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‘This is the peer reviewed version of the following article:  
Chapman, J., Zientara, J., & Wilson, C. (2018). Pilot test of  
brief instructions to improve the self-management of  
general food cravings. *Eating Behaviors*, 30, 88–92.  
<https://doi.org/10.1016/j.eatbeh.2018.05.010>,

which has been published in final form at

<https://doi.org/10.1016/j.eatbeh.2018.05.010>

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## Accepted Manuscript

Pilot test of brief instructions to improve the self-management of general food cravings

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PII: S1471-0153(17)30436-1  
DOI: doi:[10.1016/j.eatbeh.2018.05.010](https://doi.org/10.1016/j.eatbeh.2018.05.010)  
Reference: EATBEH 1231  
To appear in: *Eating Behaviors*  
Received date: 13 November 2017  
Revised date: 29 March 2018  
Accepted date: 29 May 2018

Please cite this article as: Janine Chapman, Jacquelyn Zientara, Carlene Wilson , Pilot test of brief instructions to improve the self-management of general food cravings. *Eatbeh* (2017), doi:[10.1016/j.eatbeh.2018.05.010](https://doi.org/10.1016/j.eatbeh.2018.05.010)

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Title: Pilot test of brief instructions to improve the self-management of general food cravings

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## ABSTRACT

*Objective.* To provide a preliminary investigation into the impact of brief online acceptance-based vs. control-based techniques to self-manage food cravings in women. *Method.* Female participants ( $N = 151$ ) were randomised to ‘acceptance’ or ‘control’ groups. Measures of general food cravings (primary outcome), and depression, anxiety and stress (secondary outcomes) were taken at baseline, two weeks and four weeks. *Results.* Linear mixed models showed a significant group x time interaction, with food cravings significantly reduced in the thought-control group compared to the acceptance group over four weeks, along with a reduction in food consumption. Levels of depression, anxiety and stress decreased over the course of the study, but did not differ by group. *Conclusion:* These findings provide preliminary support for the acceptability of a minimal technique to self-manage food cravings without deleterious effects, and suggest that simple control-based techniques may be useful in non-clinical, real-world settings.

## INTRODUCTION

Food cravings, relating to the subjective desire, urge or motivation to consume foods, have been linked to uncontrolled eating, overweight and obesity (Schulndt, Virts, Sbrocco & Pope-Cordle, 1993). Finding effective ways to assist individuals to manage food cravings before they lead to problematic patterns of behaviour is an important challenge.

One strategy for dealing with food cravings is the attempt to control food-related thoughts by making a conscious effort to suppress them. This involves a deliberate ‘pushing away’ of the craving experience to prevent the thoughts from occurring (May, Andrade, Batey, Berry & Kavanagh, 2010; Rogojanski, Vettese & Antony, 2011). Although a commonly-used strategy, evidence for its effectiveness is mixed. Some suggest that suppressing unwanted thoughts can intensify their frequency and duration (Wegner, Schneider, Carter & White, 1987), or result in a behavioural rebound whereby consumption of the craved substance increases (Hooper, Sandoz, Ashton, Clarke & McHugh, 2012). Thought control has also been linked to negative affect (Gross & John, 2003), suggesting that trying to suppress thoughts might have adverse effects on mood. However, some studies suggest that control-based strategies can be useful. May et al. (2010) found that, when compared to imagery and mindfulness techniques, only thought suppression effectively reduced food cravings and intrusive thoughts about food.

‘Acceptance-based’ strategies provide an alternative, as they encourage individuals to experience and accept difficult thoughts and feelings without the need to control or avoid them. In relation to food cravings, acceptance-based strategies attempt to help the individual to observe and accept potentially aversive cravings in the present moment, without acting upon them and eating the desired food (Jenkins & Tapper, 2014). Acceptance is an ideal comparison to thought control because it involves welcoming the internal experience as

opposed to pushing it away. A growing number of studies have shown promising results arising from acceptance-oriented training methods, reporting significant reductions in food cravings and / or eating behaviour (e.g. Alberts, Thewissen & Raes, 2012). Furthermore, acceptance-based approaches do not produce the deleterious effects observed in thought suppression studies.

Most interventions designed to reduce food cravings are delivered by health professionals over extended time periods. For example, Alberts et al.'s (2010) acceptance-based training to reduce food cravings was conducted over seven weeks. However, in practice this is often impractical in terms of time and cost. While short face-to-face training methods have recently been tested with initial success (see Hulbert-Williams, et al. 2017), even brief interventions to date have required participants to attend appointments or researcher-led sessions. To achieve maximum feasibility and adoption in real-world settings, interventions need to be easy to implement; low cost and resources, and low intensity and complexity (Glasgow et al., 2014). Self-led interventions that can be delivered online are increasingly used to meet this target, as they can improve access to evidence-based strategies that consumers may not otherwise seek.

This study aimed to pilot test an online, minimal acceptance-based instruction against a thought control instruction, designed to assist with the self-regulation of food cravings in everyday life. To account for the potential impact on mood, depression, anxiety and stress were investigated as secondary outcomes, along with reported changes in food consumption. Due to the mixed findings around thought control, we predicted that the acceptance-based strategy would engender superior outcomes.

## METHOD

Participants, design and procedure. Female participants were recruited from advertisements on social media to participate in a trial to improve the self-management of food cravings. Exclusion included <18 years and an eating disorder diagnosis, as unsupervised treatments may be unsuitable for these groups. The online recruitment posts contained a link to an online survey platform, which randomly allocated participants to one of two groups (1=acceptance technique, 2=control technique). Participants were contacted to complete follow-up surveys at two and four weeks via their personal email address, which they were asked to provide at baseline. The study was approved by the relevant university research ethics committee.

Survey content. General food cravings (primary outcome), and depression, anxiety and stress (secondary outcomes) were measured at baseline, followed by instructions for the allocated intervention technique. Follow-up surveys re-assessed outcome measures and asked about the frequency of practice and change in food consumption over the past fortnight.

#### Measures

General food cravings. The 15-item General Food Cravings Questionnaire (G-FCQ-S, Nijs, Franken & Muris, 2007) has 5 subscales with 3 items in each: (1) an intense desire to eat; (2) anticipation of relief from negative states; (3) craving as a physiological state; (4) obsessive preoccupation with food, and (5) anticipation of positive reinforcement that may result from eating. Items were rated on a 5 point scale (1=*strongly disagree*, 5=*strongly agree*).

Individual items for the total scale and each subscale were summed and averaged; higher scores indicate higher cravings. Reliability was acceptable for the total scale ( $\alpha=.93$ ) and subscales (all  $\alpha's \geq .76$ ).

Depression, anxiety and stress were measured by the Depression Anxiety Stress Scale-21 (DASS-21; Lovibond & Lovibond, 1995). Each subscale consists of 7 items measured on a four point scale (0=*did not apply to me at all*, 3=*applied to me very much*). Individual items

for each subscale were summed and averaged. Internal consistencies were demonstrated ( $\alpha$ 's=.84-.91).

Credibility of intervention technique, frequency of practice, and change in food consumption. Participants were asked post-intervention to rate the logic of the technique, and expectancy for success, ranked on nine point scales (1=*not at all logical*, 9=*very logical*) and (1= *not at all successful*, 9=*very successful*). Frequency of practice and change in the frequency of food consumption was assessed at both follow-ups, using the items: "Thinking back over the past two weeks, please indicate how many times per week you practiced the technique"; "Thinking back over the past two weeks, would you say that you consumed more or less of the food/s you crave than usual?" (1=*much less*, 7=*much more*).

#### Intervention instructions

The acceptance instructions were based on 'urge surfing' (see Marlatt & Gordon, 1985). Participants were encouraged to notice the craving in the present moment, and pay attention to the associated sensations. They were then instructed to imagine the craving as a wave, and encouraged to ride the wave until it subsides, with a focus on acceptance, rather than avoidance, of the urge. The control technique required participants to control their present-moment experience by deliberately pushing away their cravings, ignoring the associated urge sensation. Both sets of intervention instructions were modelled on brief scripts used in previous work (Rogojanski et al. 2011), and were designed for low complexity whilst retaining the active ingredients of the interventions (Glasgow et al., 2014). Participants were asked to read the instructions carefully, to indicate if they had understood the instructions, and to practice the technique whenever they experienced cravings. Instructions are available from the authors on request.

#### Analytic strategy



Intervention effects were analysed using linear mixed models with restricted maximum likelihood imputation. This has an advantage over traditional methods in that all participants with at least one observed data point are retained in the analysis, yielding unbiased intent-to-treat estimates (Twisk, 2006). Fixed effects were group (acceptance vs control), time as a categorical variable (baseline, 2 weeks, 4 weeks) and group x time, with BMI as a covariate. The primary outcomes of interest were change over time and between-group change in food cravings, at two weeks (initial effect) and four weeks (sustained effect).

## RESULTS

The sample comprised 151 women ( $M_{age}=30.49$ ,  $SD=13.74$ , range 18-65) with an average BMI of 26.55 ( $SD=5.88$ ). 82% were born in Australia, and 57% were educated to university level. Participants scored mid-range on food craving scales, indicating an average intensity of craving (Nijs et al, 2007). Baseline mood was within the 'normal' range for the DASS-21 ratings for Australia (Tran, Tran & Fisher, 2013) (Table 1). No significant differences were found on baseline measures between groups. From 151 participants at baseline (acceptance  $n=63$  and control  $n=88$ ), 94 were retained after two weeks (acceptance  $n=36$ , control  $n=58$ ), and 57 at four weeks (acceptance  $n=22$ , control  $n=35$ ).

INSERT TABLE 1 HERE

### Effects of the intervention

Primary outcome. Significant main effects of group  $F(2, 146,65)=5.26$ ,  $p=.023$ ,  $d=.38$ , time  $F(2, 159.46)=5.76$ ,  $p=.004$ ,  $d=.54$ , and group x time interaction were found for general food cravings  $F(2, 159.39)=3.46$ ,  $p=.034$ ,  $d=.42$ . Pairwise comparisons assessing the differential effect of group showed a greater reduction (improvement) in food cravings in the thought control group at two weeks ( $p=.009$ ), and this was maintained after four weeks ( $p=.029$ ),

yielding a large effect size of  $d=1.08$  (Table 1 and Figure 1). Significant within-group reductions in general food cravings were demonstrated over time for control group participants ( $ps \leq .003$ ) but not acceptance ( $ps \geq .248$ ). Between-group change was also modelled for the general food craving subscales and is shown in Table 1 and Figure 1, demonstrating a similar pattern.

INSERT FIG 1 HERE

Secondary outcomes. No main effects of group or group x time were found for depression, anxiety and stress, but main effects of time were significant or approaching significance, demonstrating a reduction (improvement) in scores over the course of the study:  $F(2, 133.00)=3.13, p=.047 (d=.43)$ ;  $F(2, 146.90)=2.73, p=.068 (d=.39)$ , and  $F(2, 153.130)=2.98, p=.054 (d=.39)$ , respectively (Table 1).

Credibility of intervention, frequency of practice and change in food consumption

All participants indicated that they had read and understood the intervention instructions. Participants reported that the intervention seemed logical (total  $M=6.31$  out of 9) and expected the technique to be moderately successful ( $M = 5.57$  out of 9), with no differences between groups on these measures ( $ps > .25$ ). Techniques were practiced an average of 4.4 times during the first two weeks, and 4.21 times per week after 4 weeks, again with no between-group difference or change over time ( $ps > .41$ ). For change in food consumption, participants scored mid-range on the 7-point scale (acceptance  $M=3.51, SD=1.11$ ; control  $M=3.59, SD=.09$ ) two weeks after exposure to the intervention, indicating no change. At four weeks, similar results were reported by the acceptance group ( $M=3.51, SD=1.14$ ), but the thought control group reported eating slightly less of their craved food at the end of the study ( $M=2.97, SD=0.98$ ), representing a within-group change over time of  $p=.041$ . The between-

group difference for reported change in food consumption after four weeks was approaching significance,  $p=.08$ .

## DISCUSSION

Contrary to prediction, thought control had superior initial effects after two weeks, and sustained effects after four weeks. Practice of the thought control strategy was not associated with an increase in negative affect or behavioural rebound. This suggests that in this sample, self-directed control-based strategies can lead to beneficial outcomes without detrimental effects to wellbeing in the longer term. It is encouraging that mood improved over time in both groups.

Although participants exposed to the acceptance-based instruction also showed trends towards improvement on some food craving subscales, no significant change was found. As noted elsewhere, acceptance and mindfulness approaches may change the unwanted *response* to the craving (e.g. eating the craved food) rather than the craving per se (see Hulbert-William et al. 2017). Indeed, acceptance-based strategies have engendered behavioural effects without a reduction in cravings (Hooper et al., 2012). As the aim is to heighten awareness of present experience, the increased focus may artificially inflate the perception of cravings compared to thought control. Given that the acceptance-based instructions in the present study failed to impact either cravings or reported food consumption, however, this is unlikely to be the case. It has also been suggested that craving reductions may take time to appear, through an exposure-like process (Alberts et al., 2013). Thus, it is possible that four weeks of self-led practice reported here was insufficient to produce these effects.

It is also possible that the ‘urge-surfing’ style of acceptance is less suited to short script online delivery as it involves imagery that may be hard to grasp without prior experience or face-to-face instruction. Video or audio-based formats may be useful to better

introduce potentially unfamiliar concepts. Other ways to help with craving acceptance, such as brief cognitive defusion techniques, may offer promising alternatives for short self-administered interventions (Hooper et al. 2012).

#### Implications for theory and practice

The findings from this study suggest that thought control strategies can be beneficial for certain groups of people; in this case, non-eating disordered females with average-intensity cravings. This is contrary to earlier work reporting adverse effects. One possible explanation may be differences in the way individuals respond to the task. For example, individuals with normative-range psychological distress may respond to thought control instructions by simply turning their mind to other things, rather than ruminating or attempting to monitor the target thought (see May et al., 2010). As indicated by Wegner et al. (1987), using unrelated thoughts for distraction reduces the rebound effect. Differences in monitoring and/or the implicit diversion of unwanted thoughts may underlie the contrasting findings, particularly in non-clinical vs clinical samples.

The positive changes reported in this pilot study were self-managed in the context of participants' own homes. Unlike the majority of previous studies, participants were from a non-student population and did not receive external support or incentive. The findings suggest that simple strategies to improve cravings have translation potential for consumer-led preventive health, and offer cautious optimism for the utility of control strategies without iatrogenic effects. Further research into the scope, efficacy and generalisability of these strategies is warranted, and future work will determine how 'urge-surfing' instructions can be most effectively promoted in similar self-managed, non-contact formats.

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Figure 1. Mean score changes by group on food craving outcome measures at each time point<sup>1</sup>  
 Note: Between-group difference significant at \*\* $p \leq .01$ , \* $p \leq .05$

<sup>1</sup>Lower scores indicate a reduction (improvement) in food cravings

Table 1. Means, standard errors and pairwise comparisons for all outcome measures, by group and time<sup>1</sup>

	Acceptance	Control	Between-group change		
	Mean (SE)	Mean (SE)	(95% CI)	<i>p</i>	<i>d</i> <sup>3</sup>
General food cravings, total	42.99 (1.74)	42.08 (1.46)			
Baseline					
(15-75) <sup>2</sup>	43.78 (1.91)	37.28 (1.55)	6.51 (1.66 – 11.36)	<b>.009</b>	1.02
2 weeks					
4 weeks	40.73 (2.38)	34.06 (1.88)	6.67 (.69 – 12.65)	<b>.029</b>	1.08
Intense desire to eat	9.45 (.43)	9.07 (.36)			
Baseline					
(3-15) <sup>2</sup>	9.53 (.51)	7.90 (.41)	1.63 (.34 – 2.92)	<b>.014</b>	0.97
2 weeks					
4 weeks	9.31 (.66)	7.22 (.51)	2.09 (.44 – 3.74)	<b>.013</b>	1.10
Anticipation of relief from negative states	8.73 (.40)	8.93 (.34)			
Baseline					
(3-15) <sup>2</sup>	8.99 (.49)	7.76 (.39)	1.23 (.00 – 2.47)	<b>.051</b>	0.77
2 weeks					
4 weeks	8.43 (.62)	7.40 (.49)	1.04 (-.53 – 2.60)	.194	-
Craving as a physiological state	7.87 (.40)	7.53 (.34)			
Baseline					
(3-15) <sup>2</sup>	8.62 (.47)	7.02 (.38)	1.60 (.40 - 2.79)	<b>.009</b>	1.02
2 weeks					
4 weeks	8.17 (.60)	6.45 (.47)	1.72 (.22 – 3.23)	<b>.025</b>	0.97
Obsessive preoccupation with food	8.28 (.42)	8.00 (.36)			
Baseline					
(3-15) <sup>2</sup>	8.08 (.47)	6.74 (.38)	1.34 (.15 – 2.52)	<b>.028</b>	0.86
2 weeks					

	4 weeks	7.50 (.58)	6.17 (.46)	1.33 (-.13 – 2.80)	.073	-
Anticipation of positive reinforcement	Baseline	8.57 (.42)	8.75 (.36)			
(3-15) <sup>2</sup>		8.58 (.50)	7.75 (.40)	.83 (-.43 – 2.10)	.194	-
2 weeks						
	4 weeks	7.35 (.60)	6.78 (.48)	.57 (-.94 – 2.08)	.456	-
Depression	Baseline	5.94 (.64)	6.01 (.54)			
(0-21) <sup>2</sup>		5.02 (.69)	5.73 (.56)	.71 (-2.47 – 1.05)	.427	-
2 weeks						
	4 weeks	4.55 (.80)	5.38 (.63)	.82 (-2.82 – 1.80)	.420	-
Anxiety	Baseline	5.21 (.57)	4.86 (.48)			
(0-21) <sup>2</sup>		4.78 (.65)	4.67 (.53)	.11 (-1.55 – 1.76)	.900	-
2 weeks						
	4 weeks	3.96 (.75)	4.27 (.59)	.32 (-2.22 – 1.58)	.740	-
Stress	Baseline	9.06 (.65)	8.60 (.54)			
(0-21) <sup>2</sup>		7.97 (.76)	8.22 (.61)	.25 (-2.16 – 1.66)	.799	-
2 weeks						
	4 weeks	8.30 (.88)	7.77 (.69)	.53 (-1.70 – 2.75)	.641	-

<sup>1</sup>From linear mixed model

<sup>2</sup>Possible range

<sup>3</sup>Cohen's  $d = |M2 - M1| / SD_{pooled}$  presented for significant results (highlighted in bold)



**Highlights**

- Brief, self-led strategies have potential to significantly impact population health
- Acceptance and control-based strategies were tested to reduce food cravings
- Positive findings were found for control-based strategies after four weeks
- Simple strategies may be used to improve cravings without adverse effects
- Findings show promise for consumer-led preventive health in non-clinical settings

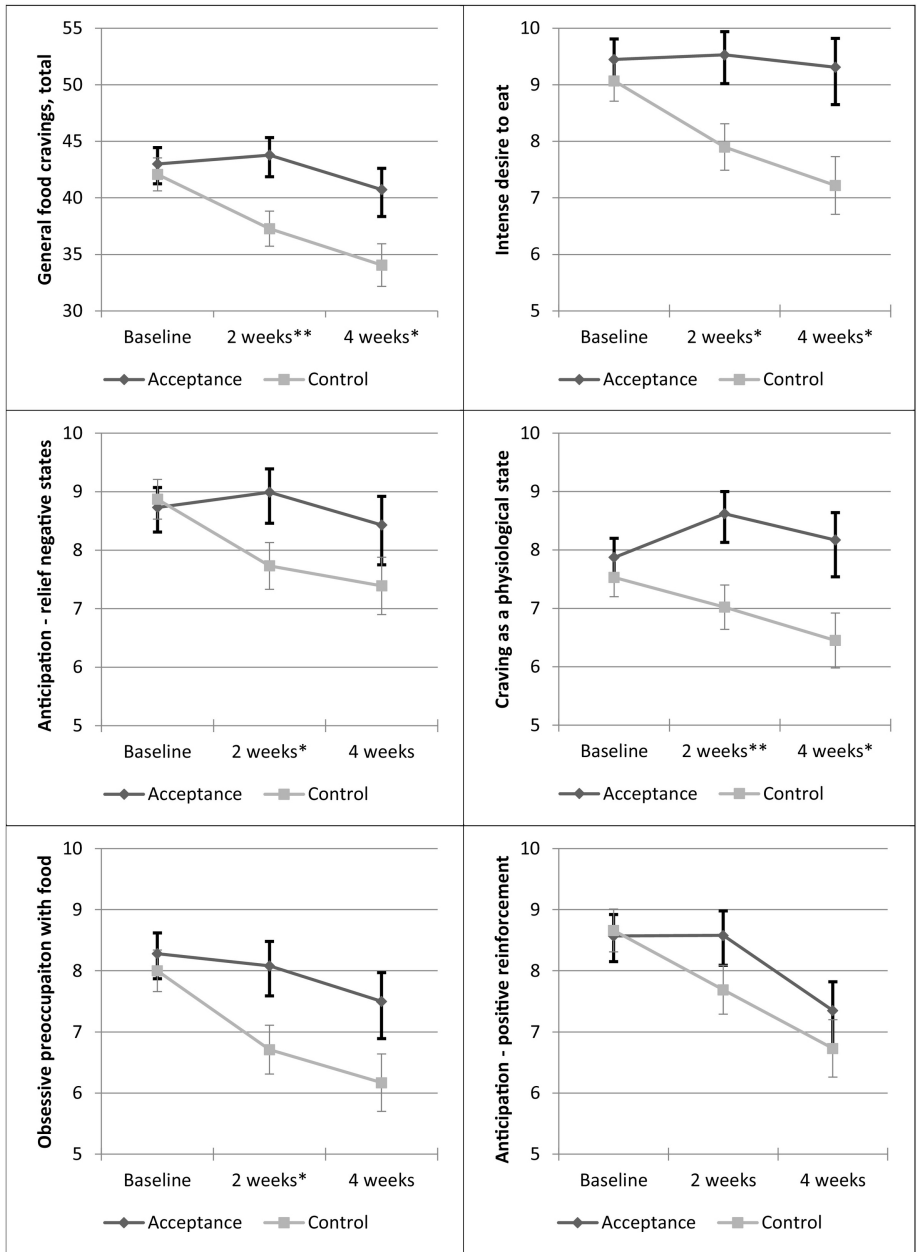


Figure 1