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Impact of dishware size on energy intake in adult females: A randomized control trial examining effects on within-meal and post-meal energy intake

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ABSTRACT

The influence dishware size has on meal energy intake is unclear and no study to date has examined the impact on total daily energy intake. In a pre-registered RCT we investigate the impact of breakfast dishware size on breakfast and post-breakfast energy intake, as well as daily energy intake and hunger/fullness. In a repeated-measures design, 50 females (aged 18–77 years) were randomised to receive smaller or larger breakfast dishware on two separate days. Energy intake was also measured during the rest of the day. The primary outcomes were breakfast and post-breakfast energy intake (kcal). Secondary outcomes were total daily energy intake (kcal), and hunger/fullness (rated from 0 to 100). We examined if results differed by socioeconomic position (SEP). Dishware did not affect energy intake at breakfast (smaller: M = 394.8 kcal; SD = 172.2 larger: M = 394.4 kcal; SD = 164.4; d = 0.003, p = 0.98), and there was no statistically significant evidence that dishware size affected energy intake after breakfast, though post-breakfast energy intake was somewhat higher after using larger breakfast dishware (smaller: M = 1974.6 kcal; SD = 475.2; larger: M = 2077.5 kcal; SD = 525.9; d = −0.27, p = 0.06). Total daily energy intake, hunger and fullness ratings did not significantly differ between dishware conditions. There was no evidence that SEP moderated the effect of dishware size on energy intake. Smaller vs. larger breakfast dishware size had no significant effect on breakfast or post-breakfast energy intake, hunger, fullness, or daily energy intake. Previous studies may have overestimated the promise of dishware size as an intervention for reducing energy intake. Alternative interventions targeting the food environment should now be prioritised.

1. Introduction

Public health approaches designed to alter structural features of the food environment have been suggested as potentially socially equitable to improve diet and reduce obesity (Beauchamp et al., 2014; Marteau, 2018; Marteau et al., 2012). One such feature is dishware size, with some suggesting that smaller dishware may help individuals reduce food intake (Hollands et al., 2015; Wansink et al., 2013), though studies to date have produced conflicting findings (e.g. Marchiori et al., 2012; Robinson et al., 2016; Rolls et al., 2007).

Several systematic reviews and meta-analyses have summarised the studies conducted in this area, reaching different conclusions. Robinson and colleagues found that the majority of studies reported no significant effect on food intake but a marginal effect of dishware size overall, driven by a small number of studies reporting large effects (Robinson et al., 2014). Hollands and colleagues found that the size of portion, package or tableware (including dishware and glassware) impacted food selection and consumption (with no evidence from subgroup analyses that tableware differed from portions/package size) (Hollands et al., 2015). Holden and colleagues reviewed randomised and non-randomised studies, finding a large effect of dishware size on energy intake if portions were self-served (vs already served on the dish) (Holden et al., 2016). However, many of the studies cited in these reviews and all of the studies which produced a positive effect in Robinson et al., 2014 were conducted by the Cornell Food and Brand Lab with several studies since retracted, including one on bowl size (Bauchner, 2018).

Since these reviews, Kosite and colleagues conducted a pre-

Abbreviations: SEP, socioeconomic position.

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registered RCT on the effect of plate size on lunch energy intake in a sample diverse in socioeconomic position (SEP), in order to examine the potential moderating role of SEP on the dishware effect (Kosīte et al., 2019). Indeed, in a review of interventions designed to promote healthier eating, McGill and colleagues found some evidence that certain types of interventions may be less or more effective depending on SEP, though a dearth of evidence overall, arguing that population level interventions "should be routinely evaluated for differential socioeconomic impact" (McGill et al., 2015; p.1). In their study, Kosite and colleagues found no evidence that reducing plate size from 29 cm to 23 cm in diameter impacted lunch energy intake, nor any moderation by SEP. A second pre-registered study by the same group examined whether reducing plate size reduced amount served in grams, with three plate sizes (18 cm, 23 cm, 29.5 cm) (Clarke et al., 2021). Here, the authors found less food was served onto small and medium vs large plates. The amount of food served has been found to be positively correlated with amount consumed (Koh & Pliner, 2009). However, Clarke et al. (2021) may overestimate effects on energy intake that would be likely to occur in the real-world, as the smallest plate was very small (18 cm) and participants were not able to re-serve themselves seconds (i.e., to compensate for that small initial serving).

Indeed, in many studies on dishware size participants are not able to, or do not feel licenced to, serve themselves more food after their initial helping. Finding that smaller dishes led to reduced energy intake, Sim and Cheon reported that only a fifth of participants served themselves a second helping, which they suggested may have been due to concerns about the presence of other participants in the room (Sim & Cheon, 2022). This was suggested to be one explanation as to why their results diverged from studies which found no dishware size effect, as in those studies participants freely helped themselves to additional servings (Rolls et al., 2007). By virtue of their experimental design – therefore – several studies may have overestimated the effect dishware size has on food intake.

In addition, studies to date have typically measured only acute effects of dishware size on within-meal intake (e.g. Kosīte et al., 2019). This might be important because portions presented in larger dishware may appear smaller than the same portions presented on smaller dishware, referred to as the Deboeuf illusion (Van Ittersum & Wansink, 2012). This perceptual effect may make meals served in larger dishware less filling, with one study finding that participants rated expected satiety as lower when viewing identical portions presented on larger (vs smaller) dishware (Peng, 2017). Indeed, in a recent study, Abeywickrema and Peng served male participants a pre-determined portion of breakfast in one of three differently-sized jars (medium [control] vs small vs large) (Abeywickrema & Peng, 2023). They found that post-meal satiety was lowest when breakfast was served in the large jar, and highest when breakfast was served in the small jar. Relatedly, post-breakfast intake was initially lower after eating from the small jar, though this was counteracted by increased energy intake over the rest of the day. In this context, it would be useful to build on these preliminary findings to explore the effects of dishware size on energy intake when participants are able to compensate (during and after the meal), as well as the impacts on hunger and fullness.

In a recent commentary, Olstad and Collins called for well-designed pre-registered RCTs using population samples to strengthen the evidence base on whether reducing dishware size could be a promising intervention to reduce energy intake (Olstad & Collins, 2019). In line with this, the present laboratory study measures the impact of smaller vs larger breakfast dishware (plates and bowls) on breakfast energy intake, with participants self-serving food *ad libitum* (i.e. able to serve themselves additional helpings) and energy intake for the rest of the day. We also examine the effect of breakfast dishware size on total daily energy intake, and hunger and fullness ratings. Finally, as in Kosīte et al. (2019), we explore whether dishware size manipulations are likely to be socially equitable, by examining whether effects are moderated by participant SEP. Although preliminary studies suggested that smaller dishes may reduce energy intake, in light of the retractions based on academic misconduct (e.g., Bauchner, 2018) and the possibility that previous studies may have overestimated the dishware size effect on energy (kcal) intake (with pre-registered and well-powered studies reporting no effect (Kosīte et al., 2019), our primary hypotheses were that breakfast dishware size (smaller vs larger) would have no effect on breakfast or post-breakfast energy intake.

2. Methods

2.1. Overview

Data from this study come from a larger trial in which participants were randomised to receive smaller vs. larger lunch and dinner food portions on different days, designed to examine the impact of meal portion size and SEP on daily energy intake (see Langfield et al., 2023). Within the study participants were also randomised (within-subjects) to breakfast dishware size conditions, with breakfast foods provided as a buffet to be self-served *ad libitum* onto plates and bowls which also varied in size on each day. Manipulation of breakfast dishware size (smaller followed by larger dishware size vs larger followed by smaller dishware size) was counterbalanced with the order of lunch/dinner portion size presentation (i.e. the breakfast dishware size and later meal portion size manipulations were fully crossed).

2.2. Participants

We recruited females into a study purportedly investigating 'Mood, Diet, and Sleep' (cover story). Potentially eligible participants were recruited using online advertisements and posters in the local community and were required to meet the following eligibility criteria: aged 18 and over, BMI between 18.5 and 32.5 kg/m^2, not on a diet, no dietary restrictions (including being vegetarian), no allergies or intolerances, no history of eating disorders, not on medication which influences appetite, not pregnant, self-reported liking of test foods, and fluency in English. To allow analyses by SEP, recruitment was stratified by highest educational qualification (50% A level or below; 50% degree level or equivalent), as well as by age (50% 18–25 years; 50% 26+ years) to prevent SEP groups differing on other demographic variables. For further detail including CONSORT diagram see Supplementary Material.

2.3. Design

Participants attended two study days where all meals (breakfast/lunch/dinner) were served in the laboratory, and additional snacks were provided to eat between meals *ad libitum*. Each study day was separated by a 1–6 week washout period, and occurred on the same day of the week. Participants were randomised in a cross-over design to one of four conditions, receiving on Study Day 1 (and the reverse on Study Day 2): larger breakfast dishware and larger lunch/dinner portions; smaller breakfast dishware and smaller lunch/dinner portions; larger breakfast dishware and smaller lunch/dinner portions; smaller breakfast dishware and larger lunch/dinner portions. Conditions were placed inside envelopes, opened sequentially each time a participant consented to the study. The primary outcome measures were breakfast and post-breakfast energy intake (kcal). Secondary outcomes were total daily energy intake (kcal) and hunger and fullness ratings.

2.4. Measures and materials

2.4.1. Participant characteristics

BMI (kg/m^2) was objectively measured by taking height and weight measurements in the laboratory. SEP was defined by highest educational qualification achieved or working towards; above A level was categorised as higher SEP and A level or below was categorised as lower SEP). Age, ethnicity, and employment status were also self-reported.

2.4.2. Dishware

We chose dishware sizes with size differences that were at least as large as in previous studies which found an effect of dishware size on energy intake or amount consumed (Koh & Pliner, 2009; Van Ittersum & Wansink, 2012). Dishware sizes were as follows: smaller bowl (15 cm diameter; 360 ml capacity), larger bowl (18 cm diameter; 550 ml capacity), smaller plate (16.5 cm diameter; 214 cm^2 surface area), larger plate (22.8 cm diameter; 408 cm^2 surface area). All dishes were plain white porcelain.

2.4.3. Outcome measures

Buffet dishware was weighed before and after eating to determine amount consumed (g) from each food and drink. To account for any food leftover on the dining dishware (size-manipulated plates and bowls), dining dishware was also weighed before and after allowing us to adjust the estimate. The estimate of amount consumed (g) was therefore adjusted for any food or drink remaining on the buffet and dining dishware afterwards, meaning food and drink available but not consumed are not included in the estimate of amount consumed (g) or energy (kcal) intake. The estimate of amount consumed (g) for each food and drink item was then multiplied by the energy density given on packaging (kcal/g), to give energy (kcal) intake for each food and drink item. Breakfast energy (kcal) intake was all food and drink consumed at breakfast (i.e., all foods listed under "Breakfast" in Table 1). Post-breakfast energy (kcal) intake was the sum of all remaining food and drink consumed for the rest of the day (i.e., all foods listed under "Post-breakfast" in Table 1). Total daily energy (kcal) intake was the sum of all food and drink consumed that day (see Fig. 1). See Table 1 for breakfast foods and energy (kcal) available at breakfast and post-breakfast, and Supplementary Materials for full study menus including reported liking for each food and drink.

Hunger and fullness were recorded before and after breakfast, on visual analog scales ranging from 0 ("Not at all") to 100 ("Extremely").

2.5. Procedure

Participants attended an initial screening session in which they completed a baseline questionnaire, probing demographic and socio-economic characteristics. Prior to attending each breakfast, participants were asked to avoid eating or drinking anything other than water to standardise pre-meal appetite. Immediately before (and after) being served their meals, participants rated their level of hunger and fullness (embedded in a series of filler 'mood' ratings). The breakfast buffet consisted of their choice of tea or coffee (served black), sugar (on request), toast, cornflakes (in a plastic decanter), milk (in a jug), margarine, strawberry jam, and water – the same on both study days. Buffet items were presented on a side table, and the plate and bowl (both smaller or both larger) were presented on the dining table along with cutlery, the hot drink and water. After breakfast, participants were provided a snack box to take away and returned later for lunch and dinner (see Supplementary Materials for full study menus). They were invited to eat as much or as little as they liked at all study meals and from the snack box, and asked to avoid eating anything additional, but to make a note of any additional foods consumed. They were asked to avoid consuming more than two alcoholic beverages, and to drink teas/coffees/soft drinks as normal, but to make a note of these. Any additional food or drink consumed (outside of study meals and from the snack box) were entered into Intake24 to estimate additional energy (kcal) intake (a validated online dietary assessment tool (Bradley et al., 2016).

Table 1
Details of energy (kcal) available at breakfast and post-breakfast.

Foods available as part of study	Energy available (kcal)
Breakfast	
Toasted white bread (4 pieces)	390
Cornflakes (120g)	464
Milk (500 ml)	250
Strawberry jam (60g)	148
Sunflower spread (40g)	168
White sugar	Served to participants on request
Tea or coffee (250 ml, black)	3.75
Post-breakfast	
Snack box (consumed *ad libitum* outside of the laboratory)	910
Lunch	1768
Dinner	2451
Additional food and drink (self-reported; consumed outside of the laboratory)	N/A

Notes. A glass of water (500 ml) was provided with every meal. Tea and coffee energy (kcal) content averaged. Lunch and dinner energy (kcal) comprises meal portions (smaller and larger averaged here) as well as second helpings, and additional sides and desserts (dinner only). Energy (kcal) available at breakfast = 1423.75. Average total daily energy (kcal) available = 6462.75.

2.6. Data analysis

The analytic plan was pre-registered before data were collected. The primary analysis comprised two repeated-measures t-tests comparing smaller vs larger dishware conditions on breakfast and post-breakfast energy (kcal) intake. Secondary analyses included a repeated-measures *t*-test comparing smaller vs larger dishware conditions on total daily energy (kcal) intake, two repeated-measures two-way ANOVA testing the effect of dishware size (categorical: smaller vs larger, within-subject), timepoint (categorical: pre breakfast vs post breakfast, within-subject) and the dishware size*timepoint interaction on hunger and fullness ratings, and a two-way mixed ANOVA testing the effect of dishware size (categorical: smaller vs larger, within-subject), SEP (lower vs higher, between-subject), and the dishware size*SEP interaction on breakfast energy (kcal) intake and post-breakfast energy (kcal) intake.

The level of significance was set at $p < 0.05$ for primary analyses and $p < 0.01$ for secondary analyses (using Bonferroni correction to account for multiple testing; 0.05/5 = 0.01 (Bland & Altman, 1995). All statistical analyses were performed using SPSS (Version 26.0). Additional Bayesian analyses to quantify strength of evidence were conducted using JASP 0.9.2 (for further information see Supplementary Materials). The study and analysis plan were pre-registered on the Open Science Framework (osf.io/apxnh/) and Clinicaltrials.gov (NCT05173376).

Although breakfast dishware size condition was crossed with lunch and dinner portion size condition, after attrition the sample was imbalanced (breakfast dishware size corresponded with lunch/dinner portion size [n = 27]; dishware size did not correspond with lunch/dinner portion size [n = 23]). We used multiple imputation to correct for this (unplanned), see Supplementary Materials for more information.

In primary analyses we had sufficient power (G*Power 3.1, 80% power, d = 0.4, alpha = 0.05) to detect moderate-to-small sized effects of dishware size on outcomes with the final analytic sample size.

3. Results

3.1. Sample characteristics

Fifty female participants (50% lower SEP) completed the study, see Table 2 for participant characteristics and Supplementary Materials for participant flow diagram including exclusions. The final analytic sample consisted of N = 54 participants after imputation. There was no evidence that participants with lower vs higher SEP differed in BMI ($p = 0.125$) or age ($p = 0.138$).

3.2. Primary analyses

There was no evidence of a difference in energy intake at breakfast from smaller vs. larger dishware, $t(1507) = 0.023$, $p = 0.982$, and no statistically significant evidence of a difference in energy intake after

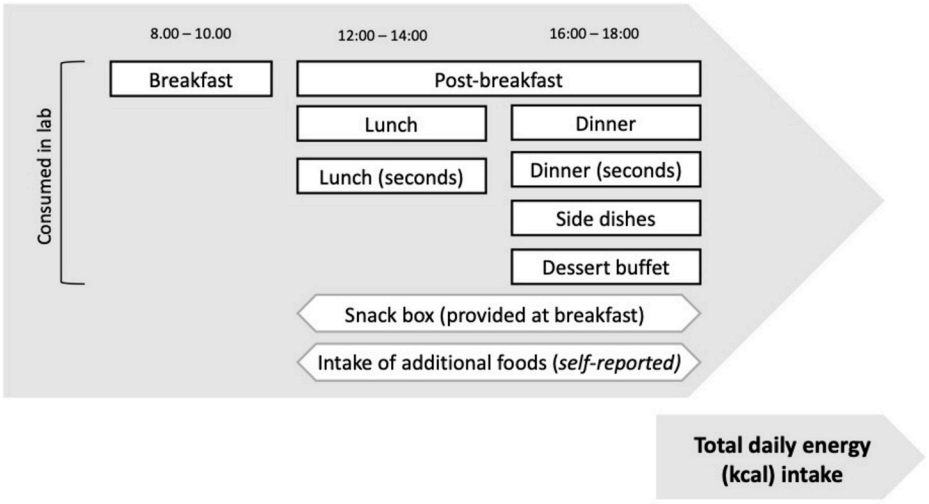

Fig. 1. Total daily energy intake (kcal), including breakfast and post-breakfast energy (kcal) intake.
Footnote. Adapted from Langfield et al. (2023).

breakfast from smaller vs. larger dishware, t (562) = −1.89, p = 0.06, though post-breakfast energy intake was somewhat higher after using larger breakfast dishware. Note the degrees of freedom reflect analyses based on imputed dataset (see 2.6 Data analysis and Supplementary Material for further information). For summary outcome data split by dishware condition see Table 3. Bayesian analyses were indicative of moderate evidence for the null hypothesis (i.e., no effect of dishware on breakfast energy intake) on breakfast energy intake and of anecdotal evidence for the alternative hypothesis on energy intake after breakfast. For full results based on the raw data (i.e., without imputation to correct for imbalanced groups), see Supplementary Material (complete case analysis).

3.3. Secondary analyses

There was no evidence that dishware size impacted total daily kcal consumed, t (628) = −1.73, p = 0.085. There was a main effect of time point on hunger ratings, with increased hunger reported before vs after breakfast (ps < 0.001), no main effect of dishware size (ps > 0.377), and no evidence of an interaction between dishware size and time point on hunger ratings (ps > 0.377). There was a main effect of time point on fullness ratings, with increased fullness reported after vs before breakfast (ps < 0.001), no main effect of dishware size (ps > 0.015), and no evidence of an interaction between dishware size and time point on fullness ratings (ps > 0.327). There was no evidence of an interaction between dishware size and SEP on breakfast EI (ps > 0.142). See Table 3 and Supplementary Information for full ANOVA and multiple imputation reporting.

4. Discussion

The present study found no evidence that manipulating the size of breakfast dishware (plates and bowls) reduced breakfast energy intake when participants self-served food and could eat ad-libitum. This finding is consistent with the majority of studies cited in Robinson et al. (2014), which reported no effect of dishware size on energy intake, as well as another recent pre-registered RCT, which – like the present study – also found no evidence of a moderating effect of SEP (Kosīte et al., 2019). Another review which included non-randomised studies found an effect of dishware size on energy intake only when food was self-served onto the dish (rather than pre-served) (Holden et al., 2016). One explanation for the mixed findings on dishware is that in the present study participants could freely help themselves to additional servings, and therefore compensate for smaller initial portions served into smaller dishware. In some previous studies, dishware size has had a large effect on amount served (Clarke et al., 2021) and amount consumed (Peng, 2017) when participants were not able to or did not feel licenced to serve themselves additional helpings, by nature of the experimental design. We assume this methodological artefact in some studies likely inflates the true influence dishware has on food intake. This observation is important because we presume that in most dining situations food is self-served onto dishware (e.g., a buffet or at home), individuals would be able to serve themselves additional food. Another possible explanation for the lack of effect of dishware size on energy (kcal) consumed in this study is that some of the food available at breakfast may have meant that participants served themselves a familiar portion based on a form of unit selection bias (i.e., pieces of toast as familiar units), rather than to serve themselves a portion anchored by the size of the dishware. However, we also served participants cereal – a finely textured food which was free poured and would not be prone to a similar unit selection bias and therefore should be amenable to a dishware size effect. Indeed, exploratory analyses (reported in the Supplementary Material) revealed there was no evidence of a dishware size effect for cereal served in bowls nor toast served on plates, suggesting that this explanation may not sufficiently explain the absence of a dishware size effect reported in this study.

To our knowledge, only one study has examined the longer-term effects on energy intake of manipulating dishware size (Abeywickrema & Peng, 2023). The present study found no convincing evidence that smaller dishes led to changes in hunger and fullness or the amount consumed for the rest of the day. If perceptual effects of larger dishware mean food appears to be less satiating (Abeywickrema & Peng, 2023; Peng, 2017), one might expect to observe longer-term effects of dishware size after the meal. There was limited evidence of this in the primary analyses of the present study and it remains unclear from these findings whether dishware size may have a marked influence on daily energy intake. However, we do note that in secondary Bayesian analyses limited to post-breakfast energy intake there was some unconvincing evidence in support of the alternative hypothesis, and therefore further research examining longer-term effects of dishware may be warranted.

In light of the low methodological quality of many of the existing studies on the effects of dishware size, Olstad and Collins called for more rigorous pre-registered studies (Olstad & Collins, 2019). In response, the present study was a pre-registered RCT following best practice guidelines on eating behaviour research, such as attempting to blind participants to study aims and standardising pre-meal appetite (Robinson et al.,

Table 2
Summary participant characteristics split by SEP group.

	Lower SEP (n = 25)	Higher SEP (n = 25)	Overall (N = 50)
Age	46.36 (18.35)	38.20 (19.88)	42.28 (19.37)
BMI (kg/m^2)	26.50 (3.66)	25.18 (2.07)	25.84 (3.02)
Weight status			
Normal weight	10 (40%)	11 (44%)	21 (42%)
Overweight	11 (44%)	13 (52%)	24 (48%)
Class I obesity	4 (16%)	1 (4%)	5 (10%)
Ethnicity			
White	24 (96%)	18 (72%)	42 (84%)
Mixed or multiple	–	1 (4%)	1 (2%)
Asian or Asian British	–	6 (24%)	6 (12%)
Black, African, Caribbean, or Black British	1 (4%)	–	1 (2%)
Employment status			
Current student	3 (12%)	12 (48%)	15 (30%)
Full or part time	10 (40%)	6 (24%)	16 (32%)
Looking after home/family	–	1 (4%)	1 (2%)
Retired	9 (36%)	6 (24%)	15 (30%)
Unemployed/other	3 (12%)	–	3 (6%)
Highest educational qualification achieved or working towards			
No formal qualifications	2 (8%)	–	2 (4%)
1–3 GCSEs or equivalent - *US equivalent: High School Diploma/GED Certificate; ISCED equivalent: 3*	2 (8%)	–	2 (4%)
4+ GCSEs or equivalent - *US equivalent: High School Diploma/GED Certificate; ISCED equivalent: 3*	9 (36%)	–	9 (18%)
A level or equivalent - *US equivalent: Advanced Placement; ISCED equivalent: 3*	12 (48%)	–	12 (24%)
Certificate of higher education (CertHE) or equivalent - *US equivalent: Associate degree; ISCED equivalent: 5*	–	2 (8%)	2 (4%)
Diploma of higher education (DipHE) or equivalent - *ISCED equivalent: 5*	–	4 (16%)	4 (8%)
Bachelor or equivalent - *ISCED equivalent: 6*	–	12 (48%)	12 (24%)
Master's degree or equivalent - *ISCED equivalent: 7*	–	6 (24%)	6 (12%)
Doctorate or equivalent - *ISCED equivalent: 8*	–	1 (4%)	1 (2%)

Notes. SEP = socioeconomic position. BMI = body mass index. ISCED = international standard classification of education. Values are M(SD) or counts (%). Further educational equivalents are reported in the Supplementary Materials.

Table 3
Summary outcome measures split by dishware condition.

	Smaller dishware	Larger dishware
Breakfast energy (kcal) intake	395 (25)	394 (23)
Post-breakfast energy (kcal) intake	1975 (66)	2077 (74)
Total daily energy (kcal) intake	2369 (84)	2472 (90)
Change in hunger (Post-Pre)	−56.4 (3.7)	−53.7 (4.0)
Change in fullness (Post-Pre)	72.0 (3.7)	74.3 (3.8)

Note. Values are based on pooled data after multiple imputation - M (SE). Hunger and fullness rated from 0 ("not at all") to 100 ("extremely"). Change in hunger and fullness (post-breakfast rating minus pre-breakfast rating) reported.

2018). Laboratory conditions allowed precise measurement of energy intake so we could isolate the effect of dishware, and participants were able to serve themselves *ad libitum* and in the absence of others who might influence the likelihood of having additional servings (Peng, 2017). It is worth noting – however – that such laboratory conditions by nature lack many of the typical markers of dining environments (such as the presence of others to dine with and other distractions) and participants may be less susceptible to external influences on food intake in the laboratory (Gough et al., 2021). Therefore, future research may benefit from testing of dishware size in more naturalistic dining environments. Though blinding represents a strength of this research, it meant that participants were unaware of the intention to influence their eating behaviour through manipulating dishware size. It remains possible – though to our knowledge untested – that dishware size may have a different impact on eating behaviour when participants are aware that they are using smaller dishes with the explicit intention of reducing energy (kcal) intake. In the present study, participants were blind. Furthermore, the sample size of the present study would not provide sufficient power to detect statistically small effects of dishware size on outcomes and if the influence of dishware is very small then future studies will need extremely large sample sizes to detect such effects. However, based on the present study and other recent evidence (Kosīte et al., 2019; Robinson et al., 2016), we would argue that public health approaches targeting other features of the food environment ought to now be prioritised.

Consent for publication

Not applicable.

Availability of data and materials

The datasets generated during the current study are available in the Open Science Framework repository, [https://osf.io/apxnh/].

Ethics approval and consent to participate

This study was approved by the Central Ethics Committee at the University of Liverpool (reference number: 6154). All participants provided informed consent prior to participating.

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CRediT authorship contribution statement

Tess Langfield: Writing – original draft, Supervision, Project administration, Investigation, Formal analysis, Conceptualization. **Katie Clarke:** Writing – review & editing, Project administration, Investigation. **Ahmed A. Sadab:** Project administration, Investigation. **Andrew Jones:** Writing – review & editing, Formal analysis, Conceptualization. **Eric Robinson:** Writing – original draft, Supervision, Project administration, Funding acquisition, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The datasets generated during the current study are available in the Open Science Framework repository, [https://osf.io/apxnh/].

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.appet.2024.107296.

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