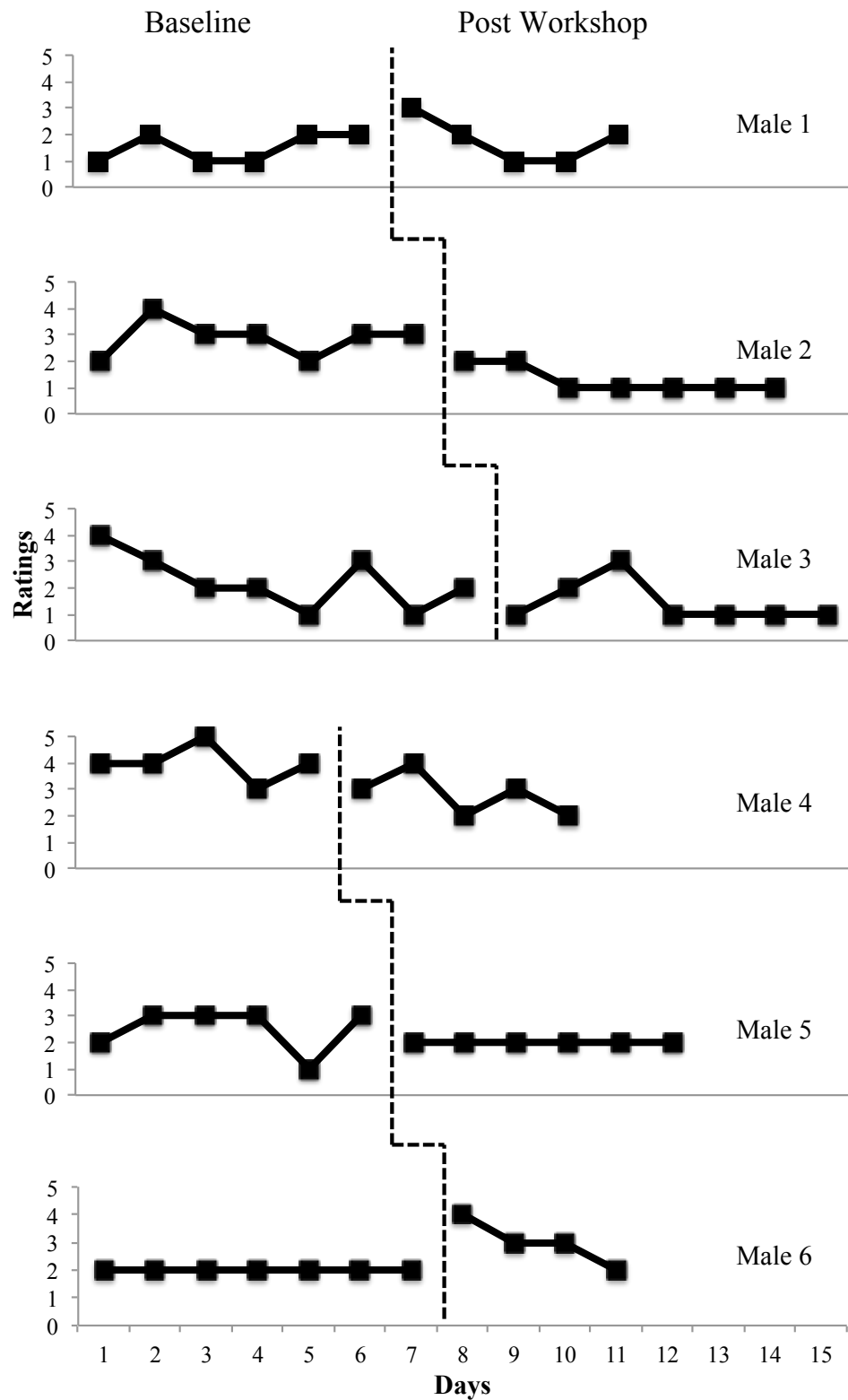


Figure 9. Combined Group 1 and Group 2 Male Single Item Craving Dimension Resistance Ratings plotted against days

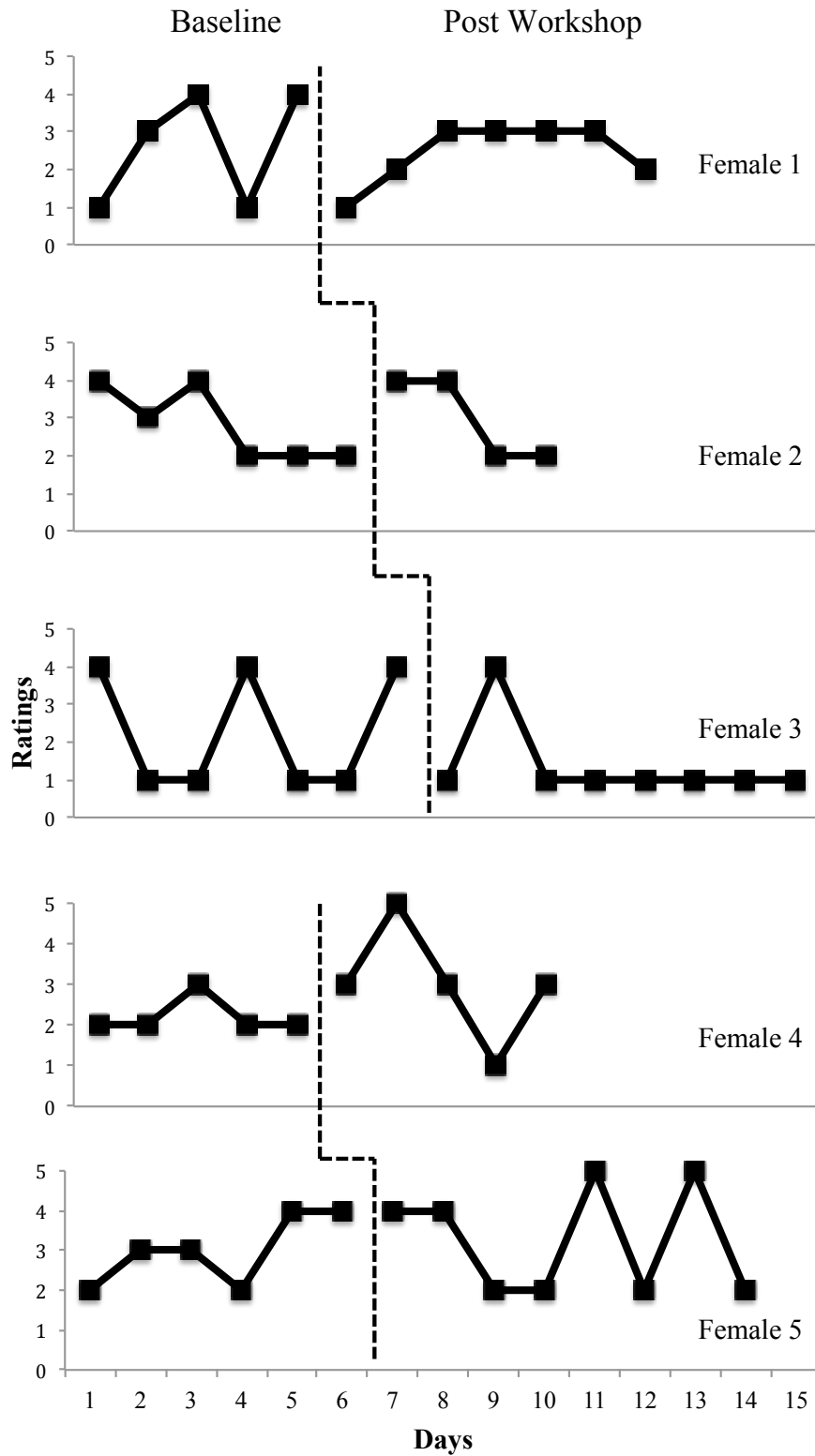


Figure 10. Combined Group 1 and Group 2 Female Single Item Craving Dimension Resistance Ratings plotted against days

the highest baseline level before decreasing to the lowest baseline level. Female 3 experienced variable resistance in baseline, post-workshop; variable resistance

decreased to a low stable level. Female 4 experienced variable resistance in baseline, post-workshop; variable resistance continued at a higher level than baseline resistance. A repeated-measures *t* test showed that the mean single-item Craving Dimension Resistance ratings for men and women combined did not differ significantly after the workshop, although the mean rating decreased after the workshop ($M = 2.31$, $SD = .06$) compared to before the workshop ($M = 2.55$, $SD = .04$; $t(10) = .96$, $p = .36$, $d = 0.29$). A reasonably small effect size was obtained.

Figures 11 and 12 display individual data for the male single-item Craving Dimension Rating Distress. Craving distress ratings for Males 1, 2, and 3, were stable and low in baseline, with no change post-workshop. Craving distress ratings for Males 4 and 5 were variable in baseline, post-workshop, resistance was initially stable, then increased overlapping with baseline ratings. Male 6 experienced stable and low distress in baseline, post-workshop; distress initially increased higher than baseline before decreasing back to baseline levels. Craving distress ratings for Females 1 and 5 were variable and distress increased through baseline, post-workshop, variability distress ratings overlapped with baseline levels. Female 2 experienced variable distress in baseline, post-workshop; distress initially increased higher than baseline before decreasing back to baseline ratings. Female 3 experienced variable distress in baseline, post-workshop; variable distress decreased to a stable and low level. Female 4 experienced variable distress in baseline, post-workshop; distress was stable and overlapped with baseline ratings. A repeated-measures *t* test showed that the mean single-item Craving Dimension Distress ratings for men and women

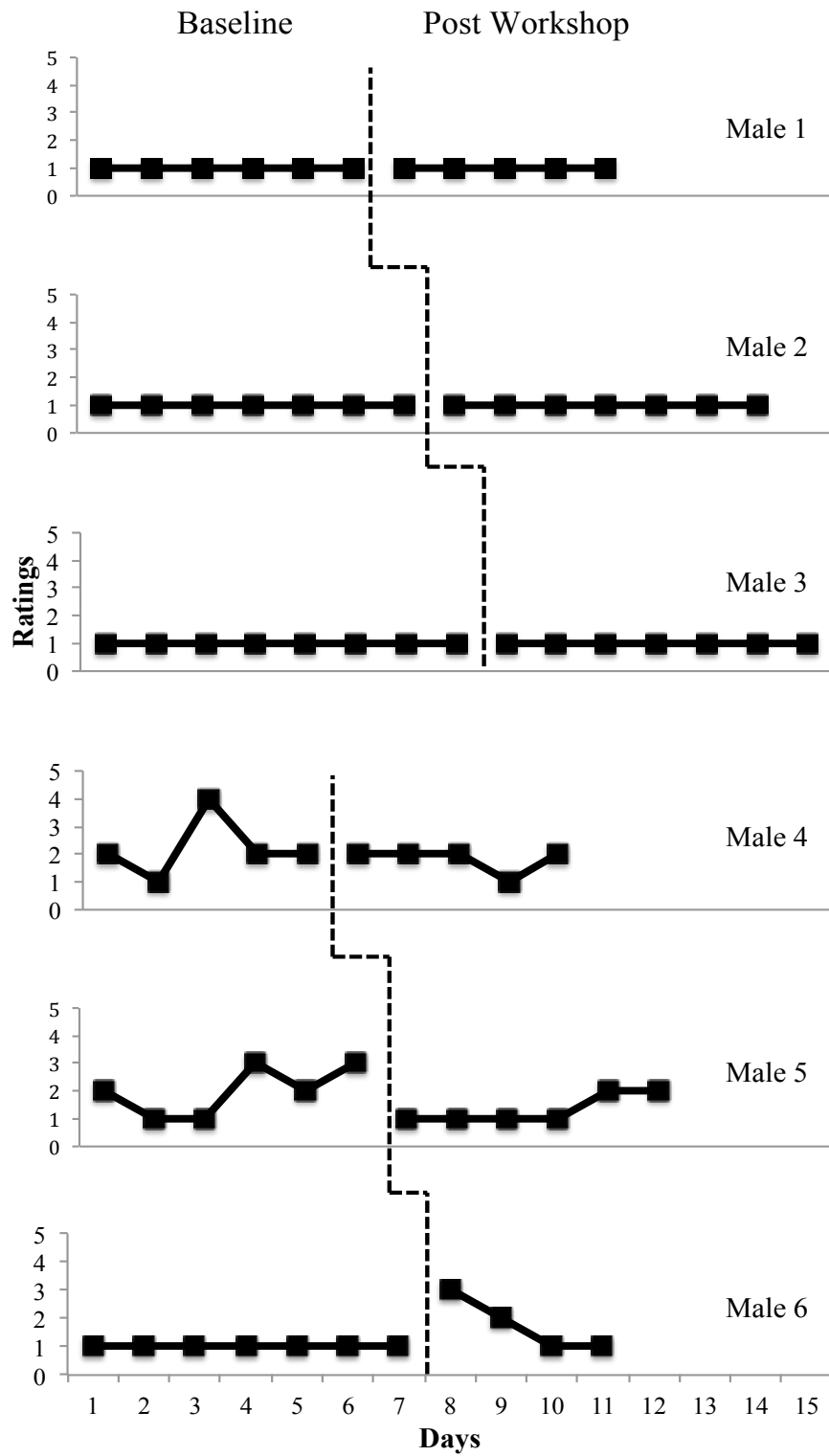


Figure 11. Combined Group 1 and Group 2 Male Single Item Craving Dimension Distress Ratings plotted against days

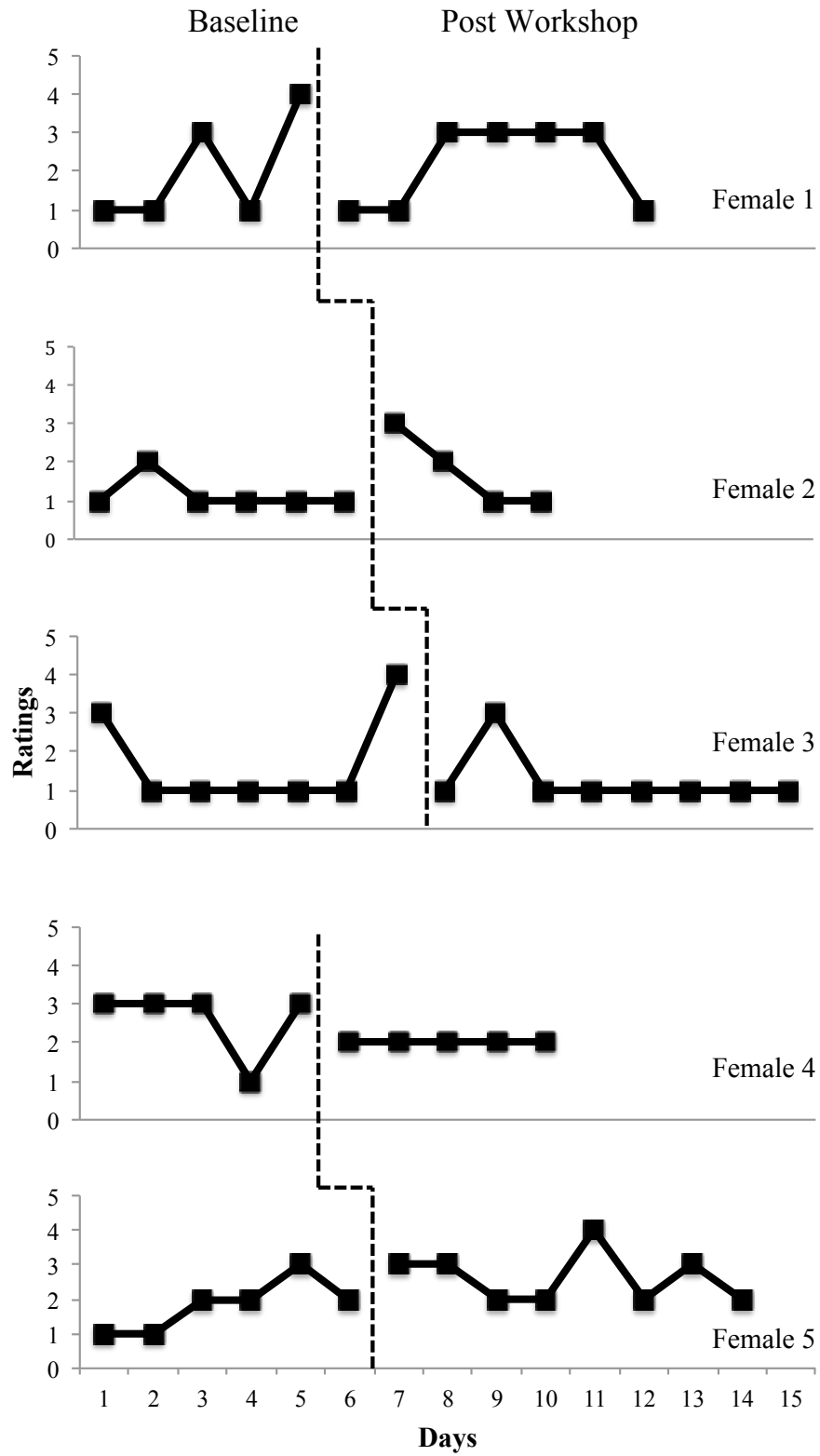


Figure 12. Combined Group 1 and Group 2 Female Single Item Craving Dimension Distress Ratings plotted against days

combined did not differ significantly after the workshop, ($M = 1.73$, $SD = .05$) compared to before the workshop ($M = 1.59$, $SD = .03$; $t(10) = -0.74$, $p = .48$, $d = -0.23$). An effect was obtained, however, the effect was an increase in distress rather than a decrease.

Questionnaires

Food Craving Questionnaire – State (FCQ-S).

Figures 13 and 14 display individual data for male and female FCQ-S scores.

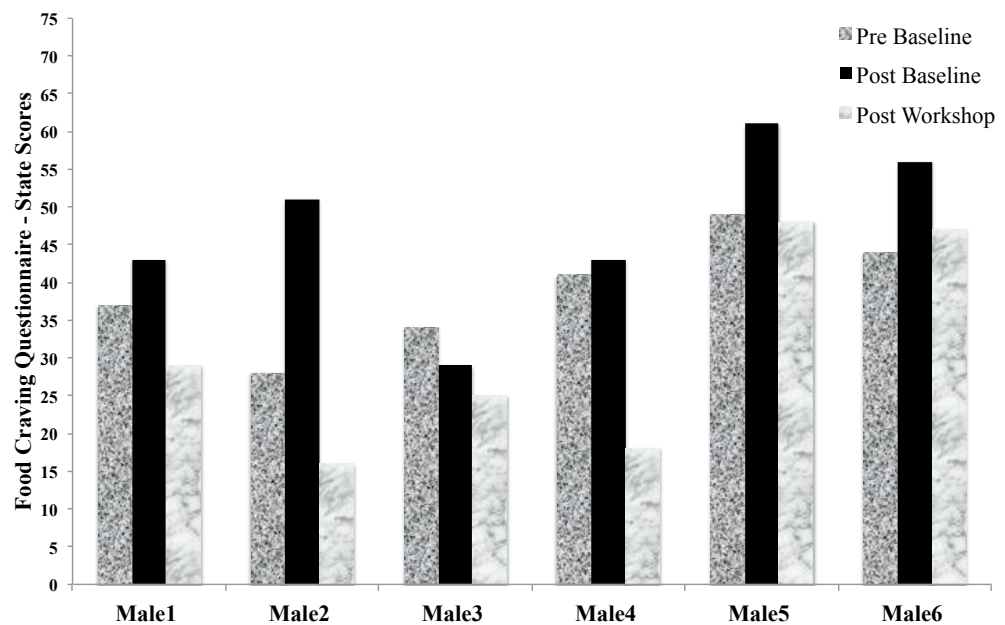


Figure 13. Male Participant Food Craving Questionnaire – State Scores.

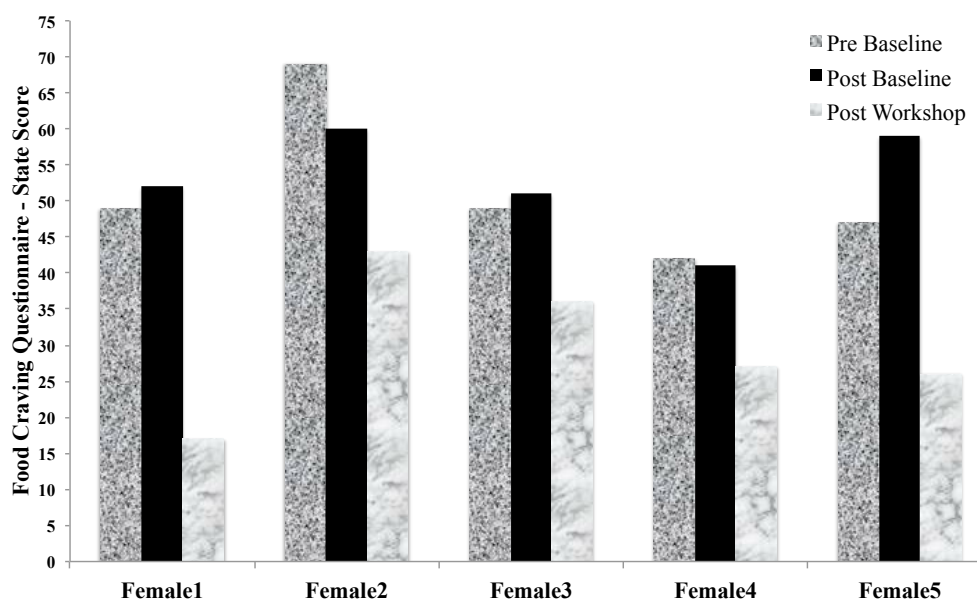


Figure 14. Female Participant Food Craving Questionnaire – State Scores.

The FCQ-S score indicates the emotional state-based reaction an individual experiences in relation to food craving. Post-workshop, each male participant's FCQ-S score had decreased from their post-baseline scores. Therefore, each male participant reported a decrease in state-based craving experience post-workshop. Males 1, 2, 4, and 5's FCQ-S scores increased from their pre-baseline score to their post-baseline score, post-workshop scores then decreased below both baseline scores. Male 6's FCQ-S score increased from pre-baseline to post-baseline; post-workshop, his score decreased below his post-baseline score but remained higher than his pre-baseline score. Male 3's FCQ-S score decreased from pre-baseline to post-baseline, post-workshop, his score decreased further, below both baseline scores.

Post-workshop, each female participant's FCQ-S score had decreased from their post-baseline scores. Therefore, each female participant reported a decrease in state-based craving experience post-workshop. Females 1, 3, and 5's

FCQ-S scores increased from their pre-baseline score to their post-baseline score, post-workshop, scores decreased below both baseline scores. Female 2 and 4's FCQ-S score decreased from pre-baseline to post-baseline, post-workshop, their scores decreased further, below both baseline scores. A repeated-measures *t* test showed that the mean FCQ-S score for men and women combined was significantly lower after the workshop ($M = 30.18, SD = 13.77$) compared to before the workshop ($M = 49.64, SD = 9.63; t(10) = 5.96, p < .001, d = 1.41$). The effect size was large with a small sample size.

Power of Food Scale (PFS).

Figures 15 and 16 display individual data for male and female PFS scores.

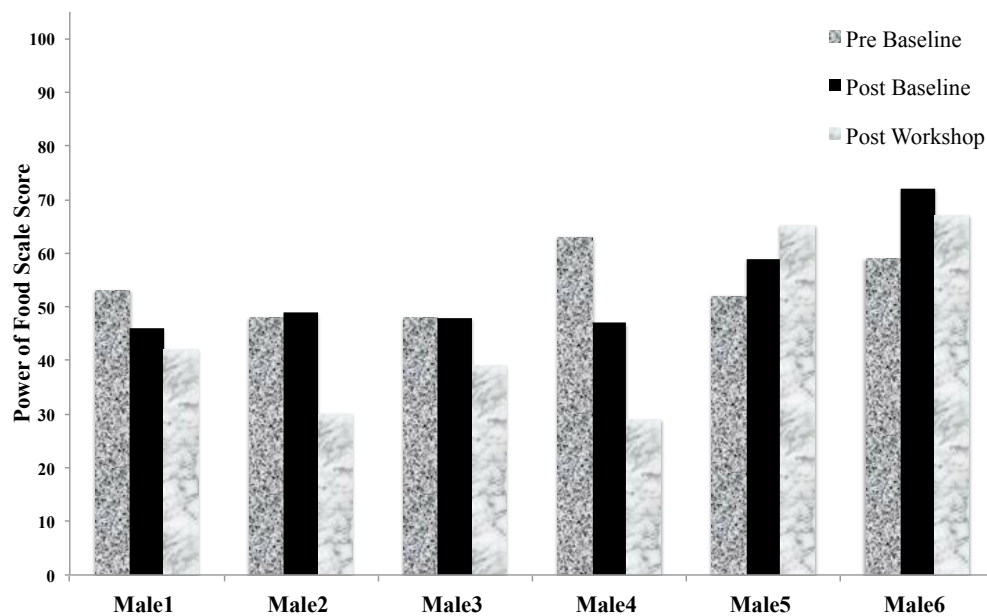


Figure 15. Male Participants Power of Food Scale Scores.

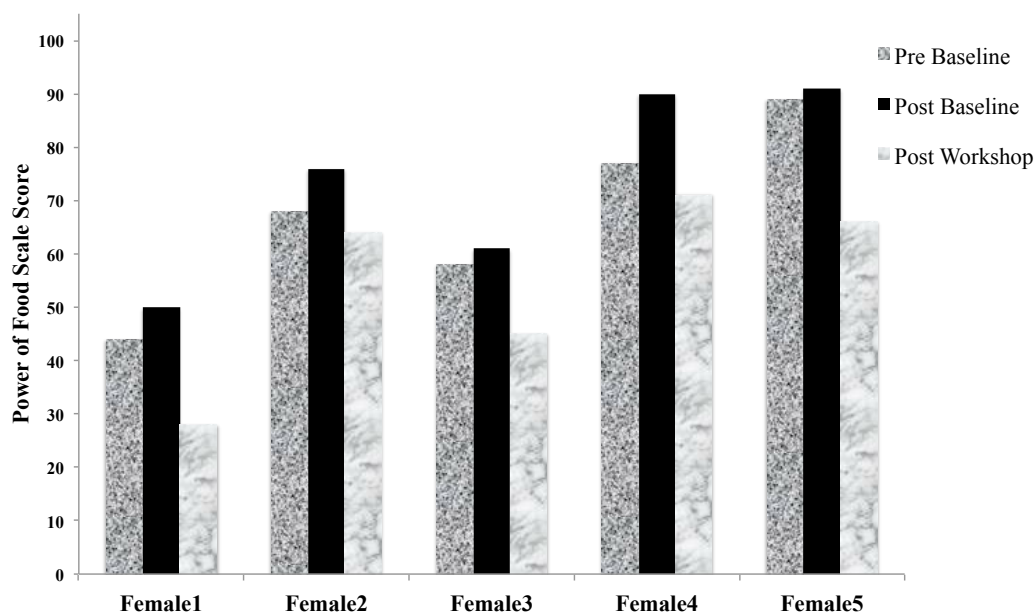


Figure 16. Female Participants Power of Food Scale Scores.

The PFS score reflects how susceptible an individual is to external food cues in their environment. Males 1 and 4 display decreasing scores between pre-baseline, post-baseline, and post-workshop. Males 2 and 6 display slightly increased scores between pre-baseline and post-baseline. Post-workshop, five out of six male participants decreased their PFS score lower than post-baseline, although, in the case of Male 6, post-workshop his PFS score decreased, it still remained higher than his pre-baseline score. Male 5 displayed increasing scores, pre-baseline, post-baseline, and post-workshop. All female participants displayed an increase in PFS scores between pre-baseline and post-baseline. Post-workshop, all female participants decreased their PFS score lower than post-baseline. A repeated-measures *t* test showed that the mean PFS score for men and women combined was significantly lower after the workshop ($M = 49.64$, $SD = 29.41$) compared to before the workshop ($M = 62.64$, $SD = 29.17$; $t(10) = 4.67$, $p < .001$, $d = 1.8$). A large effect size was obtained.

Discussion

The results show that following the acceptance-based workshop participants consumed less snack food than they had in baseline. The decrease in snack food consumption following the workshop suggested that the workshop influenced the change in consumption. Overall, findings for consumption in the current study replicated the consumption results of Forman et al. (2007), where, following the workshop, participant consumption decreased to almost zero. In the present study PFS scores decreased significantly from post-baseline to post-workshop for both male and female participants with a large effect size obtained, also replicating Forman et al.'s (2007) findings. Thus, the results support both hypotheses that following the acceptance-based workshop participants would report changes in snack food consumption and PFS scores.

Forman et al. (2007) demonstrated that following the acceptance-based intervention, participant consumption decreased to almost zero. It is not known if any gender differences were present in the Forman et al. (2007) data, as it was not analyzed by gender. The current study analyzed participant data individually and evaluated male and female consumption data for possible gender differences. Male participants decreased snack food consumption to near zero following the workshop. Female participants also decreased snack food consumption following the workshop, however only two female participants decreased consumption to near zero. The remaining three female participants decreased snack food consumption, but maintained variable consumption levels. Female 5's post-workshop consumption initially decreased less than baseline, then increased. It is possible that Female 5's consumption level post-workshop may have returned to

baseline level across a longer data collection period. The present data showed that there were gender differences in snack food consumption and craving. Male and female snack food consumption levels and single-item Craving Dimension ratings maintained similar levels and ratings during baseline. Following the workshop male participants decreased snack food consumption more than female participants, they displayed more stability in their consumption data than female participants and they decreased their single-item Craving Dimension ratings more than female participants. Overall, male participants consumed less snack food and experienced less Craving Dimension affect than female participants did following the workshop. Findings from the current study suggest that an acceptance-based workshop may be more effective decreasing food craving and consumption for a male participant than for a female participant. The current study is the first research to date that has evaluated gender differences in relation to snack food consumption and craving following an acceptance-based workshop. Previous research evaluating gender differences in food craving has found that men experience craving with less intensity and frequency than women (Hormes, Orloff, & Timko, 2014; Imperatori et al., 2013) The findings of the current study suggest that further investigation is warranted into whether or not an acceptance-based workshop is effective for both men and women in decreasing snack food consumption and craving and that future research needs to continue to explore gender differences in relation to the frequency and intensity of food craving. Future research findings evaluating gender differences with food consumption and craving may contribute to treatment applications that specifically target a male or a female craving experience.

Forman et al. (2007) found that participants with high PFS scores of 42 or higher experienced a high frequency of craving and high food consumption. Additionally, participants with high PFS scores and who therefore reported more susceptibility to external food cues in their environment found an acceptance-based workshop more effective than a control-based workshop in decreasing food consumption. In the current study all participants had a PFS score of 42 or higher and were therefore considered to be more susceptible to external food cues in their environment. The results of the current study replicated Forman et al.'s (2007) result in that participants decreased snack food consumption following an acceptance-based workshop. The current study evaluated behaviour change following an acceptance-based intervention only and did not include a control group. Using a single-subject multiple baseline experimental design the baseline phase acts as its own control comparison for each individual. Findings from the current study provide further support for the effectiveness of acceptance-based intervention to manage snack food consumption and craving for participants with a PFS score of 42 or higher. Findings from the current study provide support for the validity of the PFS questionnaire in identifying participants who are susceptible to external food cues in their environment (Forman et al., 2007; Stirling & Yeomans, 2004). Further research evaluating the effectiveness of acceptance-based intervention with participants who have a PFS score of 42 or higher is warranted, due to the fact that individuals who are susceptible to external food cues in their environment are more likely to struggle with food craving and consumption management (Forman et al., 2013).

Combined male and female results from the single-item Craving Dimension ratings show that across frequency, temptation, intensity, and

resistance ratings decreased from baseline to post-workshop. Distress craving ratings increased. Male craving ratings decreased across all five dimensions. Female craving ratings decreased for frequency, temptation, and resistance and for intensity and distress the craving ratings increased. Significant findings were not found for either male or female results across any craving dimension. Lack of significance may have occurred due to the validity of the single-item Craving Dimension ratings, or a participants lack of understanding of the single-item Craving Dimension ratings, or the small sample size. The small sample size of the current study meant that the statistical tests might have lacked the power to find any differences significant. Future research might consider replicating the current study with a larger sample size to evaluate if any single-item Craving Dimension rating changes are significant. If future research continued to find that single-item Craving Dimension rating results lack significance it is also possible that the ratings do not accurately measure an individuals' craving experience. To date, further craving research by Forman et al. (2013) has evaluated craving using the Food Craving Questionnaire–Trait version (FCQ-T) rather than single-item Craving Dimension ratings. Although not validated by research, the single-item Craving Dimension ratings do have the advantage of recording craving dimension ratings daily rather than at interval time points in the case of the FCQ-T or FCQ-S (Forman et al., 2007; Stirling & Yeomans, 2004). Future investigation is warranted into evaluating craving measures that can accurately report an individuals' craving experience.

It was expected that single-item Craving Dimension ratings would decrease from baseline to post-workshop for both male and female participants. This expectation was based on the results of Forman et al. (2007). At an

individual level the current results did not replicate Forman et al.'s (2007) findings. The increase in distress ratings for the male participants and increase in the intensity and distress ratings for the female participants were unexpected. One reason for an increase in Craving Dimension ratings post-workshop could be that the workshop taught acceptance and awareness of cravings. Following the workshop participants were asked to refrain from snack food consumption. Intensity and distress ratings may have increased following the workshop as participants implemented the strategies taught to them but were not yet completely proficient at applying the strategies. Acceptance-based intervention does not aim to reduce craving frequency directly; it supports an individual to manage the relationship with their internal state, to experience the craving with acceptance and awareness, and to make a decision to act or not act on the craving with mindfulness in line with individual values (Bailey et al., 2014). Considering the single-item Craving Dimension rating results from an acceptance-based perspective, the increase in Craving Dimension intensity and distress ratings might be expected with acceptance-based intervention. Previous research has cited that acceptance-based intervention is effective in supporting individuals to manage food craving. However, in the short-term craving may initially increase in frequency and intensity (Alberts et al., 2013) Future research should consider whether or not acceptance-based intervention has a short-term and long-term impact on an individuals food craving, particularly in relation to frequency, intensity, and distress. The current findings provide support for the effectiveness of a short-term acceptance-based intervention to support individuals with a PFS score of 42 or higher to manage snack food consumption and craving. However, future investigation evaluating both short-term and long-term effectiveness of an

acceptance-based intervention will enable a more successful treatment package for snack food consumption and craving management to be developed.

In contrast to the single-item Craving Dimension ratings, FCQ-S scores decreased significantly from post-baseline to post-workshop for both male and female participants. The effect size obtained was large. FCQ-S scores were taken at three time points across the study. Male and female results support the hypothesis that participant responses to the FCQ-S would change following the workshop. Both the FCQ-S and single-item Craving Dimension ratings measure an individual's emotional state-based food craving experience. For the purposes of the current study, the single-item Craving Dimension ratings considered the participants' daily experience of craving and the FCQ-S considered the participants' state-based craving experience pre-baseline, post-baseline and post-workshop. According to Cepeda-Benito et al. (2001) the FCQ-S has good construct validity and high internal consistency ($\alpha = .88-.94$). The single-item Craving Dimension ratings have been used in previous research by Forman et al. (2007) but have not been tested and validated as a reliable measurement tool. Given the significant results of the FCQ-S scores in the current study and the positive FCQ-T results in the Forman et al. (2013) study, future research might consider if the single-item Craving Dimension ratings accurately report the food craving experience for an individual or alternatively, continue to use the FCQ-S to measure state-based craving experience and the FCQ-T to measure trait-based craving experience in relation to food craving.

FCQ-S scores were not expected to have shown much variability between the first two time points, pre-baseline and post-baseline, as participants had not yet participated in the workshop. Although, if anything a slight increase in scores

was expected due to the fact they were exposed to snack foods and this may have evoked emotional responses. Male participants gave more variable FCQ-S scores over the first two time points pre-baseline and post-baseline than did female participants. This was an unexpected result due to the fact that the independent measure had not been introduced. One factor potentially influencing the variability of the first and second FCQ-S scores may be that the questionnaires were completed at different times of the day and the participants may have been in different states of hunger. Participants were not questioned on their hunger states at the time they completed the FCQ-S nor were the times of the day they completed the FCQ-S recorded. However, participants were asked to attend the workshop in a state of hunger and this is when they completed the second FCQ-S questionnaire post-baseline. The hunger state the participants were experiencing may have influenced their FCQ-S scores. Future research should consider this when using the FCQ-S by recording what time of day the participants completed the questionnaire at and in what hunger state the participants were in when they did so.

The present study has demonstrated that it is possible, using a single-subject multiple baseline experimental design, to replicate findings from a group design. An advantage of using a single-subject multiple baseline experimental design is the ability to visually explore data changes before and after the independent variable has been introduced (Moeyaert et al., 2014). Visual analysis of consumption data using trend-lines clearly shows the decrease in snack food consumption following the acceptance-based workshop. Using a group design, data would have reported a change in consumption for participants following the workshop; evaluation of the change in consumption levels between individuals

would not have been possible. By using a single-subject multiple baseline experimental design in the current study consumption levels and single-item Craving Dimension ratings are reported daily for each participant across the baseline and post-workshop phases of the study, evaluation of change for each individual and the differences between individuals has been evaluated. Future research should continue to explore food craving and consumption using a single-subject experimental design procedure due to the fact that food craving is a complex experience particular to an individual and differs from one individual to the next (Rogers & Smit, 2000).

Acceptance-based intervention is an effective treatment option for individuals struggling to manage food craving and consumption (Alberts et al., 2010; Forman et al., 2009). The current study provides further evidence of the effectiveness of an acceptance-based workshop to support individuals with a PFS score of 42 or higher to manage food craving and consumption. Each of the components of the workshop, such as cognitive defusion, acceptance, willingness, awareness and mindfulness originate from ACT principles and work together to allow the individual to experience a food craving but not necessarily to act on it (Hayes et al., 2006). Previous research has considered whether or not specific components of an acceptance-based intervention are more effective than other components in supporting an individual to manage food craving and consumption. Acceptance and cognitive defusion were cited as components that should be prioritized over other components during treatment (Lacaille et al., 2014). The current study did not evaluate if any of the components of the acceptance-based workshop were more effective than any another component in supporting the individual to manage snack food consumption and craving.

Further investigation is warranted to evaluate whether or not specific components of an acceptance-based intervention are more effective than other components in supporting an individual to manage snack food consumption and craving.

Participants in the current study did not record specific food cravings in relation to consumption; therefore a direct correlation between food craving and consumption was not possible from the data collected. Given the increasing research support for the effectiveness of an acceptance-based intervention to support an individual with a PFS score of 42 or higher to manage snack food consumption and craving, future research should evaluate a correlation between food craving and consumption. How would an acceptance-based intervention mediate a correlation between food craving and consumption and what implications would this mediation have on treatment development. One hypothesis may be that individual consumption will follow food craving on some occasions and not on other occasions (Hill, 2007; Weingarten & Elston, 1990). A further hypothesis may be that acceptance-based intervention may be more effective long-term than a control-based intervention to support individuals managing snack food consumption following food craving (Alberts et al., 2012; Forman et al., 2013). Findings from the current study provide some support for the hypothesis that acceptance-based intervention may be effective in supporting an individual managing snack food consumption following a food craving.

Limitations of the current study included use of participant self-report in the daily data collection. Self-report relies on a participant's honesty, integrity, and ability to follow the procedural instructions of the study. Self-report data collection in the current study relies on participants providing the exact weight in

grams of snack food consumed daily and the participants' daily experience of craving rating. Data integrity may be compromised if participants underestimated their daily weight of snack food consumption or there was a lack of understanding in relation to the single-item Craving Dimension rating questions. Previous research has cited that measures involving self-report provide data lacking in accuracy and validity and that self-reported behaviour differs in frequency and integrity to observed behaviour (Corral-Verdugo, 1997; Jenner et al., 2006) However, in relation to food craving research a more efficient method of data collection is not currently available. Preliminary research into a hand held device that participants can use to record real-time eating experiences has had limited success, although usage of the device is in its infancy (J. G. Thomas et al., 2011) Future research should continue to test and evaluate data collection methods that provide higher integrity levels in relation to food craving and consumption research. The ability to capture an individual's food craving experience in the moment with associated consumption or alternative behaviour would greatly enhance the research area of food craving and consumption and associated treatment options.

A further limitation in the current study is the possibility that the individual findings may have been influenced by rule-governed behaviour. For example, rule-governed behaviour exists when an individual behaves in a way that follows a rule; either they have experience with the consequences of that rule or the person who they learn the rule from has a manner of authority (Kudadjie-Gyamfi & Rachlin, 2002). In the current study participants were asked to resist their cravings following the acceptance-based workshop. Up until this point in the study participants had not been given this instruction. It is possible that

participants followed the instructions of the researcher using rule-governed behaviour rather than the strategies taught in the workshop. In Forman et al.'s (2007) study, rule-governed behaviour would have had less impact on the results given the large number of participants and the small amount of contact the individuals had directly with the researcher. In the current study, each participant met with the researcher individually. It is not clear if the behaviour change following the workshop was influenced by the independent variable, rule-governed behaviour, or something other than these two possibilities. Future research may consider a single-subject ABC multiple baseline design that takes data firstly on food craving and consumption behaviour with no instructions given to resist the snack food, followed by a second phase where the instruction is given to the participant to resist the snack food, enabling any change in behaviour elicited by rule-governed behaviour to become evident, followed by a third phase where the participants attended the acceptance-based workshop. Additionally, a larger sample size and a longer study time frame may be needed to counteract any possible interference from rule-governed behaviour.

A major advantage of a single-subject multiple baseline experimental design is to visually compare the introduction of the independent variable for one participant while the baseline condition continues for another participant. This enables the data to demonstrate if a change in behaviour following the introduction of the independent variable can be replicated across participants and the strength of the behaviour change following the introduction of the independent variable (Moeyaert et al., 2014). A limitation of the current study may be that the introduction of the independent variable was too fast between participants and this didn't allow a long enough data collection period to

demonstrate the strength of the behaviour change following the introduction of the independent variable. Replicating the current study with longer baseline data collection for participants following the introduction of the independent variable for the preceding participant will allow the findings to demonstrate stronger evidence of any behaviour change following the introduction of the independent variable.

Almost all of the participants in the current study fall within a healthy BMI weight range. Male 5 was the only participant whose BMI was in the overweight category. While using predominantly healthy weight participants is not a limitation of the study, it does however, limit the extent to which the results can be generalized. For the current study, findings are only applicable to a healthy weight population. Previous food craving and consumption research has replicated Forman et al.'s (2007) acceptance-based intervention results with an overweight and obese population (Forman et al., 2009; Forman et al., 2013). Future research should continue to consider healthy-weight, overweight and obese populations in relation to food craving and consumption behaviour and any possible differences in behaviour with an overweight and obese population compared to a healthy weight population. Food craving and consumption management is of strong social significance to healthy-weight, overweight and obese populations and it is possible that different treatment applications may apply to different population groups and or individuals.

The length and presentation of the acceptance-based workshop may have been a limitation of the study. The current study did not consider whether participants had any prior knowledge of acceptance-based intervention in relation to food craving or consumption, nor did the current study measure pre and post

understanding of the acceptance-based content taught in the workshop. The one-hour acceptance-based workshop may not have been long enough for participants to understand the content of the workshop, and to develop and practice the skills needed to be able to apply the strategies discussed. Previous research evaluating acceptance-based intervention has cited that individuals may differ in their ability to learn acceptance-based content and that some components may increase in understanding but not necessarily due to the intervention (Lacaille et al., 2014). Furthermore, acceptance-based intervention may be more effective for an individual across a weekly workshop format or alternatively, via a workbook that the individual can work through daily at their own pace (Alberts et al., 2013; Alberts et al., 2012). The current study was presented in an individual one-hour face-to-face workshop format. Future research evaluating intervention presentations is warranted to develop an intervention format that supports the individual to learn and effectively apply acceptance-based strategies in relation food craving and consumption.

Lastly, the length of data collection phases and the lack of follow-up data collection may have been limitations in the study. It is possible that if the post-workshop data had been continued for a longer time frame, snack food consumption may have returned to baseline levels. Additionally, follow up data was not collected in the current study. It is also possible that the decrease in snack food consumption demonstrated in the current study may not have maintained over a longer time frame. Future research may consider extending the post-workshop data collection duration to evaluate if given a longer time, snack food consumption levels may have increased to baseline levels or decreased to zero. Additionally, follow up data collection should be included in future

research to evaluate if the strategies taught in an acceptance-based workshop can be maintained across a longer time period. Research with acceptance-based intervention that included follow-up data across an eight-week period has shown promising results in a participant's ability to learn and maintain acceptance-based strategies in relation to food craving management (Alberts et al., 2012). Outside of food craving and consumption studies, management of food craving and snack food consumption requires long-term behaviour change in an environment that constantly exposes the individual to external food cues and temptation.

Conclusion

On-going research into strategies to cope with food craving and effective management of snack food consumption is of urgent social significance. Food craving is a common occurrence in both healthy and overweight individuals. Food craving and snack food consumption can lead to obesity. Participant self-report currently evaluates an individual's food craving experience. Food craving involves complex interactions that differ between individuals. In the current study, I demonstrated that a single-subject multiple baseline experimental design could be used to evaluate an individual's experience with food craving and snack food consumption. Following an acceptance-based workshop participants consumed less snack food, reported less frequency of craving, less temptation to consume snack food, less intensity of desire for snack food, and less resistance required to resist the snack food. The current study replicated the consumption results of Forman et al. (2007), where, post-workshop, participants decreased

snack food consumption. Future research might consider a single-subject multiple baseline design study with a larger sample size, an overweight and or obese population, a longer study time frame, and a more intensive workshop or series of workshops. Future research could continue to evaluate data collection methods that provide higher integrity levels with a longer time frame to counteract possible interference from rule-governed behaviour. Management of food craving and snack food consumption, requires long-term behaviour change, further research is warranted in the treatment application of acceptance-based intervention with food craving coping strategies, snack food consumption management and evaluation of the impact a palatable food environment has on an individual.

References

- Alberts, Mulkens, S., Smeets, M., & Thewissen, R. (2010). Coping with food cravings. Investigating the potential of a mindfulness-based intervention. *Appetite, 55*, 160-163. doi: 10.1016/j.appet.2010.05.044
- Alberts, Thewissen, R., & Middelweerd, M. (2013). Accepting or suppressing the desire to eat: Investigating the short-term effects of acceptance-based craving regulation. *Eating behaviors, 14*, 405-409. doi: 10.1016/j.eatbeh.2013.06.008
- Alberts, Thewissen, R., & Raes, L. (2012). Dealing with problematic eating behaviour. The effects of a mindfulness-based intervention on eating behaviour, food cravings, dichotomous thinking and body image concern. *Appetite, 58*, 847-851. doi: 10.1016/j.appet.2012.01.009
- Altman, J., Everitt, B. J., Robbins, T., Glautier, S., Markou, A., Nutt, D., . . . Phillips, G. (1996). The biological, social and clinical bases of drug addiction: commentary and debate. *Psychopharmacology, 125*, 285-345.

- Bailey, A., Ciarrochi, J., & Harris, R. (2014). *The Weight Escape* (1st Edition ed.). Melbourne, Vic: Australia: Penguin
- Batten, S. V., & Hayes, S. C. (2005). Acceptance and Commitment Therapy in the Treatment of Comorbid Substance Abuse and Post-Traumatic Stress Disorder A Case Study. *Clinical Case Studies, 4*, 246-262.
- Benton, D., Greenfield, K., & Morgan, M. (1998). The development of the attitudes to chocolate questionnaire. *Personality and Individual Differences, 24*, 513-520.
- Blackledge, J. T. (2003). An introduction to relational frame theory: Basics and applications. *The Behavior Analyst Today, 3*, 421-433.
- Blackledge, J. T., & Hayes, S. C. (2006). Using acceptance and commitment training in the support of parents of children diagnosed with autism. *Child & Family Behavior Therapy, 28*, 1-18.
- Cepeda-Benito, A., Gleaves, D. H., Williams, T. L., & Erath, S. A. (2001). The development and validation of the state and trait food-cravings questionnaires. *Behavior Therapy, 31*, 151-173.
- Christensen, L., & Pettijohn, L. (2001). Mood and carbohydrate cravings. *Appetite, 36*, 137-145. doi: 10.1006/appe.2001.0390
- Corral-Verdugo, V. c. (1997). DUAL 'REALITIES' OF CONSERVATION BEHAVIOR: SELF-REPORTS VS OBSERVATIONS OF RE-USE AND RECYCLING BEHAVIOR. *Journal of environmental psychology, 17*, 135-145.
- Eifert, G. H., Forsyth, J. P., Arch, J., Espejo, E., Keller, M., & Langer, D. (2009). Acceptance and commitment therapy for anxiety disorders: Three case studies exemplifying a unified treatment protocol. *Cognitive and Behavioral Practice, 16*, 368-385.
- Fedoroff, I., Polivy, J., & Peter Herman, C. (2003). The specificity of restrained versus unrestrained eaters' responses to food cues: general desire to eat, or craving for the cued food? *Appetite, 41*, 7-13.
- Fedoroff, I. D., Polivy, J., & Herman, C. P. (1997). The effect of pre-exposure to food cues on the eating behavior of restrained and unrestrained eaters. *Appetite, 28*, 33-47.

- Forman, E. M., Butryn, M. L., Hoffman, K. L., & Herbert, J. D. (2009). An open trial of an acceptance-based behavioral intervention for weight loss. *Cognitive and Behavioral Practice, 16*, 223-235.
- Forman, E. M., Hoffman, K. L., Juarascio, A. S., Butryn, M. L., & Herbert, J. D. (2013). Comparison of acceptance-based and standard cognitive-based coping strategies for craving sweets in overweight and obese women. *Eating behaviors, 14*, 64-68. doi: 10.1016/j.eatbeh.2012.10.016
- Forman, E. M., Hoffman, K. L., McGrath, K. B., Herbert, J. D., Brandsma, L. L., & Lowe, M. R. (2007). A comparison of acceptance-and control-based strategies for coping with food cravings: An analog study. *Behaviour research and therapy, 45*, 2372-2386.
- Gaudiano, B. A., & Herbert, J. D. (2006). Acute treatment of inpatients with psychotic symptoms using Acceptance and Commitment Therapy: Pilot results. *Behaviour research and therapy, 44*, 415-437.
- Gendall, K. A., Joyce, P. R., & Sullivan, P. F. (1997). Impact of definition on prevalence of food cravings in a random sample of young women. *Appetite, 28*, 63-72. doi: 10.1006/appe.1996.0060
- Gifford, E. V., Kohlenberg, B. S., Hayes, S. C., Antonuccio, D. O., Piasecki, M. M., Rasmussen-Hall, M. L., & Palm, K. M. (2004). Acceptance-based treatment for smoking cessation. *Behavior Therapy, 35*, 689-705.
- Harris, R. (2008). *The Happiness Trap: How to Stop Struggling and Start Living* (1st Edition ed.). Boston, MA United States of America: Trumpeter Books.
- Harris, R. (2009). *ACT with Love* (1st Edition ed.). Oakland, CA United States of America: New Harbinger Publications, Inc.
- Hayes, S. C. (2004). Acceptance and commitment therapy, relational frame theory, and the third wave of behavioral and cognitive therapies. *Behavior Therapy, 35*, 639-665.
- Hayes, S. C., Luoma, J. B., Bond, F. W., Masuda, A., & Lillis, J. (2006). Acceptance and commitment therapy: Model, processes and outcomes. *Behaviour research and therapy, 44*, 1-25. doi: 10.1016/j.brat.2005.06.006

- Hetherington, M. M., & MacDiarmid, J. I. (1993). Chocolate addiction: a preliminary study of its description and its relationship to problem eating. *Appetite, 21*, 233-246. doi: 10.1006/appe.1993.1042
- Hill, A. J. (2007). The psychology of food craving. *Proceedings of the Nutrition Society, 66*, 277-285. doi: 10.1017/S0029665107005502
- Hill, A. J., & Heaton-Brown, L. (1994). The experience of food craving: A prospective investigation in healthy women. *Journal of Psychosomatic Research, 38*, 801-814.
- Hill, A. J., Weaver, C. F., & Blundell, J. E. (1991). Food craving, dietary restraint and mood. *Appetite, 17*, 187-197.
- Hofmann, W., van Koningsbruggen, G. M., Stroebe, W., Ramanathan, S., & Aarts, H. (2010). As Pleasure Unfolds Hedonic Responses to Tempting Food. *Psychological Science, 21*, 1863-1870.
- Hooper, N., Sandoz, E. K., Ashton, J., Clarke, A., & McHugh, L. (2012). Comparing thought suppression and acceptance as coping techniques for food cravings. *Eating behaviors, 13*, 62-64.
- Hormes, J. M., Orloff, N. C., & Timko, C. A. (2014). Chocolate craving and disordered eating. Beyond the gender divide? *Appetite, 83*, 185-193. doi: 10.1016/j.appet.2014.08.018
- Imperatori, C., Innamorati, M., Tamburello, S., Continisio, M., Contardi, A., Tamburello, A., & Fabbriatore, M. (2013). Gender differences in food craving among overweight and obese patients attending low energy diet therapy: a matched case-control study. *Eating and Weight Disorders-Studies on Anorexia, Bulimia and Obesity, 297-303*.
- Jenner, E., Fletcher, B. C., Watson, P., Jones, F., Miller, L., & Scott, G. (2006). Discrepancy between self-reported and observed hand hygiene behaviour in healthcare professionals. *Journal of hospital infection, 63*, 418-422.
- Juarascio, A. S., Forman, E. M., & Herbert, J. D. (2010). Acceptance and commitment therapy versus cognitive therapy for the treatment of comorbid eating pathology. *Behavior Modification, 34*, 175-190. doi: 10.1177/0145445510363472
- Kudadjie-Gyamfi, E., & Rachlin, H. (2002). Rule-governed versus contingency-governed behavior in a self-control task: Effects of changes in contingencies. *Behavioural Processes, 57*, 29-35.

- Lacaille, J., Ly, J., Zacchia, N., Bourkas, S., Glaser, E., & Knäuper, B. (2014). The effects of three mindfulness skills on chocolate cravings. *Appetite*, *76*, 101-112. doi: 10.1016/j.appet.2014.01.072
- Lillis, J., Hayes, S. C., Bunting, K., & Masuda, A. (2009). Teaching acceptance and mindfulness to improve the lives of the obese: A preliminary test of a theoretical model. *Annals of Behavioral Medicine*, *37*, 58-69. doi: 10.1007/s12160-009-9083-x
- Lillis, J., Hayes, S. C., & Levin, M. E. (2011). Binge eating and weight control: The role of experiential avoidance. *Behavior Modification*, *35*, 252-264. doi: 10.1177/0145445510397178
- Lowe, M. R., & Butryn, M. L. (2007). Hedonic hunger: a new dimension of appetite? *Physiology & behavior*, *91*, 432-439. doi: 10.1016/j.physbeh.2007.04.006
- Lowe, M. R., Butryn, M. L., Didie, E. R., Annunziato, R. A., Thomas, J. G., Crerand, C. E., . . . Wallaert, M. (2009). The Power of Food Scale. A new measure of the psychological influence of the food environment. *Appetite*, *53*, 114-118. doi: 10.1016/j.appet.2009.05.016
- Michener, W., & Rozin, P. (1994). Pharmacological versus sensory factors in the satiation of chocolate craving. *Physiology & behavior*, *56*, 419-422.
- Moeyaert, M., Ugille, M., Ferron, J. M., Beretvas, S. N., & Van den Noortgate, W. (2014). The influence of the design matrix on treatment effect estimates in the quantitative analyses of single-subject experimental design research. *Behavior Modification*, *38*, 665-704. doi: 10.1177/0145445514535243
- Mumford, G. K., Evans, S. M., Kaminski, B. J., Preston, K. L., Sannerud, C. A., Silverman, K., & Griffiths, R. R. (1994). Discriminative stimulus and subjective effects of theobromine and caffeine in humans. *Psychopharmacology*, *115*, 1-8.
- Niemeier, H. M., Leahey, T., Palm Reed, K., Brown, R. A., & Wing, R. R. (2012). An acceptance-based behavioral intervention for weight loss: a pilot study. *Behavior Therapy*, *43*, 427-435. doi: 10.1016/j.beth.2011.10.005

- Parker, G., Parker, I., & Brotchie, H. (2006). Mood state effects of chocolate. *Journal of Affective Disorders, 92*, 149-159. doi: 10.1016/j.jad.2006.02.007
- Rodin, J., Mancuso, J., Granger, J., & Nelbach, E. (1991). Food cravings in relation to body mass index, restraint and estradiol levels: a repeated measures study in healthy women. *Appetite, 17*, 177-185.
- Rogers, P. J., & Smit, H. J. (2000). Food craving and food “addiction”: a critical review of the evidence from a biopsychosocial perspective. *Pharmacology Biochemistry and Behavior, 66*, 3-14.
- Rozin, P., Levine, E., & Stoess, C. (1991). Chocolate craving and liking. *Appetite, 17*, 199-212.
- Stirling, L. J., & Yeomans, M. R. (2004). Effect of exposure to a forbidden food on eating in restrained and unrestrained women. *International Journal of Eating Disorders, 35*, 59-68. doi: 10.1002/eat.10232
- Styn, M. A., Bovbjerg, D. H., Lipsky, S., & Erblich, J. (2013). Cue-induced cigarette and food craving: A common effect? *Addictive behaviors, 38*, 1840-1843. doi: 10.1016/j.addbeh.2012.09.010
- Thomas, E. A., Bechtell, J. L., Vestal, B. E., Johnson, S. L., Bessesen, D. H., Tregellas, J. R., & Cornier, M.-A. (2013). Eating-related behaviors and appetite during energy imbalance in obese-prone and obese-resistant individuals. *Appetite, 65*, 96-102. doi: 10.1016/j.appet.2013.01.015
- Thomas, J. G., Doshi, S., Crosby, R. D., & Lowe, M. R. (2011). Ecological Momentary Assessment of Obesogenic Eating Behavior: Combining Person-Specific and Environmental Predictors. *Obesity, 19*, 1574-1579. doi: 10.1038/oby.2010.335
- Tiggemann, M., & Kemps, E. (2005). The phenomenology of food cravings: the role of mental imagery. *Appetite, 45*, 305-313. doi: 10.1016/j.appet.2005.06.004
- VanBuskirk, K. A., & Potenza, M. N. (2010). The treatment of obesity and its co-occurrence with substance use disorders. *Journal of addiction medicine, 4*, 1.
- von Deneen, K. M., & Liu, Y. (2011). Obesity as an addiction: Why do the obese eat more? *Maturitas, 68*, 342-345. doi: 10.1016/j.maturitas.2011.01.018

- Wadden, T. A., & Foster, G. D. (2000). Behavioral treatment of obesity. *Medical Clinics of North America*, *84*, 441-461.
- Wansink, B., Painter, J. E., & Lee, Y.-K. (2006). The office candy dish: proximity's influence on estimated and actual consumption. *International journal of obesity*, *30*, 871-875. doi: 10.1038/sj.ijo.0803217
- Weingarten, H. P., & Elston, D. (1990). The phenomenology of food cravings. *Appetite*, *15*, 231-246.
- Weingarten, H. P., & Elston, D. (1991). Food cravings in a college population. *Appetite*, *17*, 167-175.
- Woidneck, M. R., Morrison, K. L., & Twohig, M. P. (2014). Acceptance and commitment therapy for the treatment of posttraumatic stress among adolescents. *Behavior Modification*, *38*, 451-476.
- Womble, L. G., Wadden, T. A., McGuckin, B. G., Sargent, S. L., Rothman, R. A., & Krauthamer-Ewing, E. S. (2004). A randomized controlled trial of a commercial internet weight loss program. *Obesity Research*, *12*, 1011-1018. doi: 10.1038/oby.2004.124
- Wurtman, R. J., & Wurtman, J. J. (1994). Carbohydrates and depression. *The Neurotransmitter Revolution: Serotonin, Social Behavior, and the Law*, 96.

Appendix 1

University Advertisement

ACT and Food Craving

- Do you experience food cravings?
- Do you spend time thinking about your food craving?
- Is it hard to walk past your favourite foods?
- Do you start salivating at the sight or smell of chocolate, chips, lollies....?

If you answered **YES** to any of the questions above please consider being part of an exciting Thesis on ACT and food craving.

Commitment will involve questionnaires, daily data points regarding snack food consumption, attending a 1-2 hour ACT workshop at your convenience and providing follow up questionnaire responses. The study will involve your participation for up to one month but no more than 5 minutes a day of your time.



What you will gain from the experience:

- You will access information about ACT (Acceptance and Commitment Therapy) that may help you personally in managing your food craving and or inspiring you in a step toward a healthier lifestyle.
- A positive feeling of helping out a fellow student!!
- Free snack foods!!

If you would like more information about joining this fantastic and fun study please contact:

Jackie Tritt:
jst18@students.waikato.ac.nz

Note: this study is being supervised by Professor Mary Foster
psyc0182@waikato.ac.nz

Appendix 2

Power of Food Scale Questionnaire

Power of Food Scale Participant number _____ Session _____

Please indicate the extent to which you agree that the following items describe you. Use the following 1-5 scale for your responses.

. 1 don't agree at all . 2 agree a little . 3 agree somewhat . 4 agree . 5 strongly agree

1. I find myself thinking about food even when I'm not physically hungry. ____
2. When I'm in a situation where delicious foods are present but I have to wait to eat them, it is very difficult for me to wait. ____
3. I get more pleasure from eating than I do from almost anything else. ____
4. I feel that food is to me like liquor is to an alcoholic. ____
5. If I see or smell a food I like, I get a powerful urge to have some. ____
6. When I'm around a fattening food I love, it's hard to stop myself from at least tasting it. ____
7. I often think about what foods I might eat later in the day. ____
8. It's scary to think of the power that food has over me. ____
9. When I taste a favorite food, I feel intense pleasure. ____
10. When I know a delicious food is available, I can't help myself from thinking about having some. ____
11. I love the taste of certain foods so much that I can't avoid eating them even if they're bad for me. ____
12. When I see delicious foods in advertisements or commercials, it makes me want to eat. ____
13. I feel like food controls me rather than the other way around. ____
14. Just before I taste a favorite food, I feel intense anticipation. ____
15. When I eat delicious food I focus a lot on how good it tastes. ____
16. Sometimes, when I'm doing everyday activities, I get an urge to eat "out of the blue" (for no apparent reason). ____
17. I think I enjoy eating a lot more than most other people. ____
18. Hearing someone describe a great meal makes me really want to have something to eat. ____
19. It seems like I have food on my mind a lot. ____
20. It's very important to me that the foods I eat are as delicious as possible. ____
21. Before I eat a favorite food my mouth tends to flood with saliva. ____

Total score:

Appendix 3
Food Craving Questionnaire-State Version

Food Cravings Questionnaire – State

Participant _____ Session _____

**Likert Scale – 1. Strongly disagree 2. Disagree 3. Somewhat agree 4. Agree
5. Strongly agree**

1. I have an intense desire to eat [my specified snack foods].
2. I'm craving [my specified snack foods].
3. I have an urge for [my specified snack foods].
4. Eating [my specified snack foods] would make things seem just perfect.
5. If I were to eat what I am craving, I am sure my mood would improve.
6. Eating [my specified snack foods] would feel wonderful.
7. If I ate something, I wouldn't feel so sluggish and lethargic.
8. Satisfying my craving would make me feel less grouchy and irritable.
9. I would feel more alert if I could satisfy my craving.
10. If I had [my specified snack foods], I could not stop eating it.
11. My desire to eat [my specified snack foods] seems overpowering.
12. I know I'm going to keep on thinking about [my specified snack foods] until I actually have it.
13. I am hungry.
14. If I ate right now, my stomach wouldn't feel as empty.
15. I feel weak because of not eating.

Total score:

Appendix 4
Participant Daily Data Sheet

Daily Questions: Please indicate the extent to which you agree that the following items describe your day. Use the following 1-5 scale for your responses.

- 1. Not at all**
- 2. Somewhat**
- 3. Moderately**
- 4. Strongly**
- 5. Extremely**

Date:		
Frequency	“How much did you think about your specified snack food?”	
Temptation	“How tempted were you to eat your specified snack food?”	
Intensity	“How much did you want the specified snack food?”	
Resistance	“How difficult did you find resisting the specified snack food?”	
Distress	“If you had cravings for your specified snack food, how distressing did you find them?”	

Daily weight (grams) of food consumed from snack food box

Daily consumption (grams)	
---------------------------	--

Have you on this day consumed any nominated snack foods from any source other than your snack foods provided by the research study?

Yes/ No: _____

If so: what was it? _____

How much (in grams) did you consume? _____

Appendix 5

Participant Information Sheet

Researcher: Jackie Tritt – jst18@students.waikato.ac.nz

Supervision provided by Professor Mary Foster: psyc0182@waikato.ac.nz

Thank you for your consideration in participating further in this research study. Details are provided below of what will be required from you throughout the study.

Your participation is voluntary. You may withdraw your participation from the study at any stage without question. The study will take up to two weeks to complete.

I will keep the data and information collected in this study confidential at all times and will use it only for the purposes of my current Thesis study.

In all aspects of the study you will meet and communicate individually with me.

Eligibility phase: (Via Email)

You will be excluded if you are currently pregnant or taking part in a restrictive diet that does not allow willing and voluntary access to your preferred snack foods. Please advise the researcher via email if either of these restrictions apply.

To determine your eligibility for the study, you are asked to complete the Power of Food Scale questionnaire, attached. Please complete and return, to me via email. It should take approximately 5 minutes to complete.

If you are eligible, you will be emailed to confirm if you would like to continue participating in the research study. You will be provided with a consent form to read before meeting with me.

Introduction phase: (In person, 15 minutes)

You will meet me at a mutually convenient time to discuss, confirm and sign the consent form, to complete the Snack Food preference assessment and to provide personal demographics information. I will answer any questions you may have and provide my contact details for further questions, the contact details of the Waikato University Ethics department will also be provided for any ethical concerns regarding the study.

Baseline phase: (In person 15 minutes, then via email/text 5 minutes daily)

You will meet with me at a mutually convenient time to complete the Food Craving Questionnaire – State Version.

You will be given a box filled with your preferred snack foods. You will be advised to eat the snack food specified on your preference questionnaire only from the snack food box provided and not to purchase it elsewhere.

You will be provided with a set of weigh scales. You will be asked to eat from the snack food box as you like and to respond to your food craving in the same way that you normally would to having food available in your environment. You will be asked to keep the snack food box with you at all times during the day and night.

You will be asked to complete the Single-Item Ratings of Craving Dimension questions, to weigh the snack food box at the same time every day, and to email or text this information to me daily.

Experimental phase: (In person 1 hour 30 minutes, then via email/text 5 minutes daily)

I will run a 1-hour Acceptance and Commitment Therapy Workshop at a time and location convenient to you. The Acceptance-based workshop content will include behaviour strategies to help you to deal with your food craving.

During the workshop you will complete the Power of Food Scale, and Food Craving Questionnaire – State version. You will have your snack food box filled up and weighed.

You will be advised to do your best to resist your food craving and to use the Acceptance-based strategies taught to you during the workshop to avoid eating any of the food from your transparent snack food box. You will be asked to keep the snack food box with you at all times during the day and night.

You will be asked to complete the Single-Item Ratings of Craving Dimension questions, to weigh the snack food box at the same time every day, and to email or text this information to me daily.

I will advise you when the study has been completed and on completion of the study you will be asked to complete the Power of Food Scale, and Food Craving Questionnaire – State version for the last time via email. You will be offered a voluntary debrief opportunity with me via phone, to answer any questions you have about the study, food craving or where you can find more information about Acceptance and Commitment Therapy (ACT).

When I have finalized the results of the study I will email you and offer you a summary of the findings. I will continue to answer any further questions about the study via email.

Appendix 6

CONSENT FORM

A completed copy of this form should be retained by both the researcher and the participant.

Research Project: The Impact of ACT in relation to Food Craving

Please complete the following checklist. Tick (✓) the appropriate box for each point.	YES	NO
1. I have read the Participant Information Sheet (or it has been read to me) and I understand it.		
2. I have been given sufficient time to consider whether or not to participate in this study		
3. I am satisfied with the answers I have been given regarding the study and I have a copy of this consent form and the participant information sheet		
4. I understand that taking part in this study is voluntary (my choice) and that I may withdraw from the study at any time without penalty		
5. I have the right to decline to participate in any part of the research activity		
6. I know who to contact if I have any questions about the study in general.		
7. I understand that my participation in this study is confidential and that no material, which could identify me personally, will be used in any reports on this study.		
8. I wish to receive a copy of the findings		

Declaration by participant:

I agree to participate in this research project and I understand that I may withdraw at any time. If I have any concerns about this project, I may contact the convenor of the Psychology Research and Ethics Committee (Associate Professor John Perrone, Tel: 07 838 4466 ext 8292, email: jpnz@waikato.ac.nz)

Participant's name (Please print): _____

Signature: _____ Date: _____

Declaration by member of research team:

I have given a verbal and written explanation of the research project to the participant, and have answered the participant's questions about it. I believe that the participant understands the study and has given informed consent to participate.

Researcher's name (Please print): _____

Signature: _____ Date: _____

Appendix 8
Participant Information

Demographic Information (Kept strictly confidential between participant and researcher)	
Name:	
Gender:	
Age: (Years and months)	
Cultural / Ethnic Identification:	
BMI Calculation: $= \frac{\text{mass(kg)}}{(\text{height(m)})^2}$	
Smoking Status:	
Contact mobile phone:	
Contact Email:	
How do you prefer to be contacted?	