

Full Length Article

A failure of food-specific inhibitory control training to affect food choices via a hypothetical food delivery platform

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ABSTRACT

Inhibitory control training (ICT) is a computerised intervention which requires individuals to repeatedly inhibit a pre-potent motor response to unhealthy food-related cues. In doing so the cues are devalued, which may in turn reduce the choice and/or consumption behaviour towards unhealthy foods. Whilst single-session laboratory evidence suggests ICT may be a promising intervention, online studies show equivocal results. In this pre-registered randomised controlled trial, we administered ICT online (vs a control group) to 512 individuals (47.6% female, mean age = 41.68). Immediately following training participants were asked to make a hypothetical food order from a mock pizza delivery website based on a popular UK chain. Devaluation of pizza, salad, and unhealthy but untrained images was also measured pre- and post-training. Our results demonstrated that ICT (mean = 1270 kcal) did not lead to fewer calories ordered vs the control group (mean = 1287 kcal: $t(503.74) = 0.381, p = .703, d = 0.03$ [95% CI: -0.14 to 0.21]; $BF^{10} = 0.105$), or fewer number of individuals ordering pizza-dishes ($X^2(1) = 1.93, p = .165$; OR = 0.72 [95% CI: 0.47 to 1.11]; $BF^{10} = 0.272$). Overall, the findings of this study suggest ICT delivered online is unlikely to be an effective stand-alone intervention for changing food-ordering behaviours, however replication with real world outcomes is necessary.

1. Introduction

Inhibitory control, also known as response inhibition, is the (in) ability to change, stop or delay an inappropriate response (Logan et al., 1984), and is considered a core component of impulsivity and executive functioning (Bickel et al., 2012; Miyake et al., 2000). Inhibitory control is thought to be critical in the effective self-regulation of behaviour, specifically allowing behaviour to be adjusted according to the presence and availability of motivationally salient stimuli within the environment (Verbruggen, Best, et al., 2014), in accordance with immediate and long-term goals. Stimulus cues associated with ‘stopping’ have also been shown to engage inhibitory control automatically, in the absence of an intention to regulate behaviour (McLaren & Verbruggen, 2016; Verbruggen, Best, et al., 2014). In parallel, cues signalling desirable items (e.g. unhealthy foods or alcohol) may impair inhibitory control, reducing self-regulation in the presence of temptation (Jones, Christiansen, Nederkoorn, Houben, & Field, 2013a).

The transiency of inhibitory control in response to appetitive food cues has been linked to overweight/obesity, and unhealthy food-related

behaviours (Houben et al., 2014; Liu et al., 2022; Schroeder et al., 2023). As such, behavioural interventions have been designed to target these processes for the reduction of problematic appetitive behaviours (Jones et al., 2013a; Verbruggen, Best, et al., 2014; Verbruggen, McLaren, & Chambers, 2014).

Multiple studies have examined ICT paradigms followed by food choice/consumption outcomes. Collectively, findings support ICT as a promising psychological intervention, with a single session often leading to a reduction in food and alcohol consumption in the laboratory (e.g. Houben & Jansen, 2011). Several meta-analytic investigations have supported the short-term efficacy (Allom et al., 2016; Iannazzo et al., 2024; Jones et al., 2016), with the most recent pooled estimate indicating a small, pooled effect ($d = 0.241$ [95% CI: 0.126 to 0.355]). However, there is considerable heterogeneity in effect sizes, possibly attributable to methodological differences across studies. For instance, greater effects are seen when using a Go/No-Go task (vs Stop Signal) for training as this leads to more consistent stimulus mapping; when a greater number of cue-specific inhibitory trials are included; and when reversed contingency control groups (i.e. cue-response training) are

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used (Iannazzo et al., 2024).¹ Effects are also larger using objective outcomes (e.g. *ad-libitum* access to food: Robinson et al., 2017) vs subjective/self-report outcomes (e.g. food-frequency questionnaires: Cade et al., 2002). However, the few studies examining the longevity of ICT effects on behaviour have demonstrated equivocal results. For instance, Lawrence et al. (2015) demonstrated that 4 ICT training sessions administered online (vs control) over a two-week period led to reductions in weight and energy intake in healthy volunteers. However, Adams et al. (2021) were unable to replicate the effects of weight loss over one-week of training online. Furthermore, meta-analysis have suggested limited effects in clinical or 'at-risk' samples (Di Rosa et al., 2026), suggesting that the effects of training on consumption, choice, or weight-related outcomes do not seem to reliably persist over long periods, when a shift of context occurs (Jones et al., 2020), or in those who would see greatest benefit of behaviour change (Di Rosa et al., 2026).

There are multiple proposed mechanisms as to why training inhibitory responses to food cues might impact appetitive behaviour in the short-term (Veling et al., 2017). It is possible that training individuals to inhibit to appetitive (food-related) cues could directly strengthen inhibitory responses to these cues under temptation, or that through associative learning these cues could automatically trigger an inhibitory response. Indeed, there is some evidence that ICT can change inhibitory control processes (Iannazzo et al., 2024), but others suggest this may not be the primary mechanism (Lawrence et al., 2022; Veling et al., 2017). Alternatively (but not mutually exclusively), Veling et al. (2008) suggest that rewarding stimuli automatically elicit approach tendencies. When these approach tendencies conflict with the need to inhibit negative affect is elicited as a result of response conflict (Dreisbach & Fischer, 2015), leading to the devaluation of said stimuli to resolve the conflict (Quandt et al., 2019). Considerable evidence suggests that devaluation of food-related cues is a robust outcome of ICT, with multiple meta-analyses (Yang et al. (2022): SMD = 0.242 [95% CI: 0.160 to 0.325]; Iannazzo et al. (2024): SMD = 0.314 [95% CI: 0.185 to 0.444]), demonstrating a small-to-moderate effect in both laboratory and online studies.

To date, there have been limited attempts to apply the effects of food-specific ICT outside of the laboratory, in contexts which unhealthy eating behaviours are likely to occur. One potential avenue for the application of food-specific ICT training is to target food-ordering behaviour in online settings. The online food delivery market has increased in popularity, in part due to the Covid-19 pandemic resulting in a hybridisation of restaurants and food delivery, with estimates suggesting ~13 to ~15% of the UK population use online-food delivery services to order food preprepared out of home in the past week (Cummins et al., 2024; Keeble et al., 2020). These systems are an increasing public health concern, as they facilitate almost immediate access to foods that are typically highly calorific with lower nutritional quality (often labelled as '*junk food on demand*'; Buettner et al., 2023; Partridge et al., 2020), compared with physical restaurants and food prepared at home (Altaf Dar et al., 2023; Mahawar et al., 2022; Willie et al., 2024). They also enable or prompt the consumer to order increased portion sizes and select extra items to supplement orders with promotional strategies, which in turn drives excessive calorie consumption (Kakoschke et al., 2018; Okumus & Bilgihan, 2014). As ordering is typically done on a computer device it can be performed in very close temporal proximity to ICT, but also crucially within the same context. As such, providing an ICT intervention immediately before ordering food may overcome some of the issues thought to limit the effectiveness of training.

Therefore, in an online study we applied ICT (vs control) immediately prior to hypothetical ordering on a hypothetical pizza delivery service. We chose pizza due to homogeneity of images related to

different types of pizza, and prevalence as a fast-food choice (Mohammadbeigi et al., 2018; Powell et al., 2015). We also measured changes in food (de)valuation as a potential mechanism of action. We hypothesised that:

- 1 Food-specific inhibitory control training would reduce overall calories ordered (vs the control condition).
- 2 Food-specific inhibitory control training would reduce the likelihood of ordering high calorie food (pizza) and increase the likelihood of ordering low calorie food (salad: vs the control condition).
- 3 Food-specific inhibitory control training would lead to a devaluation of high calorie food images (pizza) from pre-to post training (vs the control condition).

The hypotheses, analysis plan and power calculation were pre-registered here [<https://osf.io/tjbpb8>]

1.1. Methods

1.1.1. Participants

Six hundred and eighty-six individuals clicked the study link. Of these, five hundred and eighty-four participants accessed and completed at least part of the study (no participants skipped sections), of which we obtained complete data on our dependent variables from 514 participants (245 female/260 male/9 non-binary) with a mean age = 41.68 (SD = 13.98), in line with our pre-registered *a-priori* power calculation for our primary hypothesis. Inclusion criteria were individuals aged 18+, fluent English speakers, regular consumption of pizza (at least once per month). We excluded participants who self-reported any history of eating disorders. We did not exclude participants based on self-reported dieting as we wanted to increase generalizability, and the prevalence of dieting/weight loss attempts is high (often > 30%: Santos et al., 2017). We primarily powered the study to detect an effect of $d = 0.22$ (with 80% power, in an independent samples *t*-test, one-tailed) which is the average lower bound confidence interval from two meta-analyses on inhibitory control training effects on behaviour (Allom et al., 2016; Jones et al., 2016). However, we were also powered to small-to-moderate effect sizes for differences in pizza vs salad selected (Cohen's $w = 0.20$: Hypothesis 2); and the detection a smallwithin-between interaction (Cohen's $f_s < 0.10$) for the effect of ICT on (de)valuation effects (Hypothesis 3) at 80% power ($\alpha = 0.05$), which is smaller than effects reported in previous meta-analyses (Iannazzo et al., 2025). The majority of participants reported ordering food for delivery at least once per month ($N = 305/59.3\%$).

Participants were recruited via Prolific.co (Palan & Schitter, 2018) and we limited participation to individuals with a minimum of 95% approval rate and those with a minimum of 50 completed studies, to ensure high quality data. Prolific reduces the likelihood of bot responses (Liem 2025) by requiring multiple levels of verification, and we also included explicit attention checks and removal of fast ('low effort') responses.

1.1.2. Materials

1.1.2.1. Brief eating disorder examination (Jenkins & Davey, 2020). The brief eating disorder examination is a 7-item scale which measures different aspects of eating disorder-related behaviours including dietary restraint, shape/weight overvaluation and body dissatisfaction. Reliabilities of these scales in this sample were restraint ($\omega = 0.91$), shape/weight overvaluation ($\omega = 0.92$), body dissatisfaction ($\omega = 0.92$). Confirmatory factor analysis supported the three-factor structure (CFI = 0.99, TLI = 0.99; RMSEA = 0.041 [95% CI: 0.008 to 0.068]; SRMR = 0.037], with standardised factor loadings ranging from 0.83 to 0.94.

¹ Iannazzo et al. refers to these as 'impulsive control' conditions.

1.1.2.2. Health motives (Robinson et al., 2022). We included two statements ('It is important to me that the food I eat on a typical day is healthy' and 'It is important to me that the food I eat on a typical day helps me control my weight') as a measure of food choice health motives. These statements scored from 1 (Not important at all) to 7 (Very important), and are associated with BMI but also ordering behaviours in similar hypothetical situations (Jones et al., 2024).

1.1.2.3. Stimulus value (Chen et al., 2016). Participants were presented with 15 images (5 Pizza Images, 5 Salad Images, and 5 untrained unhealthy images [such as pasties and hamburgers]) in a random order. We included untrained unhealthy images to examine the generalization of devaluation from precise items to more general 'unhealthy food' category (as recommended by (Lawrence et al., 2022)). For each image they were asked to make a rating on a 201-point sliding scale ('How appealing do you find this image?') with anchors of Not appealing at all (coded as -100) and Very appealing (coded as 100). The slider began each trial in the centre at 0. The dependent variable was the average score across the 5 images within each of the 3 categories (Pizza, Salad, Untrained and Unhealthy). The internal reliability of the value estimates at baseline were good (Pizza Omega = 0.91; Salad Omega = 0.88; Unhealthy Food Omega = 0.90).

1.1.2.4. Food-specific ICT/control task. The training/control was in the form of a modified go/no-go task. On each trial an image appeared in a random position on the screen, then 200 ms later a blue or red border appeared around the image. Participants were required to respond (if blue) or inhibit (if red) to the colour of the border as quickly as possible. To improve engagement with the task we included gamified elements (MacLellan et al., 2024). Specifically, participants were awarded 'points' for speeded reaction times and deducted points for failures to inhibit.² The 5 participants with the highest points were awarded a bonus payment on Prolific of £2.50 (which participants were informed of in the task instructions). Participants first completed 12 practice trials with neutral images (e.g. laptop computers, chessboards) before the main task. The main task consisted of 240 trials split into two blocks with a short rest in between, and contained pizza and salad images.

In the pizza-specific ICT participants completed 120 trials which required inhibition to pizza-related images and 120 trials which required a speeded response to salad-related images (ensuring a consistent stimulus ~ response mapping). The control group completed 60 trials which required inhibition to pizza-related images; 60 trials which required inhibition to salad-related images; 60 trials which required a speeded response to pizza-related images and 60 trials which required a speeded response to salad-related images (ensuring no consistent stimulus ~ response mapping; Jones et al., 2016). We used 50%/50% splits for Go/No-Go trials in line with guidance (Larence et al., 2017) to ensure equal exposure to pizza and salad related cues across groups. Furthermore, as the task was not designed to measure inhibitory control larger proportions of Go trials were not necessary to elicit a dominant response.

1.1.2.5. Mock delivery website for hypothetical ordering (see Fig. 1). This was modelled on a popular pizza chain restaurant in the UK and contained many of the same items, with the same price and calorie information (as well as branding information, see Fig. 1.) Participants read the instructions 'We would like you to imagine that you are going to order and pay for an evening meal from a food delivery app. Please imagine this is a real-life scenario, where you will pay for this meal yourself and eat the meal this evening'. Participants could then browse the menu, which included Pizzas, Pastas, Salads, Sides, Desserts and soft drinks (for all options and

calorie information see Supplementary Table 1). There were 40 pizza options (min kcal = 660, max kcal = 1,283, mean kcal = 985); 3 pasta options (705, 712 or 1,082 calories); 10 salad options (min kcal = 360, max kcal = 955, mean kcal = 654); 13 sides (min kcal = 166, max kcal = 556, mean kcal = 395); 10 drink options (mix kcal = 0, max kcal = 139, mean kcal = 36) and 6 dessert options (min kcal = 312, max kcal = 545, mean = 429). Participants could add items to their basket and then see a summary of their basket before confirming their order or resetting their basket. Calorie information was provided for all dishes, and included a statement for recommended calorie consumption ('Adults need around 2000 kcal per day'), in line with mandatory calorie labelling policies implemented in England in 2022. We placed no restrictions on minimum number of items ordered. The dependent variable(s) were the total number of calories ordered (the sum of pizza, pasta, salad, sides, desserts and drinks), and whether participants ordered a pizza or salad (1 = yes, 0 = no), as these images were specific to the inhibitory control training task. This paradigm and mock food-ordering platform has been used previously in online randomised controlled trials to examine different price-based incentives (Finlay et al., 2025).

1.1.3. Procedure

Data collection took place on Prolific between 23rd and 28th July 2024. Participants who were interested clicked a link which took them to the experiment hosting site (Inquisit Web v6, Millisecond, SA, USA). Participants provided informed consent and then completed demographic questions (age in years; gender [male, female, non-binary]; completed education [no formal education, GCSE/equivalent, A-Level/equivalent, Degree/equivalent, Higher degree(MSc/PhD)/equivalent]; household income [rounded to the nearest £1000]; height; weight]. They then reported how often they ordered lunch/dinner from an online food delivery website [never, once/twice per year, once every few months, once per month, once per week, more than once per week], and answered an attention check question ('Which planet do you live on?' [Mars, Earth, Venus, Saturn]). They then completed the Brief Eating Disorder Examination and health motive questions. Following this they completed the baseline measure of stimulus value.

Participants were then randomised (using Inquisit's random number generator) to the food-specific inhibitory control training or the control group, and completed the relevant task. Upon completion of the training participants were taken to the mock food delivery website. After they completed their order, they completed the post-training measure of stimulus value again for the three image categories (pizza, salad, untrained but unhealthy). Then they were given a funnelled debrief, in which they were asked 'Please can you tell us what you think this study was about in a few sentences'. Finally, they were debriefed fully. The study took approximately ~20 min to complete in total, and participants were paid ~£2. The study was approved by the local research ethics committee on 22-07-24 (REF:UREC: 24/PSY/042)

1.1.4. Data reduction and analysis

Data was processed using the 'tidyverse' (Wickham et al., 2019), 'janitor' (Firke, 2024), and 'psych' (Revelle, 2025) packages in R. For descriptive statistics we removed implausible BMI estimates (BMI < 14 or > 70, based on Booth et al. (2013)), of which there were 4 instances. However, these participants were retained for hypothesis testing. Hypothesis 1 was tested using Welch's *t*-test; Hypothesis 2 was tested using a Chi-Square test and Hypotheses 3 was tested using a 2 (time: pre-training vs post-training) x 2 (experimental group: control vs food-specific ICT training) mixed ANOVA. Distributions were assessed using qqplots, and was normally distributed for kcals ordered. There were some deviations from normality for stimulus value ratings (due to some clustering at end points of the scale). These violations of normality are unlikely to influence the ANOVA model (Knief & Forstmeier, 2021). However, as a robustness check we also conducted ANOVA models on trimmed means (5%) using the 'WRS2' package to overcome these violations (Wilcox, 2017). There were no deviations from the analyses

² Participants lost 5 points for every inhibition error and gained (1000 - millisecond RT)/100 points on each go trial.

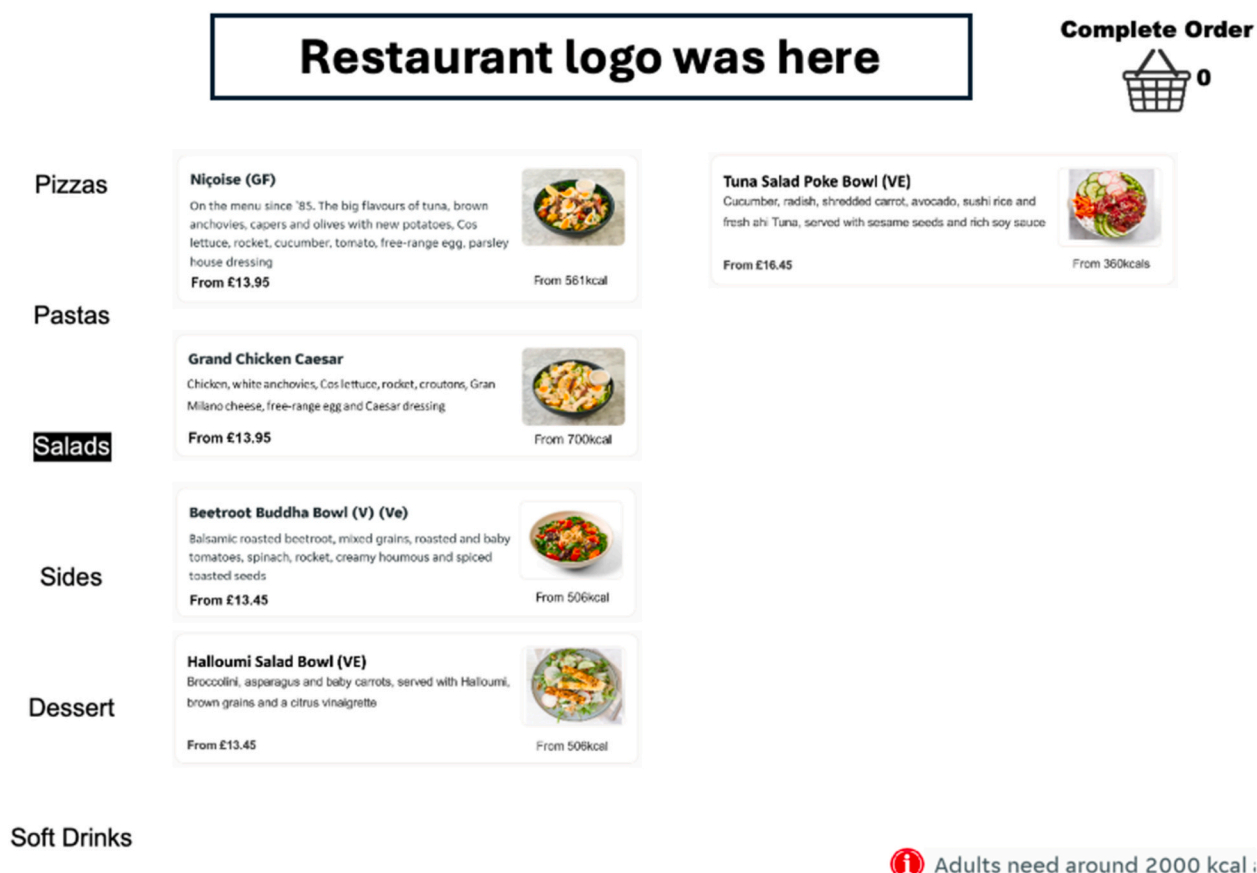


Fig. 1. Screenshot of the mock food delivery website.

reported (see supplementary) and thus we retain the standard parametric analyses in the main manuscript.

In line with pre-registered sensitivity analyses we examined the average amount of time spent ordering on the mock food delivery app (mean = 95 s, SD = 60 s, after removal of one clear outlier > 1000 s) which did not differ by experimental group ($t(489.01) = 0.72, p = .472, d = 0.06$ [95% CI: -0.11, 0.23]), and removed the fastest 5% ($N = 26$). This did not impact ordering behaviour. Similarly, removal of 31 participants who had < 90% accuracy on the go/no-go task did not impact ordering behaviour.

One participant failed the attention check, similarly removal did not influence the findings (all sensitivity analyses reported in online supplementary materials). For the outcome of calories ordered (hypothesis one) and likelihood of ordering Pizza (hypothesis two) we computed Bayes Factors using default priors using the 'BayesFactor' (Morey & Rouder, 2026) package, and interpreted the Bayes Factor using criteria noted in Beard et al. (2016).

In an addition to our pre-registered analyses, we report on sensitivity analysis in which participants who only ordered a drink ($N = 6$) were removed from the analyses, as the ICT did not specifically target beverages. We also examined whether inhibitory control training was moderated by restraint (using the Brief Eating Disorder Examination restraint scale), as evidenced elsewhere (Lawrence et al., 2022), household income, and whether gender interacted with experimental group for calories ordered (given differences in eating behaviours and in line with best practice for appetite research: Geary et al., 2025).

1.1.5. Research data

Data and analysis scripts can be found on the Open Science Framework here [https://osf.io/jfvwc]

1.2. Results

1.2.1. Participant demographics and training performance

A breakdown of participant demographics split by experimental condition is shown in Table 1. The sample is somewhat representative of

Table 1

Demographic information, split by experimental group.

	ICT Mean (SD)	Control Mean (SD)
Age	41.13 (14.52)	42.30 (13.35)
BMI	26.71 (6.00)	26.83 (6.89)
Income	51,900 (94,627)	47,565 (57,687)
EDE-Restraint	3.08 (1.85)	2.79 (1.77)
EDE-Shape	3.47 (1.90)	3.11 (1.85)
EDE-Body Dissatisfaction	3.40 (1.94)	3.04 (1.83)
Health Motives (a)	5.46 (1.13)	5.40 (1.14)
Health Motives (b)	4.79 (1.51)	4.50 (1.65)
Inhibition Accuracy (%)	96.81 (8.43)	92.39 (18.31)
N	N	N
<i>Gender</i>		
Male	139	121
Female	131	114
Non-Binary	3	6
<i>Education</i>		
No formal education	1	2
GCSE/equivalent	35	43
A-Level/equivalent	68	62
Degree/equivalent	113	96
Higher Degree/equivalent	56	38

Legend: BMI = Body Mass Index; EDE = Eating Disorder Examination; Health motives (a) = 'It is important to me that the food I eat on a typical day is healthy'; Health motives (b) 'It is important to me that the food I eat on a typical day helps me control my weight'.

the UK population, but is skewed towards higher levels of education, indicative of Prolific users.

There was a significant difference in performance (inhibition accuracy) between the experimental groups ($t(328.19) = 3.44, p < .001, d = 0.31$ [95% CI: 0.13 to 0.49]) with the ICT demonstrating greater accuracy overall. This suggests some associative learning occurred, as accuracy in the control group (where consistency stimulus ~ response mapping wasn't possible), was lower.

1.2.2. Hypotheses 1: does food-specific ICT training reduce calories ordered

There was no significant difference in total calories ordered between the control and food-specific ICT groups ($t(503.74) = 0.381, p = .703, d = 0.03$ [95% CI: -0.14 to 0.21]). The Bayes Factor was strongly in favour of the null hypothesis ($BF^{10} = 0.105$; see Fig. 2). Removing individuals who only ordered a drink did not substantially impact the findings ($t(496.11) = 0.199, p = .842, d = 0.02$ [95% CI: -0.16 to 0.19], $BF^{10} = 0.100$).

Examining only calories from pizza ($W = 21501, p = .61, r = 0.03$ [95% CI: -0.08, 0.14]) but also salads ($W = 1438, p = .99, r = 0.00$ [95% CI: -0.22, 0.22]) demonstrated no significant differences between the ICT and control groups.

In exploratory analyses we examined the interaction between experimental group * restraint. However, there was no significant main effect of restraint ($B = -23.70$ [95% CI: -59.83 to 12.43], $p = .198$) or interaction ($B = -2.24$ [95% CI: -50.82 to 46.35], $p = .928$). Similarly, there was no main effect of gender ($B = -49.04$ [95% CI: -176.79 to 78.84], $p = .452$) or interaction between experimental group * gender ($B = 4.07$ [95% CI: -171.42 to 179.56], $p = .964$). Finally, there was no main effect ($B = -1.10$ [95% CI: -3.08 to 0.88], $p = .276$) or interaction with household income ($B = -0.89$ [95% CI: -3.54 to 1.77], $p = .513$).

1.2.3. Hypotheses 2: does food-specific ICT change likelihood of ordering pizza/salad

A Chi-Square analyses demonstrated that food-specific ICT did not decrease the likelihood of ordering pizza ($X^2(1) = 1.93, p = .165$;

OR = 0.72 [95% CI: 0.47 to 1.11]). The effect was in the hypothesised direction, in that the estimate suggests a 28% reduction in the odds of ordering pizza following ICT, the confidence interval is compatible with effects ranging from a 53% reduction to an 11% increase, and the Bayes factor ($BF^{10} = 0.272$) supports the null. ICT did not increase the likelihood of ordering salad ($X^2(1) = 1.37, p = .241$; OR = 1.32 [95% CI: 0.86 to 2.03]; $BF^{10} = 0.202$), see Table 2.

1.2.4. Hypothesis 3: does food-specific ICT lead to the devaluation of pizza-specific images (see table 3)

A 2 (time: pre-training vs post-training) x 2 (experimental group: control vs food-specific ICT training) was conducted on the average value scores for pizza images (see Table 3). There was no main effect of experimental group ($F(1,533) = 0.74, p = .389$) or interaction with time ($F(1,533) = 0.21, p = .646$). There was a significant main effect of time ($F(1,533) = 21.44, p < .001$). There was a small reduction in value from pre-training ($M = 14.70, SD = 44.06$) to post-training ($M = 13.20, SD = 44.21$; $d = 0.09$ [95% CI: 0.01 to 0.18]).

1.2.5. Exploratory analyses: changes in value for salad and untrained-unhealthy images

For salad images the time * experimental group interaction was significant ($F(1, 533) = 5.91, p = .015$). Value for salads increased in the food-specific ICT training group from pre-training ($M = 14.52, SD = 39.36$) to post-training ($M = 16.74, SD = 40.76$; $d = 0.13$ [95% CI:

Table 2
Number (%) of participants ordering pizza and salad, split by experimental group.

	ICT (N = 273)	Control (N = 241)
Ordered Pizza	211	198
Did not order Pizza	65	44
Ordered Salad	64	45
Did not order Salad	212	197

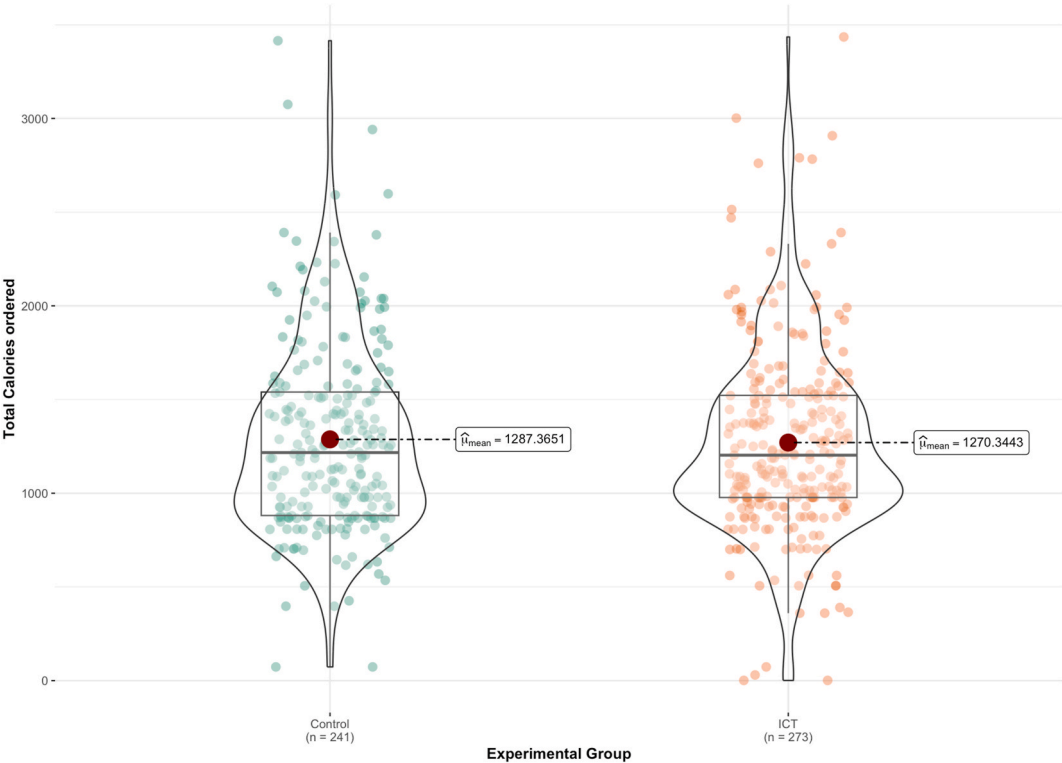


Fig. 2. Number of calories ordered between the ICT and control groups.

Table 3

Stimulus value ratings of different image types by experimental group and time.

	ICT	Control	
<i>Pre-Training</i>	<i>Mean (SD)</i>	<i>Mean (SD)</i>	<i>d [95% CI]</i>
Pizza	14.91 (45.33)	14.46 (42.66)	0.01 [-0.15 to 0.18]
Salad	14.52 (39.36)	10.68 (40.18)	0.10 [-0.08 to 0.27]
Untrained	5.59 (43.20)	4.66 (42.30)	0.02 [-0.15 to 0.20]
<i>Post-Training</i>	<i>Mean (SD)</i>	<i>Mean (SD)</i>	<i>d [95% CI]</i>
Pizza	12.03 (46.41)	14.52 (41.61)	-0.05 [-0.23 to 0.12]
Salad	16.74 (40.76)	9.53 (40.56)	0.18 [0.00 to 0.35]
Untrained	1.07 (45.50)	0.57 (43.97)	0.04 [-0.14 to 0.21]

0.01 to 0.24)). There was no significant change in the control group (pre-training $M = 10.68$, $SD = 40.18$; post-training $M = 9.53$, $SD = 40.56$; $d = 0.08$ [95% CI: -0.04 to 0.20]). There was no main effect of time ($F(1,533) = 0.87$, $p = .350$) or experimental group ($F(1,533) = 2.61$, $p = .106$).

For untrained unhealthy images there was a main effect of time ($F(1,533) = 70.21$, $p < .001$). There was a reduction in value from pre-training ($M = 5.16$, $SD = 42.76$) to post-training ($M = 0.30$, $SD = 44.75$; $d = 0.36$ [95% CI: 0.27 to 0.45]). There was no main effect of experimental group ($F(1,533) = 0.11$, $p = .731$) or interaction ($F(1,533) = 0.37$, $p = .541$).

1.3. Discussion

The present study investigated the effects of food-specific inhibitory control training on calories ordered, food choice, and devaluation of high-calorie food images in a hypothetical online food delivery scenario. Contrary to our *a-priori* hypotheses, the results indicated that food-specific inhibitory control training did not significantly reduce targeted ordering behaviour, food-choice, or lead to devaluation of pizza-specific images. Exploratory analyses revealed a small but significant increase in the valuation of salad images in the ICT group, suggesting a potential shift in appetitive evaluation for healthier options, in line with cue-approach training. However, this did not translate into changes in choice.

At first glance, our findings contrast with previous studies demonstrating short-term reductions in food-consumption or choice behaviour following inhibitory control training in the laboratory (Jones et al., 2016; Veling et al., 2017). However, we note this is the first study (to our knowledge) which has used hypothetical food prepared out of home for delivery ordering behaviour as an outcome. Although our previous research has shown that similar online paradigms are sensitive to intervention testing (Finlay et al., 2025; Jones et al., 2024), the outcomes here are still hypothetical and have no real-world consequences for participants (Klein & Hilbig, 2019). Furthermore, this study adds to a growing body of evidence to suggest ICT has no meaningful effect on behaviours when administered online in single or multiple sessions (Jones, McGrath, et al., 2018; Masterton et al., 2021). As such, our findings support evidence that ICT is not effective for self-reported outcomes in online studies (Jones, McGrath, et al., 2018; Masterton et al., 2022). These observations suggest limited practical benefit of ICT if it requires face-to-face administration, as this would likely take place in neutral contexts (not under temptation), and any effects would likely be extinguished under context-shifts (Jones et al., 2020).

The current study demonstrated no change in likelihood of ordering specific food items that were trained (pizza), between the control or the training conditions. These findings further align with previous research which shows no effect of inhibitory control training on food choice outcomes (Allom & Mullan, 2015; Carbine et al., 2021). Finally, the results demonstrate little evidence for stimulus devaluation as a mechanism for ICT. This contrasts the effects of recent meta-analyses which demonstrate a small to moderate devaluation effect following inhibitory control training specifically for food stimuli (Yang et al., 2022).

Notably, there was considerable variability in the stimulus ratings, and it is possible that using a 50/50 contingency may lead to a very weakened form of ICT in the control group as 60 trials are pizza inhibition, which might have obscured a devaluation effect. However, we did demonstrate some increased value of salad-related images, likely the result of cue-approach training in the ICT group (Itzkovitch et al., 2022; Schonberg et al., 2014). These exploratory findings should be cautiously interpreted until replicated.

The current study has some limitations. First, the hypothetical design may not capture participants true intentions, given there were no real-world consequences to their ordering behaviour. Future research should attempt to replicate these findings with consequential outcomes, for instance using actual food-selection such as logged purchases from delivery apps, or the possibility of actually receiving the meal ordered (Lohmann et al., 2024). Second, participants were required to complete via a website designed to mimic the website of a popular UK pizza restaurant. Whilst many individuals prefer to order directly from websites, food-delivery apps via mobile devices are also widely used due to convenience (Buettner et al., 2023). We were unable to scale our experiment to mobile phone screens (however, we note previous studies have demonstrated some success with app-based ICT in children: (Memarian et al., 2022)). As such, our paradigm might not be reflective of the majority of individuals who might use food-delivery apps, nor take into account the social patterning of their use (i.e. lower socio-economic status and younger age: Cummins et al. (2024)). Third, our sample is not overly representative of the UK general population (due to a large proportion of individuals educated to degree level and higher degree level). Education levels are associated with increased health motivation (Robinson et al., 2022), and future research should attempt to recruit a more representative sample which would also permit testing well-powered interactions between ICT and socioeconomic status. Finally, although we did not measure self-reported dieting to enhance generalizability, this may confound or reduce any effects of the intervention and future research should examine potential moderating effects by diet status.

The strengths of our design are the use of a control group which was unlikely to inflate any effect sizes (due to unpredictable stimulus response matching), whilst still containing an inhibitory response (Jones, Hardman, et al., 2018). We also chose to train inhibitory responses to pizza which allows for fairly homogenous images, and is ubiquitous in food-delivery systems. We note that inhibitory control training to more specific food images (meat) has led to successful devaluation elsewhere, although over multiple sessions (Camp & Lawrence, 2019). However, future research might consider tailored paradigms in which participants identify foods they find palatable or wish to change their behaviour towards.

In conclusion, we demonstrated little evidence for a single-session of inhibitory control training for a specific-food images on ordering behaviour. The findings add to a growing body of evidence to suggest there are no effects of inhibitory control training delivered online, which limits the practicality as a stand-alone behavioural intervention.

CRedit authorship contribution statement

Sam Burton: Writing – review & editing, Writing – original draft, Methodology, Data curation, Conceptualization. **Amy Finlay:** Writing – review & editing, Writing – original draft, Methodology, Investigation, Conceptualization. **Andrew Jones:** Writing – review & editing, Writing – original draft, Visualization, Supervision, Software, Resources, Methodology, Formal analysis, Data curation, Conceptualization.

Ethics statement

The research presented here was approved by the local research ethics committee (reference: UREC: 24/PSY/042). All participants provided informed consent.

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Declaration of competing interest

AJ has received funding for projects unrelated to this from Camurus Pharmaceuticals. All other authors report no conflicts of interest.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.appet.2026.108805>.

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