Ultra-brief non-expert-delivered defusion and acceptance exercises for food cravings: A partial replication study

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Short Title: Defusion and acceptance for food craving

Keywords: Mindfulness, Craving, Eating, Food, Acceptance and Commitment Therapy, Defusion

The final, definitive version of this paper has been published in Journal of Health Psychology, by SAGE Publications Ltd. (Accepted 2nd Feb 2017.)

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Acknowledgements:
We would like to acknowledge the help of Jainub Begum and Kellie Hitchens for collecting data, and to Kim T Jenkins for advice on the design.

Abstract

Food cravings are a common barrier to losing weight. This paper presents a randomised comparison of non-expert group-delivered ultra-brief *defusion* and *acceptance* interventions against a distraction control. Sixty-three participants were asked to carry a bag of chocolates for a week whilst trying to resist the temptation to eat them. A behavioural rebound measure was administered. Each intervention out-performed control in respect of consumption, but not cravings. These techniques may have a place in the clinical management of food cravings. We provide tentative evidence that the mechanism of action is through decreased reactivity to cravings, not through reduced frequency of cravings.

Introduction

Attempts to restrict one's diet often lead to intense cravings for 'forbidden' foods (Martin, O'Neil, & Pawlow, 2006). Such effects are more pronounced in those with a history of food restriction, such as repeated dieters (Polivy, Coleman, & Herman, 2005). The occurrence of food cravings during a period of dieting has long been associated with the failure to maintain a restrictive diet (e.g. Meule, Westenhöfer, & Kübler, 2011), specifically early drop-out. Indeed, some dieters attribute the failure of weight-loss diets to the increase in food cravings (Buchanan & Sheffield, 2015). Cravings are usually defined as strong motivational states and are often thought to comprise affective and cognitive elements (Potenza & Grilo, 2014). Cravings can be distinguished from liking and other attitudes toward a given substance (Rozin, Levine, & Stoess, 1991) in that they often involve intense mental images and a strong anticipation of the rewarding experience (Tiggemann & Kemps, 2005). Some researchers have theorised that cravings may be exacerbated by stress (e.g. Chao, Grilo, White, & Sinha, 2015).

Whilst some psychologists have rightly pointed to the relevance of contextual factors, such as weight-related stigma and the financial cost of healthy diets (Marks, 2015), others have focused on developing techniques to be used in client-facing settings, such as coaching, therapy, and dietetics. Third-Wave behavioural interventions (Hayes, 2004) such as mindfulness training and Acceptance and Commitment Therapy/Training (ACT) have recently garnered a great deal of interest from both psychologists and allied health professionals. There is a rapidly growing literature suggesting that such approaches can be effective in achieving salutary behaviour changes in the context of cravings for both alcohol (e.g. Ostafin, Bauer, & Myxter, 2012) and nicotine (e.g. Schuck, Otten, Kleinjan, Bricker, & Engels, 2014). There is also a small but promising literature specifically on the use of third-wave techniques for the amelioration of unhealthy eating behaviour (Godsey, 2013; O'Reilly, Cook, Spruijt-Metz, & Black, 2014). A number of researchers have recognised the potential relevance of third-wave approaches for food cravings. However, before we describe the existing evidence base, it is important to clarify a few points about the putative mechanisms of action in third-wave interventions of this type.

Whilst third-wave interventionists share a common interest in mindfulness, the latter is itself a complex and multifaceted phenomenon which has been the object of a great deal of theoretical deliberation in recent years. There have been a number of attempts to define and operationalise mindfulness (e.g. Bishop et al., 2004), and it has been carved up into differing numbers of sub-processes by different researchers (e.g. Baer, Smith, & Allen, 2004; Hayes, 2002; Tran, Glück, & Nader, 2013; Walach, Buchheld, Buttenmuller, Kleinknecht, & Schmidt, 2006). Researchers from different backgrounds have defined their terms in different ways, leading to multiple names for what appear to be overlapping constructs. We would argue that amongst all this flux, two foci of relative theoretical clarity have emerged— acceptance and defusion — though each goes by several names. *Acceptance* is sometimes labelled *openness*, *willingness* or *curiosity*, amongst other things, and refers to an attitude of allowing private events (such as thoughts, sensations, and emotions) to exist without making efforts to do away with them. Thus, so-called *urge surfing* interventions try to bring to the client's attention the evanescent nature of urges and cravings, so as to increase acceptance (e.g. Ostafin & Marlatt, 2008). The term *defusion* comes from the ACT literature (e.g. Villatte et al., 2016) but it shares a great deal of similarity with *de-centering* and *repercieving* as described elsewhere in the literature on mindfulness (Bishop et al., 2004; Shapiro, Carlson, Astin, & Freedman, 2006). Regardless of the lack of agreement over terminology, the general idea is to attempt to place some psychological distance between the content of private events and the subjective sense of self. The means of inducing this process are somewhat varied. They include meditative practices where the client is asked to notice a stream of thoughts, only later to be prompted with a question such as 'Notice you are noticing all these things' (e.g. Hayes & Smith, 2005); briefer instructions where clients are encouraged to append phrases such as; 'I am having the thought that…" to the beginning of a troubling thought (Lacaille et al., 2014); and even exercises in mental imagery where the client is asked to imagine the words written out in such a way that they are (in imagination) outside the self, such as on a billboard (Stoddard & Afari, 2014).

A number of published studies have examined the effects on food cravings and craving-related outcomes, of complex mindfulness-based interventions. For instance, Alberts and colleagues (2010) measured food cravings during seven weeks of acceptance training involving body-scan techniques and other types of meditative practices. They reported a reduction in self-reported food cravings over time compared with control ($\eta^2 = .32$). Similarly, Alberts et al. (2012) compared an 8-week mindfulness-based cognitive therapy intervention to wait-list control. One of their outcome measures was the General Food Craving Questionnaire — Trait, and again they reported a significant decline in craving favouring the treatment group ($\eta^2 = .29$).

Other studies have tended to explore the use of a brief intervention, usually lasting from 5 minutes to an hour, but have then typically measured cravings or consumption over the course of days. Lacaille and colleagues (2014) gave participants briefer interventions, across a two-week period, with the aim of separating the acceptance and defusion (or *disidentification*) components of mindfulness, and examining their relative efficacy in relation to cravings. They produced brief audio recordings (< 5 min) which participants listened to each day. Training in defusion resulted in a reduction in cravings, whilst acceptance did not (pairwise effect sizes not provided). Moffitt and Brinkworth (2012) randomised participants to waitlist, or to receive a 60-minute video presentation along with take-home materials, which encouraged either cognitive restructuring or defusion. In what has now become a popular method, participants were asked to carry a transparent bag of chocolates for several days (hereafter, 'the bag method'), whilst restraining themselves from consumption. The chocolates were marked surreptitiously, and participants were told there were fewer than was the case, so as to improve the researchers' ability to detect deception. Reductions in cravings did not differ between groups, however, the odds of chocolate abstinence were 3.26 times higher for participants in the defusion condition compared with cognitive restructuring, and 4.61 times higher compared with control. Hooper and colleagues (2012) assessed behavioural rebound — the tendency for a supressed but desired behaviour to emerge with greater frequency after it has been suppressed for a time. Participants were given either an acceptance or thought

suppression technique, or told to 'deal with chocolate cravings in whatever way you feel suitable'. After six days they returned to the lab to be congratulated on completion and given *ad libitum* access to chocolate. The defusion condition resulted in a lesser behavioural rebound effect (i.e. consumption, η^2 =.27), but did not reduce cravings (η^2 =.02).

Forman and colleagues (2013) randomised participants into an ACT-based or cognitive restructuring intervention, each of which was 2 hours in length, before adopting the bag method, with a lab-based behavioural rebound test. The study was designed as a pilot, and therefore underpowered; so very little can be concluded from the report that cravings and rebound consumption were lower in the ACT group. A sort of food diary, conducted via ecological momentary assessment yielded a Cohen's *d* of 0.01. It is worth noting that food diaries have long been recognised as highly error-prone, not least because high participant burden leads to low compliance (Day, McKeown, Wong, Welch, & Bingham, 2001; Lansky & Brownell, 1982).

Jenkins and Tapper (2014) adopted the bag method in assessing 20- to 25-minute interventions based on either acceptance or defusion, with the addition of a food diary, and an active (relaxation) control condition. The defusion intervention produced a significant reduction in chocolate consumption as measured by the bag method (z=1.998, p=.046). A similar but non-significant trend was reflected in the food diary, underlining again the importance of more direct behavioural measures of consumption, rather than relying on food diaries. The brief acceptance intervention (urge surfing) did not yield significant effects on craving or consumption.

Taken at face value, these results would seem to be mixed. Multi-component interventions, generally delivered over several hours, often over 7 or 8 weeks, do tend to find a reduction in self-reported cravings. In studies on single intervention components, such as acceptance and defusion, however, cravings are not reliably reduced. Recent evidence suggests that third-wave techniques 'decouple' the

relationship between private events (such as cravings) and the overt behaviours that usually follow, such as eating, drinking, and smoking (Levin, Luoma, & Haeger, 2015). Thus, cravings might be expected to continue, even whilst the behaviours they once provoked (e.g. eating) reduces in frequency. Alberts, Thewissen and Middleweerd (2013) have posited another mode of action: the reduction in cravings sometimes seen in acceptance interventions may take some time to appear, and may result from the action of Pavlovian extinction on previously conditioned food cues. Indeed, Alberts and colleagues sought to demonstrate the short-term ineffectiveness of acceptance in the lab. Participants were deprived of food for three hours before being taught either acceptance- or suppression- based skills (or allocated to the control condition) and then being presented with palatable food. There was little opportunity for participants to practice these skills before the food challenge, and the acceptance technique was found not to decrease cravings over the course of the 20-minute filler task. Thus we would propound a two-factor theory of craving reduction: cravings are unlikely to be affected in the short term, though the decoupling effect might lead to a meaningful reduction in consumption; over the medium term, cravings may reduce through an exposure-like process. Indeed, exposure to food cues in the absence of consumption has previously shown some promise for reducing the power of such cues (Coelho, Nederkoorn, & Jansen, 2014) though this may be complicated by a history of dietary restraint in some participants.

Though these findings show the potential applicability of Third Wave techniques for managing food craving, there are significant limitations. First, is the length of the intervention protocols being tested. In many cases, these are many hours in length, and we have concerns over the extent to which these can realistically be adopted in most practice settings. Only two studies have (Hooper et al., 2012; Jenkins & Tapper, 2014) examined the use of ultra-brief interventions (10 minutes or less), and results have been somewhat mixed. Hooper and colleagues examined the effect of defusion on rebound, and on daily consumption as measured by a diary, finding a reduction in consumption only with the former. Jenkins and Tapper examined similar outcomes, and found an effect for defusion, but not for acceptance, with respect to behavioural measures but not a self-report diary. The follow-up periods of chocolate

monitoring are also problematic—we know from previous research (Haines, Hama, Guilkey, & Popkin, 2012) that food cravings tend to ebb and flow through the week and for some, weekend activities may give rise to more cravings. A follow-up period for only a few days, therefore, can miss out on this natural variation and may either under- or over-estimate effectiveness of the interventions. In previous work, the degree of facilitator expertise is often unclear, thus leaving a question over the feasibility of roll-out in dietetic services.

Though our original initial intention for this study was a simple replication design, we have tried to improve upon previous methods, by incorporating the several innovations made by previous researchers. We were also conscious of developments in the wider literature on third wave interventions that were of direct relevance. Specifically, recent advancements (e.g. Luciano et al., 2010; 2011) in the applications of Relational Frame Theory (RFT), which helps to form the theoretical underpinnings of ACT, suggested ways to improve ultra-brief interventions. First, we wrote our defusion script to take advantage of multiple exemplar training, such that the participant was given multiple exercises within the intervention, each of which was an example of the general technique of defusion, rather than relying on a verbal description of defusion. Multiple exemplar training has been shown to be important in the learning of generalized rules for guiding our own behaviour (Hayes, Barnes-Holmes, & Roche, 2001). Second, drawing on research on how effective metaphors can lead to behaviour change (Hayes, 2004), we wrote our acceptance scripts with more complex and more context-specific metaphorical content. Following the method of Hooper *et al.* (2012) and Jenkins and Tapper (2014), each of our interventions was defined in a short script. Our intervention scripts were delivered by non-experts (undergraduate psychology students) to mimic delivery by a non-psychologist healthcare professional, and used a leaflet as an aide memoire for the participant. As such, this study represents a partial replication design: the aims and broad method replicate those used in earlier research, but we were responsive to changes in the field in altering the content of the interventions to maximise potential effectiveness. Contrary to the findings of Jenkins & Tapper (2014), and due to improvements in intervention design, we hypothesized that both acceptance-

and defusion-focused techniques would be effective in the *management* of chocolate cravings when compared with a plausible distraction control, though we did not expect a reduction in the frequency or intensity of cravings.

Method

Design & Participants

A controlled experimental trial was conducted, with three conditions — ultra-brief defusion and acceptance protocols adapted from standard Acceptance and Commitment Training exercises were compared against a distraction control condition. To adequately power an ANOVA ($1-\beta=.80$, $\alpha=.05$) to detect a main effect commensurate with those seen in Hooper *et al.* (2012) and Jenkins & Tapper (2014) (approximate Cohen's F of 1.087), it was calculated that 12 participants would be required. However, given recent calls for larger sample sizes in psychological research, we aimed for a total sample size five times as large. Participants were recruited across two university campuses in the UK, were blinded and group randomized to one of the three conditions. Randomization was achieved through the use of a random number generator spreadsheet function, and groups of between two and six participants were allocated to the next place in the list as they booked in. Both university staff and students (offered participant pool credit) were recruited. The final sample comprised 12 male and 51 female (total 63) participants. BMI ranged from 17.2 to 40.7 (M=24.7, SD=5.1) and age from 18 to 47 (M=22.6, SD=6.4). The sample was predominantly white British (87.3%), with 12.8% from black or ethnic minority backgrounds (Caribbean, Indian, Pakistani, Bangladeshi).

Interventions

All interventions were delivered in a group setting, through the use of a standard script, taking on average 8 minutes (from pilot data). Participants were given a leaflet as an *aide memoire*. Each intervention began with a brief rationale for the technique, to enhance plausibility. The intervention materials used in this study are freely available by contacting the corresponding author.

The *acceptance intervention* was a modified 'urge surfing' exercise. We used the early steps of a mindful eating exercise (notice a chocolate, pick it up, feel, smell, and touch it to the lips), in which the participants were given a chocolate, to induce a mild craving in the session (see Kristeller, Wolever, & Sheets, 2014 for a similar protocol). The participant was then asked simply to notice this craving or urge. Participants were encouraged to pay attention to the physical sensations involved, including physiological changes such as salivation. Participants were encouraged to notice how long the urge would last. Throughout, participants were encouraged to adopt an accepting mind-set to these experiences.

The *defusion intervention* encouraged participants to bring to mind an unpleasant or difficult thought. The example given was a thought relating to chocolate craving. Participants were then asked to try three defusion techniques: two concerning imagined audition and one concerning visualisation. First, they were asked to sing the thought silently to themselves, to the tune of Happy Birthday; second, to repeat it two or three times in the voices of familiar cartoon characters; third, to imagine the same thought on a computer screen, with guidance in manipulating the typeface, colour, etc. Participants were encouraged to 'use the strategy for the length of time that you find helpful.'

The *distraction control* introduced a 'breathing and counting' technique. Participants were told that by pausing in this way they would be better able to make an active decision rather than being impulsive. Participants were lead through one exemplar, with the experimenter reading out the numbers from 10 to 1 at a slow pace, with instructions for a single, slow exhalation and inhalation between each number. In an

attempt to bolster believability, participants were told that the simplicity of the technique was the mainstay of its power.

Measures

Demographics sheet and BMI. Participants completed a brief demographic questionnaire, which asked for their age, sex, ethnicity, nationality, and relevant background information such as whether they had a special diet that would make them unable to indulge in chocolate consumption. Participants were weighed and their height measured in order to calculate their BMI.

Chocolate craving: The Food Craving Inventory UK (Nicholls & Hulbert-Williams, 2013) presents participants with 24 example foods and asks them to rate over the past month the *frequency* (never, rarely, sometimes, often, almost every day) of cravings, how often they *give in* to the craving (same responses), and how *difficult* it was to resist temptation (easy, a bit difficult, difficult, very difficult, and so difficult that I gave in). A whole-scale score can be calculated. In addition there are subscales relating to the type of foods being craved, these are fast food, sweet food, high fat food, and complex carbohydrates. In order to assess chocolate craving a *chocolate craving* variable was computed as the product of *frequency*, *giving in* and *difficulty* scores on the single item 'chocolate'.

The Mindful Eating Scale (L. Hulbert-Williams, Nicholls, Joy, & N. Hulbert-Williams, 2013) was used to assess mindfulness in relation to eating, primarily for the purpose of ensuring randomisation successfully eliminated any baseline group differences. Though the scale can be used to produce sub-scale scores, the overall total was computed and used in this study.

Chocolate consumption: chocolates taken from bag. As in previous studies (Jenkins & Tapper, 2014; Moffitt et al., 2012), participants were given a transparent bag of chocolates and asked to carry them

whenever they could in the next seven days. At the end of the experiment, participants returned the bag of chocolates to the investigator, and the number consumed was counted. Like Forman et al. (2007) we marked the chocolates in an unobtrusive manner so as to be able to detect undeclared replacements on the part of the participants. The bags of chocolates actually contained 14 pieces to allow for maximum detection of participant deception. Where participants had taken chocolates from the bag, and replaced them in a presumed attempt to conceal consumption, we counted these as having been eaten.

Chocolate consumption: post-experiment rebound. When participants returned a week later, they were told they had completed the study and were free to eat some chocolate. A bowl of chocolates, similar to the ones carried all week, was presented. This was available for several minutes, whilst participants completed psychometric measures. After the participant had left the room, the number of chocolates participants took from the bowl was counted (hereafter, 'experimental rebound').

Chocolate consumption: chocolate diary. Participants were asked to carry a small printed diary with them for the week, recording consumption of "anything with chocolate in it … even if it's a 'diet' product". These diaries were coded by two raters (SW and JP), using a protocol intended to produce agreement. Generally, participants wrote unambiguous entries including brand names of chocolates. Where ambiguity did exist, the raters each made their own best estimate based on online dietary information databases, and a mean was calculated, though this was necessary only with a handful of items (such as a scoop of chocolate ice-cream). Where participants did not provide a weight for a given item of chocolate, the raters looked up weights online where possible and omitted the item in the case of unresolved ambiguity. We refer to this variable, which is measured in grams, as 'chocolate diary'.

Procedure

The procedure was approved by the appropriate ethical review committees of both universities and a standard informed consent procedure was adopted. Participants responded to adverts asking ‘Do you crave chocolate? Do you want to try a new technique which might help you resist your craving?’

Initial session: Participants completed the Food Cravings Inventory UK (Nicholls & Hulbert-Williams, 2013) and the Mindful Eating Scale (L. Hulbert-Williams et al., 2013), BMI was calculated, and demographic details recorded. Participants completed psychometric and demographic information detailed above. They were then randomly assigned to one of the three experimental groups: defusion, acceptance (urge surfing) or control (distraction). Take-home leaflets summarizing the assigned technique were provided to support the intervention. Participants were then asked to carry ‘a bag of 12 chocolates’ everywhere for the next week, and to record any chocolate consumption either from the bag or other sources in their food diary.

Final session: After seven days had elapsed, participants were invited back into the lab for debriefing. Whilst there, they were offered chocolates *ad libitum* from a bowl as a rebound check during completion of the same psychometric measures as at baseline.

Results

Analyses demonstrated no significant differences between groups at baseline with respect to BMI $F(2,60)=1.29$, $p=.28$, frequency of chocolate craving as measured by the single item 'chocolate' on the FCI, $F(2,60)=0.28$, $p=.76$, or age $F(2,60)=0.63$, $p=.53$. Means and standard deviations for these baseline characteristics are presented in Table 1.

[INSERT TABLE 1 ABOUT HERE]

Graphical analysis of residuals suggested assumptions of normality were met for multivariate statistical testing. Means and standard deviations for dependent variables are reported in Table 2.

[INSERT TABLE 2 ABOUT HERE]

MANOVA was performed to assess effects of intervention group on measures of consumption. Pillai's trace was used as the multivariate test criterion as it is the most conservative estimate (Tabachnick & Fidell, 2001). The multivariate test indicated a significant effect of intervention type on chocolate consumption outcome measures, $F(6, 118) = 3.08$, $p=.008$, $\eta^2_{par} = .14$, in line with predicted differences. Subsequent univariate analyses revealed a significant effect of intervention on *chocolates taken from bag*, $F(2, 60) = 4.86$, $p=.011$, $\eta^2_{par} = .14$, and *post-experiment rebound,* $F(2, 60) = 6.08$, $p=.004$, $\eta^2_{par} = .17$, however, no effect of intervention type on *chocolate diary* was observed, $F(2, 60) = .27$, $p=.77$, $\eta^2_{par} = .01$. Post-hoc group analyses and effect sizes are reported in Table 3. Both defusion and acceptance interventions reduced *chocolates taken from bag* and *post-experiment rebound* but not the *chocolate diary*. Participants were instructed to record in their chocolate diaries any consumption from the bag of chocolates. In 14 cases (22.2%), there was either a discrepancy between the number of chocolates recorded and the number returned in the bag at the end of the experiment, or the chocolates returned were unmarked ones, suggesting that participants attempted to conceal consumption from the researchers. The effect sizes calculated for pairwise comparisons are presented in Table 3.

[INSERT TABLE 3 ABOUT HERE]

A two-way ANOVA was conducted with experimental condition and time-point as factors, and the *chocolate craving* variable as the dependent variable. A significant effect of time was found, $F(1, 60) = 46.53$, $p<.001$, $\eta^2_{par} = .473$, but no interaction with experimental condition, $F(2, 60) = 0.858$, $p=.429$, $\eta^2_{par} = .028$. This suggests that self-reports of cravings reduced over time, perhaps through regression to the mean, social desirability biases, or other such mechanisms, but there is no evidence that the specific techniques of acceptance and defusion were effective in reducing these cravings.

Discussion

Several studies have established the potential utility of third-wave techniques in managing food cravings, however, these have most frequently involved lengthy interventions (hours rather than minutes) delivered by professional psychologists. There is also some lack of clarity over whether third-wave interventions reduce cravings or craving-related consumption. In synthesising the literature, we propose a dual-process model, where consumption is 'decoupled' from cravings first, and cravings reduce only in the medium- to long-term as a result of an exposure-like process. In the present study, we tested ultra-brief interventions, measuring cravings across time, taking a behavioural measure of consumption (the bag method) and post-restriction rebound, and obtaining self-report diary accounts of chocolate consumption. In so doing, we have combined the differing outcome assessments seen in several previous studies seen in several previous studies. Simultaneously, we believe we have been able to improve intervention content, whilst keeping to the broad design and aims of these earlier studies. Brief acceptance interventions have typically not been shown to reduce either cravings (Lacaille et al., 2014) or consumption (Jenkins & Tapper, 2014). We attempted to improve on previous 'urge surfing' acceptance interventions by provoking cravings during the intervention, by presentation of a chocolate the participant was asked to

smell, touch, etc., but not eat. We also applied insights from recent developments in basic science (e.g. Relational Frame Theory). For instance, we made use of multiple exemplar training in teaching the abstract concept of defusion, rather than relying on a verbal description.

Results indicated significant effects of both defusion and acceptance compared to distraction control on objective measures of craving-related consumption (chocolates taken from a bag carried by participants for seven days, and post-experimental rebound). The effects observed for our defusion technique parallel, and are greater still than those of Jenkins and Tapper (2014), whilst our acceptance technique was successful in reducing cravings, whilst that of Jenkins and Tapper was not. In our data, defusion and acceptance did not significantly differ. Similarly to aforementioned research (Hooper et al., 2012; Jenkins & Tapper, 2014), results obtained from the chocolate diary showed no effect of either of the active interventions compared to control. Given that objective measures did reveal an effect, given that other researchers have reported a similar pattern of findings (e.g. Forman et al., 2013), and given the known error-proneness of food diaries (Day et al., 2001; Lansky & Brownell, 1982), we conclude that the lack of effect may be due to the methodological limitations of diary methods. Indeed, our direct assessment of the accuracy of the entries in the chocolate diaries for chocolates consumed from the bag reveal that participants rather frequently failed to record episodes where they took a chocolate from the bag.

We also improved on prior similar studies by running the study over seven days, thus allowing for the variability in cravings over both the working week and the weekend. Previously, some researchers have deliberately recruited participants with strong cravings for a given food at baseline (e.g. Forman et al., 2013) whilst others have not (e.g. Jenkins & Tapper, 2014). Given that the point of the study is to assess the impact of these ultra-brief interventions on naturally occurring food cravings, we advertised for people who would like help with their chocolate cravings to maximize real-world applicability.

The non-expert and group-based delivery format of our interventions is all the more promising. While previous studies have often relied on expert facilitators (e.g. PhD level), the techniques described in this study were delivered by undergraduate students. The combination of brevity (<10mins) and non-expert delivery increases accessibility of such techniques and potentially facilitates their inclusion in existing weight-management programmes.

Some studies (e.g. Hooper et al., 2012) have compared defusion against a thought suppression technique. Clearly, thought suppression (trying not to think about the craved food) is a commonly adopted strategy, and therefore a valid comparison. However, thought suppression has been shown in a great many studies to have the paradoxical effect of making undesirable thoughts more frequent and believable (Wenzlaff & Wegner, 2000). In the current study, therefore, we adopted a distraction technique as a true control condition with no expected exacerbating effect. We did not include a measure of intervention plausibility for this control condition, and this might be an important consideration for any replication attempt.

In respect of limitations, it is also worth pointing out that we did not include a self-report fidelity check to ensure that participants were reliably using the method they were taught for coping with cravings. In the present study, delivery was across two sites, with two different undergraduate-level researchers. Researchers were not blinded to intervention allocation. To fully isolate the behavioural effects of the intervention techniques, it may in future be helpful to automate delivery using a computerised or audio-recorded method. Researchers and practitioners alike are interested in the real-world application of these intervention methods, and so we, like others, made use of a general food diary. In previous work, and again in the current study, we see that food diaries fail to detect a significant change in the consumption of craved food. This may be because the effect is failing to generalise, however, given the known difficulties with food diaries, more work is warranted.

The findings have clear implications for clinical practice: our study has replicated previous findings and has demonstrated that these ultra-brief interventions can be effective. In furthering this work, and to establish the generalisability of these effects to the sorts of demographics more likely to present at weight-loss clinics, these techniques should be tested in those with higher BMI's and/or more extreme forms of food craving than those presented in the current study.

In summary, ultra-brief defusion- and acceptance-based interventions taught by novice facilitators show clinically significant effects in helping recipients deal with food cravings. These brief and relative simple psychological interventions are amenable to straightforward adoption in clinical settings.

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Table 1. Means and standard deviations for dependent variables

	BMI		Age		Chocolate Craving		MES total	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
acceptance	26.02	5.06	23.74	8.13	82.26	39.77	36.57	5.35
defusion	24.19	4.26	21.65	6.06	70.05	40.78	38.35	7.11
relaxation	23.70	5.68	22.15	4.00	66.00	39.37	37.60	6.60
Total	24.70	5.06	22.57	6.36	73.22	39.95	37.46	6.29

Table 2. Means and standard deviations for dependent variables

	acceptance (N=23)		defusion (N=20)		distraction (N=20)	
	Mean	SD	Mean	SD	Mean	SD
Chocolates taken from bag	2.00	3.70	1.15	2.28	4.85	5.30
Post-experiment rebound	0.26	0.50	0.40	0.60	1.45	2.00
Chocolate diary (g)	310.4	338.0	253.8	331.4	247.4	259.8
Chocolate cravings change score (FCI)	41.43	48.12	31.37	35.44	26.45	26.68

Table 3. Pairwise comparisons between intervention type

	(I) Group	(J) Group	Mean Difference (I-J)	SE	Cohen's *d*	*p*
Chocolates taken from bag	acceptance	defusion	0.850	1.207	0.27	0.484
	distraction	acceptance	2.850	1.207	0.63	0.021
	distraction	defusion	3.700	1.248	0.91	0.004
Post-experiment rebound	acceptance	defusion	-0.139	0.366	-0.25	0.706
	distraction	acceptance	1.189	0.366	0.86	0.002
	distraction	defusion	1.050	0.379	0.72	0.007
Chocolate diary (g)	acceptance	defusion	56.666	95.744	0.17	0.556
	distraction	acceptance	-63.006	95.744	-0.21	0.513
	distraction	defusion	-6.340	99.027	-0.02	0.949

Mean difference and p are based on estimated marginal means