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Does Providing Information about Cleaning Increase People's Willingness to (Re)Use Bowls That Show Signs of Previous Use?

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Abstract: Systems for reusing containers (e.g., for takeaway food) represent one way to reduce waste. However, evidence suggests that people are relatively unwilling to reuse containers, especially if they show signs of previous use. The present research investigated the hypothesis that providing information about cleaning would increase willingness to reuse containers for takeaway food and reduce concerns about contamination. Study 1 found that information about cleaning decreased, rather than increased, participants' willingness to reuse visibly stained bowls. Study 2 found no effects from the information about cleaning on willingness to reuse bowls or the accessibility of contamination concerns, although information about cleaning reduced self-reported concerns about hygienic contamination. Taken together, the findings suggest that exposure to information designed to reassure users that containers are properly cleaned is not an effective way to increase engagement with reuse systems for takeaway food. Further studies are therefore needed to test alternative ways to increase people's willingness to reuse containers that show signs of prior use.

Keywords: reuse; willingness; contamination; cleaning; hygiene; territory; utility

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1. Introduction

Reuse systems are integral to sustainability efforts as they enable "the repeated use of a product or component for its intended purpose without significant modification" [1], thereby reducing reliance on single-use items that perpetuate the throwaway culture. For example, instead of buying takeaway food in a bagasse clamshell that is disposed of after use (likely ending up in landfill), the food might be served in a reusable polypropylene bowl (with a lid), which is then returned after use to be washed and used again. The potential of reuse systems in mitigating waste and advancing a circular economy is increasingly being recognised across various industries, with benefits extending beyond resource conservation [1,2]. Widespread adoption of these systems holds the potential to substantially reduce single-use waste, foster more sustainable consumption patterns and minimise environmental degradation (see [3,4] for information on the potential environmental impact of reusable packaging systems). Transitioning towards a more sustainable, circular economy of consumption also aligns with global sustainability goals and regulatory measures aimed at curbing the detrimental impacts of single-use plastics (e.g., [2,5]).

The success of reuse systems, once implemented, depends on people being willing to use them [3]. However, people may be reluctant to reuse items, especially if they exhibit signs of wear and tear—something that may be inevitable if containers are repeatedly used and reused as required for reuse systems to confer environmental benefit. For example, Baird et al. [6] developed a paradigm to identify people's thresholds with respect to their willingness to reuse containers for food and drink. The paradigm used a sequence of 100 images of a bowl from perfectly clean through to significantly stained and identified

the point at which people became unwilling to use the bowl—termed their threshold. Despite finding variations in people's thresholds for reuse, the results indicated that people are generally unwilling to consume food or drink from containers that show any sign of prior use. One explanation for this finding is that people view signs of wear and previous use as indicating potential contamination. Indeed, the behavioural immune system is an adaptive mechanism that has evolved to detect and avoid potential sources of disease [7]. Operating through rapid cognitive processes, this system evaluates environmental cues, such as visual indicators of wear and tear, and triggers an aversive emotional reaction commonly known as the "yuck factor" [8]. This emotional reaction prompts individuals to avoid items that may have a higher probability of pathogen presence based on perceived signs of deterioration [9].

Baxter et al. [10] proposed a model of contaminated interactions, delineating three potential types of contamination that might arise from indicators of previous use: (i) hygienic, (ii) utility, and (iii) territorial. Hygienic contamination refers to contamination that poses a threat to a person's health (e.g., the belief that pathogens are present). Utility contamination refers to concerns about reduced functionality of an object (e.g., a reusable carrier bag might have become torn, or a bowl might be cracked). Territorial contamination is the concern about the object having been touched or used by someone else (e.g., a warm seat on a bus, or the smell of a previously owned jumper). This multi-dimensional model suggests that perceptions of contamination, whether related to (actual or perceived) health risks, reduced functionality, or territorial concerns, can significantly impact an individual's willingness to engage with reuse systems [11,12].

1.1. Interventions to Promote Willingness

Given evidence that people are generally unwilling to consume food or drink from containers that show any sign of prior use, Baird et al. [6] suggested that people's concerns about contamination need to be addressed and that one way to achieve this might be to help people to understand that reusable containers are hygienic and safe to use. Hubbub made a similar recommendation in their report "Reuse systems unpacked" [13]—namely, to offer reassurance through a robust washing process supported by effective communications. Providing such information has intuitive appeal as a strategy for reducing concerns and is used in related areas. For example, in 2010, the Food Standards Agency in the UK launched the Food Hygiene Rating Scheme to provide the public with information about food hygiene standards in businesses. Businesses often display this information on the premises, presumably with the intention of reassuring customers.

There is also some evidence from other domains to suggest that informing consumers about the cleanliness or safety of a product may influence their consumption decisions. For example, Wester et al. [14] provided participants in the US with one of two flyers about water treatment and purification. The two flyers differed slightly in their emphasis, but both explained that treatment removes pathogens and stated that reusing water is "A safe and effective way to save water". Wester et al. found that sharing details about the process by which water is cleaned decreased the extent to which people anticipated feeling disgusted if they used recycled water, but it did not significantly affect participants' willingness to use recycled water compared to a leaflet which simply stated that recycling water is beneficial. Likewise, extensive research has focused on enhancing the acceptability of consuming insects as a sustainable food source. Evidence indicates that informing individuals about the hygienic conditions in which insects are reared significantly reduced disgust [15], while providing information about the conditions in which they were prepared marginally increased consumption [16]. Taken together, these findings suggest that information may be sufficient to reduce concerns about contamination and increase people's willingness to engage with reuse systems. However, despite evidence that reusing packaging and containers can elicit concerns about contamination (especially if there is evidence of prior use) and the intuitive appeal of reassuring users about cleanliness, no

research has specifically tested the impact of providing information about the cleanliness or safety of reusable packaging on people's willingness to reuse packaging or containers.

1.2. The Present Research

Improving consumer engagement with reuse systems is essential for advancing sustainable consumption practices and mitigating environmental degradation. The aim of the present research was to investigate if providing information about cleaning would increase people's willingness to use reusable takeaway food containers that show signs of previous use. We hypothesised that participants exposed to the information about cleaning would be more willing to reuse containers than participants who were not exposed to the information about cleaning. Two studies were designed to investigate the effect of information about cleaning on participants' willingness to reuse containers for takeaway food. The second study also examined the effect of information about cleaning on participants' concerns about contamination.

In both studies, participants were asked to imagine that they were buying "lunch-to-go" from a local cafe which had implemented a scheme that allowed customers to have their food served in a reusable container, which they then returned after use. Reusing containers for takeaway food was used as the example for the present research because takeaway food containers are one of the main contributors to plastic waste [13] and a number of reuse systems have been developed—and are being developed—in this context [17]. Participants were shown images of the reusable bowls and asked how willing they would be to use each bowl. Prior to doing so, however, a subset of participants were shown information about how the bowls are cleaned (under the auspices of evaluating posters designed to promote the scheme), so that we could evaluate the effect of information about cleaning on willingness to use the reusable bowls.

2. Study 1

2.1. Methods

Ethical approval for this research was obtained from the Research Ethics Committee at University of Sheffield on 6 June 2022 (ref no: 046948).

2.1.1. Design

A 2-between (information about cleaning: yes vs. no) by 3-within (level of staining: none, lightly stained, heavily stained) participant design was used (Study 1 also examined the effect of a poster targeting social norms, which prompted participants to reflect on the difference between the way containers are handled in "dine in" restaurants versus for takeaway food (this poster asserted that "Restaurants don't throw away their bowls, so why would you?") and tested whether the way that containers are described (e.g., as a dish, bowl, container, plastic bowl, or lunch box) influenced participants' willingness to reuse. As the focus of this paper is the effect of information about cleaning and neither of these manipulations influenced willingness, they are not discussed further). The dependent variable was participants' willingness to use bowls for takeaway food.

2.1.2. Participants

N = 769 participants started the study and N = 590 participants provided complete data after answering two or more of the attention check questions correctly (Participants were asked three multiple choice questions, each with one correct option out of five options: (1) What is the scheme trying to achieve? (a: It is introducing more sustainable clothes in university shops; b: It is an attempt to help students study more effectively; c: It is introducing reusable containers in university cafes; d: It is fighting against corruption; e: It is encouraging students to donate money to charity), (2) How do you use the scheme? (a: You have to go and ask in the Students' Union to be signed in; b: You download an app and scan your individual QR code in the app; c: You cannot use it yet; d: You have to ask your personal tutor for detailed instructions; e: You need a UK bank account to donate to

charity), (3) What is the name of the research project that helped implement the scheme in the University of Sheffield? (a: Fight Consumerism; b: Save the World; c: Many Happy Returns; d: The Fantastic Project; e: Give a Hand)). Of these 590 participants, n = 242 were male (41%), n = 330 were female (56%), n = 15 were non-binary, n = 3 did not report their gender. Participants were aged from 18 to 77 years (M = 24.51, SD = 8.43). Only n = 2 (0.3%) of the participants had used the reuse scheme prior to taking part in the study.

2.1.3. Procedure

Figure 1 shows the procedure for this study. A link to a Qualtrics survey was shared via: (i) social media platforms, (ii) an email to student and staff at The University of Sheffield, and (iii) Prolific (www.prolific.com, last accessed on 31 August 2023). On clicking the link, participants were asked to read an information sheet and provided their informed consent. Participants were then asked to read a blog describing a scheme operated by Vytal (a German company that is now considered one of the world-leading providers of reusable food packaging, [17]) for reusing bowls for takeaway food (see Supplementary Materials) and then to answer three questions about the blog to check that they had understood the information (Participants were asked three multiple choice questions, each with one correct option out of five options: (1) What is the scheme trying to achieve? (a: It is introducing more sustainable clothes in university shops; b: It is an attempt to help students study more effectively; c: It is introducing reusable containers in university cafes; d: It is fighting against corruption; e: It is encouraging students to donate money to charity), (2) How do you use the scheme? (a: You have to go and ask in the Students' Union to be signed in; b: You download an app and scan your individual QR code in the app; c: You cannot use it yet; d: You have to ask your personal tutor for detailed instructions; e: You need a UK bank account to donate to charity), (3) What is the name of the research project that helped implement the scheme in the University of Sheffield? (a: Fight Consumerism; b: Save the World; c: Many Happy Returns; d: The Fantastic Project; e: Give a Hand)). Participants who answered at least two of the three questions correctly were retained in the sample.

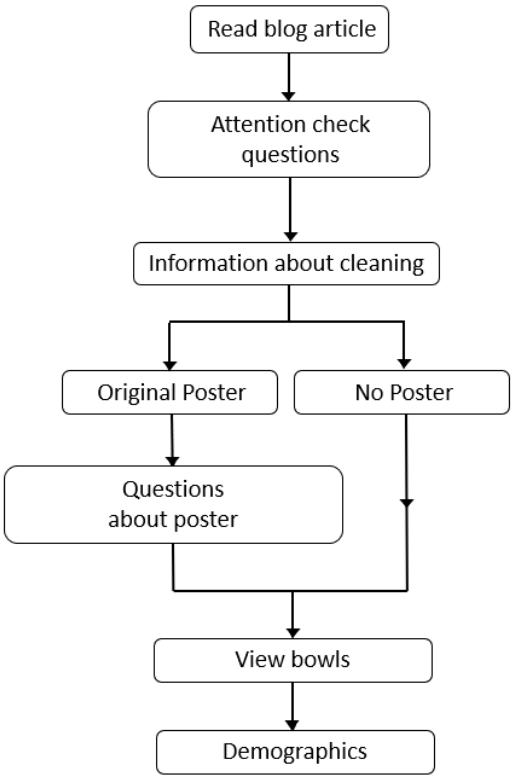

Figure 1. Flow chart depicting the procedure in Study 1.

Information about cleaning. Participants were randomly allocated to either receive information about how bowls are cleaned or not. The information took the form of a poster (presented on the computer screen) depicting soap, bubbles, a dishwasher, clean bowls, the temperature at which bowls are washed, and a statement that cleaning kills 99% of bacteria (see Figure 2). The control group did not receive any information about cleaning. Participants who were shown the information about cleaning were asked three questions about the poster to ensure that they had considered the information and to reinforce the cover story that we were interested in people's views of the poster: (1) Do you think that the poster is eye-catching? (yes/no); (2) Do you think that the poster is clear? (yes/no); and (3) Do you think that we should use this poster (yes/no)?

Figure 2. Original poster providing information about cleaning.

Participants were then presented with three pictures of reusable bowls with varying levels of staining (i.e., none, lightly stained and heavily stained; see Figure 3) and told: "Your task is to decide whether you would be willing to eat from these bowls. Please indicate your willingness to eat from this bowl on a five-point scale from 1 = "very unwilling" to 5 = "very willing". The images of the reusable bowls were created following the procedure used by Baird et al. [6]; namely, by superimposing an image of a clean bowl and an image of a dirty bowl and then adjusting the transparency of the image of the dirty bowl from 100% (i.e., not at all transparent) to 0% (i.e., fully transparent) in units of 1% to gradually morph the images together. Study 1 used images of the clean bowl (0% transparency), a bowl with 25% transparency (the "lightly stained" bowl), and 50% transparency (the "very stained" bowl). Finally, participants were asked to provide demographic information (e.g., age, gender) and to indicate whether they had used the Vytal scheme before. Participants were then thanked and debriefed.

Figure 3. Bowls with three different levels of staining.

2.2. Results

Table 1 shows how willing participants were to reuse bowls with different levels of staining as a function of information about cleaning. A 2-between (information about cleaning: yes vs. no) by 3-within (level of staining: none, light, heavy) mixed ANOVA was conducted with willingness to reuse as the dependent variable. There was a significant main effect of level of staining on willingness to reuse, F(1.51,889.70) = 3982.04, $p = 0.000$, $\eta p^2 = 0.871$. Participants were more willing to use the clean bowl (M = 4.51, SD = 0.75) than the lightly stained (M = 1.91, SD = 0.97) and heavily stained bowls (M = 1.51, SD = 0.82). There was also a significant main effect of information about cleaning on willingness to reuse, F(1,588) = 4.98, $p = 0.026$, $\eta p^2 = 0.008$. However, in contrast to our predictions, participants who received information about cleaning were significantly less willing to use bowls (M = 2.59, SE = 0.04) than those who did not receive information about cleaning (M = 2.71, SE = 0.04).

Table 1. Mean willingness to reuse bowls (SD) by level of staining and information about cleaning.

	Level of Staining		
Information about Cleaning	**None**	**Light**	**Heavy**
No poster	4.47 (0.78)	2.05 (1.06)	1.62 (0.95)
Original poster	4.56 (0.71)	1.78 (0.87)	1.42 (0.67)

Both of the main effects were qualified by a significant interaction between information about cleaning and level of staining on willingness to reuse, F(2,587) = 9.18, $p < 0.001$; Wilk's $\Lambda = 0.97$, $\eta p^2 = 0.03$. Simple main effects revealed that information about cleaning had a significant effect on willingness to reuse lightly stained F(1,588) = 11.56, $p < 0.001$; $\eta^2 = 0.019$, and heavily stained bowls F(1,588) = 5.59, $p = .004$, $\eta^2 = 0.014$, but no effect on willingness to reuse bowls that were not stained, F(1,588) = 2.33, $p = 0.128$; $\eta^2 = 0.014$. Participants who received information about cleaning were significantly less willing to use lightly (M = 1.78, SD = 0.87) or heavily stained (M = 1.42, SD = 0.67) bowls than those who did not receive information about cleaning (Ms = 2.05 and 1.62, respectively, SDs = 1.06 and 0.95).

2.3. Discussion

Study 1 investigated the effect of providing information about cleaning on people's willingness to reuse containers for takeaway food. In contrast to our hypotheses, the findings suggested that providing information about how containers are cleaned decreased (rather than increased) people's willingness to reuse bowls showing signs of previous use. One explanation is that the information provided about the cleaning process might have inadvertently triggered concerns about contamination among the participants, particularly when viewing bowls that showed signs of previous use. These factors (i.e., providing information about cleaning, viewing bowls), either combined or in isolation, may have reduced participants' willingness to use bowls that showed signs of previous use [8]. Therefore, further research is warranted to explore the effects of information about cleaning and viewing items that show signs of prior use on contamination concerns.

3. Study 2

3.1. Introduction

The aim of Study 2 was to investigate a potential explanation for the counterintuitive findings observed in Study 1—namely, that providing information about cleaning might (ironically) increase people's concerns about contamination or make them more accessible, especially when people are given the opportunity to see bowls that appear to have been used previously. To examine this hypothesis, Study 2 incorporated measures designed to assess people's concerns about contamination. In line with Baxter et al.'s model of contaminated interactions [10], we included self-report measures designed to assess concerns

about each of the three types of contamination: hygiene, utility and territory [11], as well as general concerns about contamination. We also assessed the accessibility of concepts related to contamination via a lexical decision task, in which participants are presented with a series of stimuli and are required to quickly decide whether each item is a real word or a non-word. Previous research has demonstrated the utility of LDTs for measuring other implicit processes, including goals [18], habits [19], and the accessibility of situational cues that support behaviour [20]. There is also evidence that LDTs can detect the emotional valence associated with specific words [21]. Based on evidence that people make decisions about information that is salient faster than information that is not salient [22], we hypothesised that if information about cleaning leads people to be more sensitive to potential contamination issues, they would respond faster to words associated with contamination compared to neutral or non-words.

Study 2 also sought to extend Study 1 in two further ways. First, we manipulated whether participants viewed bowls that showed signs of having been used previously. In Study 1, all participants viewed bowls and rated how willing they would be to use them. However, it is possible that viewing bowls that show signs of having been used previously raises concerns about contamination—independently, or in interaction with information about cleaning. We therefore hypothesised that there would be an interaction between providing information about cleaning and viewing bowls that show signs of wear on concerns about contamination. Specifically, we predicted that participants who viewed bowls showing different levels of staining would be more concerned about contamination than participants who did not view the bowls, especially when they received information about cleaning.

Second, to provide a conceptual replication of the findings observed in Study 1, we created a second poster that differed from the original design. The original poster was green and depicted a person using the bowl, which may have inadvertently increased territorial concerns (e.g., made it obvious that another person had used the bowl). It also stated that 99% of bacteria were killed, which may have raised concerns about hygiene (e.g., saying 99% of bacteria are killed may raise the question about the other 1% of bacteria). Therefore, we created a revised poster (Figure 4) that did not include these elements, but instead showed a stack of bowls along with information explicitly stating that the bowls undergo thorough washing and cleaning after each use. To enhance clarity and avoid any misleading implications, reference to other people using the bowls was removed, as were statistics regarding the elimination of bacteria. In addition, the colour scheme was altered to avoid any implicit associations between the colour green and feelings of unwellness or germs (e.g., [23]).

3.2. Method

We received ethics approval (ref no. 049758) for this study from the Research Ethics Committee at the University of Sheffield on 19 October 2022. Then, we registered the protocol on the Open Science Framework (available at: https://osf.io/64e57/, accessed on 4 January 2024) and commenced with data collection. Note that a preliminary study was conducted using similar methods to Study 2; however, the order of tasks in this study did not allow us to test whether viewing bowls influenced accessibility of contamination concerns. This preliminary study is reported on the Open Science Framework (available at: https://osf.io/8g36b, accessed on 4 January 2024).

3.2.1. Design

A 3-between (information about cleaning: original poster, revised poster, none) × 2-between (shown reusable bowls: yes vs. no) participant design was employed to examine effects of information about cleaning and viewing bowls on self-reported concerns about contamination and the accessibility of concerns about contamination. Willingness to reuse the bowls was also measured among the participants who viewed bowls using a 3-between (information about cleaning: original poster, revised poster, none) × 3-within (level of

staining: none, light, heavy) participant design to provide a conceptual replication of the hypotheses tested in Study 1.

Figure 4. Revised information about cleaning poster.

3.2.2. Participants

The study was powered to detect univariate effects of (the interaction between) information about cleaning and viewing bowls on each specific type of contamination. An a priori power analysis using G*Power version 3.1.9.4 [24] suggested that a sample of N = 690 participants would provide 95% power to detect a small-to-medium sized interaction between information about cleaning and viewing bowls (Cohen's f = 0.15) in a univariate ANOVA, at a significance criterion of $\alpha = 0.05$. To allow for a small dropout rate and account for participants failing attention checks, we therefore aimed to recruit N = 700 participants. The following participation inclusion criteria were set for participants to: (1) be native English speakers (to ensure that participants could efficiently perform the lexical decision task); (2) be undergraduate students (so that the scenario describing a scheme for reusing containers for takeaway food at a University was relevant); and (3) not have taken part in a study on reusable bowls before (to ensure an independent sample from that recruited for Study 1).

A total of 842 participants started the study and 692 participants provided complete data after successfully completing two or more attention check questions. Of these 692 participants, $n = 349$ were male (50%), $n = 328$ were female (47%), $n = 13$ were non-binary, and $n = 4$ did not report their gender. Participants were aged from 18 to 78 years (M = 25.61, SD = 8.48). Only $n = 3$ (0.4%) of the participants had previously used the Vytal scheme.

3.2.3. Procedure

The study procedure is shown in Figure 5. The procedure was the same as in Study 1, except that: (1) participants were recruited exclusively via Prolific; (2) half of the participants were randomized to the bowl-viewing condition and half did not view bowls; (3) participants were randomized to view either the original poster providing information about cleaning (Figure 2), a revised poster (Figure 4), or no poster, (4) viewed the respective posters twice, once at the beginning of the study and once before completing the self-report measure of contamination concerns. Study 2 also asked participants to complete two measures of concerns about contamination—a lexical decision task designed to measure the accessibility of concerns and self-report measures of concerns about contamination. These measures are detailed below.

Measure of the Accessibility of Concerns about Contamination (Lexical Decision Task). All participants completed a lexical decision task (LDT) designed to measure the accessibility of four different types of concerns about contamination: hygiene, utility, territory, and general contamination concerns. There were 16 critical words—four reflecting each category of contamination (see Table 2). Following suggestions that no more than 1/10th of the words in a LDT should be critical to prevent participants from identifying a theme to the words and the requirement for 50% words and 50% non-words (to prevent response biases) [25,26], participants were shown a total of 160 strings of letters, 80 of which were words in the English language and 80 of which were non-words. Sixteen of the neutral words were matched to the critical words on length and frequency in the English language (using the MRC database). There were also 48 neutral filler words matched in length, and 80 non-words created using the random word generator [27].

Table 2. Critical words in general and HUT categories.

General	Hygiene	Utility	Territory
Contaminated	Germs	Broken	Used
Dirty	Disease	Worn	Touched
Stained	Bacteria	Scratched	Borrowed
Residue	Illness	Damaged	Rented

Participants were told that the task was designed to assess their language ability and that words and non-words would be randomly presented one at a time in the middle of the screen. Participants were asked to press the "A" key when the string of letters was a word, and the "L" key when the string of letters was not a word in the English language. The participants were also informed that the task was timed so they should try to respond as quickly as possible. Each string of letters was preceded by a fixation point (X) for 500 ms and then the string remained visible until the participants responded. There was a 500 ms intertrial interval before the next fixation point and string of letters appeared. The participants completed 10 practice trials (5 words and 5 non-words) before moving on to the main trials.

Response latencies for erroneous responses were removed and then the average reaction time to words reflecting each form of contamination (hygiene, territorial, utility, and general) was used as a measure of the accessibility of concerns about (each type of) contamination. Outliers above or below 3 standard deviations from the sample mean for each category of word were omitted. We also ran analyses to confirm that the error rate on the LDT was comparable between conditions for each category of contamination (The error rate on the LDT was assessed by calculating the proportion of errors made by participants in classifying words as non-words across different contamination categories (hygiene, utility, territory, and general). An analysis using a 3-between (information about cleaning: original, revised, none) MANOVA was conducted, treating the error rates for words within each contamination category as dependent variables. The multivariate main effect of information about cleaning was found to be non-significant ($F(8, 1394) = 0.97$, $p = 0.458$; Wilks' $\Lambda = 0.99$,

$\eta p^2 = 0.01$)) and that there were no differences between conditions in their response latency to neutral words (A univariate ANOVA was performed to evaluate whether there were any differences between conditions in response latency to neutral words, revealing no significant effect ($F(2, 690) = 1.91$, $p = 0.148$)).

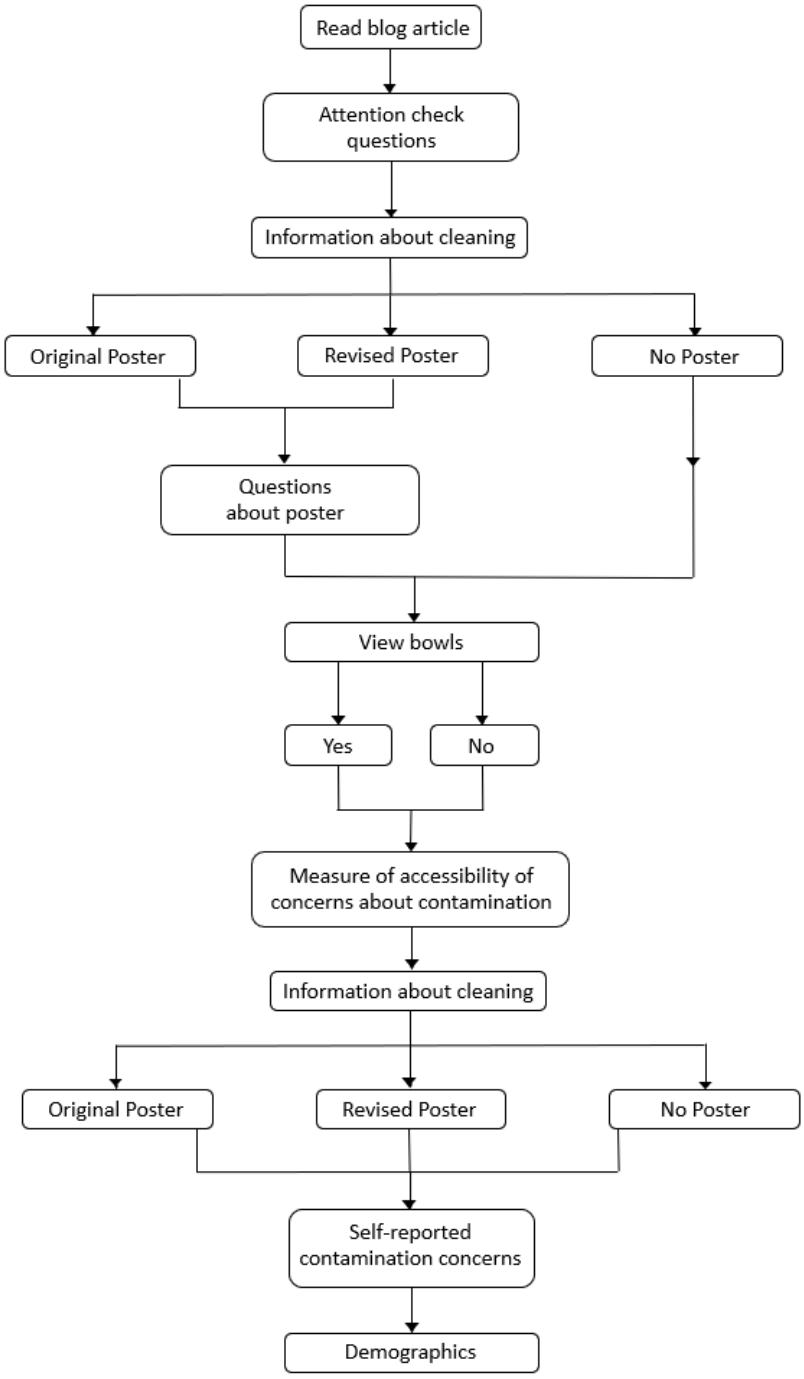

Figure 5. Flow chart depicting the procedure in Study 2.

Self-report Measure of Concerns about Contamination. Participants were asked to complete a questionnaire designed to assess their concerns about the three forms of contamination identified in the model of contaminated interactions—namely, hygiene, utility, and territorial contamination [6]—as well as general concerns. Participants' concerns with respect to each category of contamination was measured with 4 items. Some of the items were adapted from a 26-item risk perception scale developed by Danelon and Salay [28] who

measured the risk perception of diners consuming raw vegetable salads in restaurant settings. The rest of the items were created by the researchers drawing on Baxter et al.'s model of contaminated interactions [10]. The statements were shown in a random order and the participants were asked to respond on a 5-point scale from 1 = "Strongly disagree" to 5 = "Strongly agree". Higher scores reflected greater concern about contamination.

Concerns about hygiene contamination were measured with four statements: (1) Reusable bowls are often contaminated, (2) Reusable bowls are often dirty, (3) Reusable bowls often become stained, and (4) Reusable bowls often have residue from previous use. These statements were found to be internally reliable ($\alpha = 0.80$) and items were aggregated prior to analysis. Concerns about utility contamination were measured using four statements: (1) Reusable bowls are often scratched, (2) Bowls that have been used previously are often damaged, (3) Bowls that have been used previously often become misshapen, and (4) Reusable bowls often become cracked. These statements proved internally reliable ($\alpha = 0.75$) and items were aggregated prior to analysis. Concerns about territorial contamination were measured with four statements: (1) I do not like the idea that someone else has eaten from the bowl before me, (2) Knowing that other people have eaten from the bowl before makes me feel uncomfortable, (3) It does not bother me that other people will have used the bowl before me. (Reverse scored), and (4) It does not bother me that other people will have touched the bowl before me. (Reverse scored). These statements demonstrated high internal reliability ($\alpha = 0.94$) and items were aggregated prior to analysis.

At the end of the survey, participants were asked to provide demographic information including their gender, age, and if they had used the Vytal scheme before. All participants were then debriefed using a form of funnel debriefing [29] to probe their awareness of the hypothesis and nature of the words in the lexical decision task, as such awareness could have created demand characteristics [30]. Specifically, participants were asked: (1) What do you think the researchers were trying to find out? (2) Did you notice any theme to the words in the language task? (3) Do you think that the information about the Vytal scheme was related to the language task in any way? If yes, please explain how you think it was related, and (4) Do you think that reading the information about the Vytal scheme affected how you responded to the language task? If yes, how?

3.3. Results

Table 3 shows the average reaction time to words reflecting different categories of contamination, and self-reported concerns about contamination by information about cleaning and bowl viewing conditions.

Table 3. Reaction time (ms) to words reflecting different categories of contamination and self-reported contamination by information about cleaning and bowl-viewing conditions (Study 2).

		Accessibility of Concerns about Contamination				**Self-Reported Concerns about Contamination**		
Information about Cleaning	**Viewed Bowls**	**General**	**Hygiene**	**Utility**	**Territory**	**Hygiene**	**Utility**	**Territory**
No poster	No	707.84 (136.87)	663.28 (142.00)	686.46 (132.21)	685.52 (117.07)	2.90 (0.84)	3.03 (0.72)	2.94 (0.25)
	Yes	744.24 (135.13)	711.15 (111.16)	728.67 (139.29)	725.22 (124.88)	3.11 (0.72)	3.07 (0.68)	2.89 (0.31)
Original poster	No	726.72 (151.92)	693.38 (155.30)	713.34 (147.10)	681.39 (137.45)	2.73 (0.79)	2.92 (0.75)	2.97 (0.30)
	Yes	719.23 (150.19)	690.35 (156.46)	707.53 (160.54)	686.60 (129.01)	2.93 (0.76)	2.99 (0.67)	2.81 (0.26)
Revised poster	No	727.70 (136.87)	702.32 (138.17)	703.32 (143.55)	707.08 (100.71)	2.59 (0.79)	2.79 (0.70)	2.95 (0.23)
	Yes	716.88 (152.31)	697.23 (125.37)	728.19 (144.80)	691.06 (125.68)	2.98 (0.68)	3.04 (0.64)	2.81 (0.26)

3.3.1. Effect of Viewing Bowls and Information about Cleaning on Accessibility of Concerns about Contamination

A 2-between (viewed bowls: yes vs. no) by 3-between (information about cleaning: original, revised, none) groups MANOVA was conducted with reaction time to words reflecting the four categories of contamination as dependent variables. There were no statistically significant multivariate effects of viewing bowls, $F(4,683) = 1.05$, $p = 0.378$; Wilk's $\Lambda = 0.99$, $\eta p^2 = 0.01$, or information about cleaning, $F(8,1368) = 0.88$, $p = 0.530$; Wilk's $\Lambda = 0.99$, $\eta p^2 = 0.01$, on accessibility of concerns about contamination. The multivariate interaction between information about cleaning and bowl viewing on concerns about contamination was also not significant, $F(8,1366) = 1.51$, $p = 0.149$, Wilk's $\Lambda = 0.98$, $\eta p^2 = 0.01$.

3.3.2. Effect of Viewing Bowls and Information about Cleaning on Self-Reported Concerns about Contamination

A 2-between (viewed bowls: yes vs. No) by 3-between (information about cleaning: original, revised, none) groups MANOVA was conducted with self-reported concerns about different types of contamination as the dependent variables. There was a statistically significant multivariate effect of viewing bowls on self-reported concerns about contamination, $F(3,684) = 11.31$, $p < 0.001$; Wilk's $\Lambda = 0.95$, $\eta p^2 = 0.05$. Examination of the univariate effects revealed that viewing bowls had a statistically significant effect on self-reported concerns about hygiene ($F(1,686) = 20.78$, $p = < 0.001$; $\eta p^2 = 0.03$) utility ($F(1,686) = 5.38$, $p = 0.021$; $\eta p^2 = 0.01$) and territorial contamination ($F(1,686) = 19.62$, $p < 0.001$; $\eta p^2 = 0.03$). Participants who viewed the bowls were more concerned about hygiene contamination (M = 3.00, SD = 0.73) and utility contamination (M = 3.04, SD = 0.66), and less concerned about territorial contamination (M = 2.86, SD = 0.28), compared to participants who did not view the bowls (Ms = 2.74, 2.91, and 2.95, for hygiene, utility, and territorial contamination, respectively, SDs = 0.82, 0.73, and 0.26).

There was also a statistically significant multivariate effect of information about cleaning on self-reported concerns about contamination ($F(6,1368) = 2.68$, $p = 0.014$; Wilk's $\Lambda = 0.98$, $\eta p^2 = 0.01$). Examination of the univariate effects revealed that providing information about cleaning had a significant effect on self-reported concerns about hygiene ($F(2,686) = 5.25$, $p = 0.005$; $\eta p^2 = 0.02$). Participants who saw the revised (M = 2.78, SD = 0.77) and original (M = 2.83, SD = 0.78) posters were significantly less concerned about hygiene contamination than participants who did not view information about cleaning (M = 3.01, SD = 0.79). Presenting information about cleaning did not have a significant effect on concerns about utility ($F(2,686) = 2.09$, $p = 0.124$, $\eta p^2 = 0.01$) or territorial contamination ($F(2,686) = 2.01$, $p = 0.135$, $\eta p^2 = 0.01$). The multivariate interaction between information about cleaning and bowl viewing on concerns about contamination was not significant, $F(6,1384) = 0.90$, $p = 0.493$; Wilk's $\Lambda = 0.99$; $\eta p^2 = 0.00$.

3.3.3. Supplementary, Exploratory Analyses

Willingness to Reuse Bowls

Table 4 shows participants' willingness to reuse bowls with varying levels of staining against information about cleaning conditions. A 3-within (level of staining: none, light, heavy) by 3-between (information about cleaning: none, original, revised) mixed ANOVA was conducted, with willingness to reuse bowls as the dependent variable. A significant main effect was observed for the level of staining, $F(1.54,528.6) = 2694.36$, $p < 0.001$; $\eta p^2 = 0.89$, on willingness to reuse bowls. Pairwise comparisons revealed that participants were less willing to reuse bowls that were lightly (M = 1.65, SD = 0.86) or heavily stained (M = 1.31, SD = 0.61) compared to clean bowls (M = 4.37, SD = 0.78). However, there was no significant effect from the information about cleaning on willingness to reuse bowls, $F(2,344) = 1.92$, $p = 0.148$; $\eta p^2 = .01$. Furthermore, the interaction between information about cleaning and level of staining on willingness to reuse bowls was not statistically significant, $F(3.07,528.6) = 1.20$, $p = 0.309$; $\eta p^2 = 0.01$).

Table 4. Willingness to reuse bowls with different levels of staining and cleaning information (Study 2).

	Level of Staining		
Information about Cleaning	**None**	**Light**	**Heavy**
No poster	4.41 (0.80)	1.79 (0.90)	1.36 (0.67)
Original poster	4.31 (0.76)	1.60 (0.80)	1.31 (0.62)
Revised poster	4.37 (0.77)	1.54 (0.86)	1.24 (0.51)

Note: These findings are based on the subsample of participants who viewed bowls (N = 347).

4. General Discussion

Concerns about contamination have been identified as a key barrier to engagement with reuse systems [6,14,31]. Providing reassurance about cleanliness and hygiene therefore seems like an intuitive strategy to increase engagement and support efforts to promote sustainability (e.g., [2,5]). However, although this strategy has been suggested by researchers and actors in this field (e.g., [6,13]), there is currently no empirical evidence as to the effect of information about cleaning on willingness to engage with reuse systems.

To investigate this, we conducted two studies that examined whether providing information about cleaning increased people's willingness to use reusable containers for takeaway food. The second study extended Study 1 by investigating the potential impact of poster design features and exploring the impact of information about cleaning on concerns about different types of contamination. Consistent with existing research [6,12], both studies demonstrated that participants were more willing to reuse containers that were visibly clean as opposed to those exhibiting signs of prior use (i.e., staining). Furthermore, viewing bowls that showed signs of prior use increased self-reported concerns about hygienic contamination in Study 2, which aligns with Baxter et al.'s [10] model of contaminated interaction. However, while information about cleaning was found to reduce self-reported concerns about hygienic contamination in Study 2, contrary to expectations, information about cleaning did not increase people's willingness to reuse stained bowls in either of the studies.

The finding that information about cleaning did not increase willingness to reuse stained bowls may be explained by dual processing theory (e.g., [32]), which posits the existence of two cognitive systems operating simultaneously to aid decision-making. The automatic system, driven by intuitive responses and habits, may prompt individuals to avoid potentially contaminated objects despite explicit information that doing so is unnecessary (i.e., because the objects have been professionally cleaned). That is, the controlled system, which is responsible for more deliberate and thoughtful processing, may be insufficient to override automatic responses, especially when cognitive biases or strong emotions are at play, such as disgust. Indeed, this negative emotional reaction, also known as the "yuck factor", is believed to be an evolutionary adaptation that promotes pathogen avoidance [7].

Previous evidence supports the idea that the impact of visceral, affective influences on behaviour may be difficult to overcome using education alone. For example, Wester et al. [14] found that, although providing information about the safety of recycled water reduced anticipated disgust (i.e., people's cognitive evaluation of the water), it did not increase people's willingness to use the water. Similarly, Study 2 in the present research found that information about cleaning reduced self-reported concerns about hygienic contamination but did not increase willingness to reuse bowls. Therefore, the finding that information about cleaning did not increase willingness to reuse stained bowls, despite decreased self-reported concerns about hygiene in this study, is consistent with Wester et al.'s [14] findings and seems to further support the idea that willingness is primarily driven by affect rather than cognitive deliberation about risk of contamination.

Strengths, Limitations and Future Directions

The present research is the first, to our knowledge, to investigate the effects of providing information about cleaning on concerns about contamination and willingness to reuse takeaway food containers. Study 2 builds upon the findings of Study 1, providing conceptual replication and contributing to a more detailed understanding of the role of cleaning-related information in reuse behaviour in this context. The findings should, however, be considered in light of certain limitations. Firstly, all participants were recruited from UK universities. The acceptability of reuse practices has been noted to vary by country and is not currently popular in the UK [33]. Therefore, the results may not be generalizable to other contexts and/or populations in different countries where reuse is more widespread (e.g., Denmark). Additionally, research has shown that culture can influence people's perceptions of cleanliness (e.g., [34]). There is also evidence that people who are more religiously or politically conservative may exhibit heightened levels of pathogen avoidance and disgust sensitivity [35–38]. However, the present research did not record the cultural, religious, or political backgrounds of participants. Future studies should consider including additional demographic variables as this may provide valuable contextual information to support interpretation of the findings.

Another notable limitation of the present research pertains to the measurement of accessibility of contamination concerns. Given that concerns about contamination may reflect a relatively unconscious, affective reaction (i.e., disgust [7]), we were keen to use an implicit measure alongside more traditional self-report measures. We therefore designed an LDT for use in Study 2. Previous research has demonstrated the utility of LDTs for measuring other implicit processes (e.g., [18,19]). However, in the present research, the measure of the accessibility of concerns about contamination was not influenced by viewing bowls that show signs of previous use. Given that multiple studies have demonstrated that signs of use serve to cue contamination (e.g., [6]), including evidence in the present research that viewing bowls heightened self-reported hygiene and utility concerns, these findings suggest that the LDT may not have been sensitive to such concerns. One potential explanation is that contamination-related words may not be optimal for capturing the visceral feelings of disgust that precede contamination concerns. Future research aiming to investigate the accessibility of contamination concerns should, therefore, consider employing a task with visual images representing the different types of contamination. Additionally, exploring alternative implicit measures, including physiological measures like heart rate [39] or facial electromyography [40], may provide complementary insights into the automatic affective reactions associated with contamination concerns.

In terms of developing interventions to promote engagement with reusable containers for takeaway food, the present findings suggest that people's decisions in this context may be driven by affect over cognition. Therefore, one way of improving the efficacy of information about cleaning may be to shift affective responses in favour of reuse. This could potentially be achieved through "affective" message framing (e.g., [41]), which involves presenting information using emotive language and images rather than rational language and statistics representative of "cognitive" framing. Given that both posters used in this research presented information about cleaning using a combination of cognitive and affective message framing, it was not possible to isolate the effects of these approaches individually. It should, however, be noted that Wester et al. [14] did not find any differences between leaflets that adopted a cognitive framing (e.g., including a graph of bacterial presence before and after treatment) versus leaflets with a more affective framing (e.g., including personal testimonials of satisfied recycled water users using affect-laden language), suggesting that informational interventions (even those with an affective frame) still require strengthening.

One potential approach to strengthen the impact of informational interventions might be to use storytelling. Indeed, narratives are widely acknowledged to be more persuasive and memorable compared to fact-based messages [42,43] and have been associated with increased intentions to engage in pro-environmental behaviours [44]. Stories could showcase individuals, contexts or communities who have successfully embraced the use of reusable

containers and include elements that highlight their safety and cleanliness. For example, an analogy could be drawn between contexts where reuse is common (e.g., plates and bowls in restaurants) and those where it is not (e.g., takeaway food). This approach may not only help to shift affective responses in favour of reuse, but also support the cognitive aspects of decision-making, promoting a holistic and persuasive message to increase willingness to reuse takeaway food containers.

5. Conclusions

The findings of the present research found no evidence that providing information about cleaning increased people's willingness to reuse takeaway food containers showing signs of previous use, and in one study evidence that it may even backfire. However, there was some evidence that providing information about cleaning may help to reduce people's explicit concerns about some types of contamination. Dual processing theory highlights the challenge of overcoming automatic emotional responses, such as disgust, using education alone. Therefore, future studies might seek to explore how to strengthen information interventions.

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