Project Description

This research project aims to identify signage designs supporting successful waste sorting. It builds on a successful pilot study from Roskilde Festival 2021. This document details the methods planned for a stimuli identification study and nine laboratory studies where participants sort images of waste under different signage conditions. The experimental conditions follow insights from categorisation research and are designed to evaluate psychological principles as to why the pilot study intervention worked and possible boundary conditions of that effect.

Background: Pilot Study Results

At Roskilde Festival 2021, COVID-19 restrictions required the festival site to be parted into two physical halves featuring the same food and beverage outlets, but not allowing participants to cross, creating a natural randomised-control trial experimental setup. We carried out a series of pilot experiments on waste sorting signage and found that an experimental condition with signs providing multiple exemplars in high fidelity (physical examples glued to the signs) together with a monocolour iconographic and rule-descriptive text improved the chance of a waste item being sorted correctly with 16.1% compared to the baseline condition with signs only providing the monocolour iconographic exemplar together with rule-descriptive text (see Figure 1 below - as can be seen on Figure 2 below, this intervention differs quite radically from typical waste fraction signage designs across countries). A similar result has been obtained by Rousta et al. (2015) who find that replacing a black/white information sticker with drawn icons with a sticker containing coloured photos increased the amount of waste sorted into that fraction and reduced the number of miss-sorted packaging items and newspapers in these. While both these results are positive, they explain little about why they work. The present project addresses this question.

Figure 1 Examples of baseline condition (left) and experimental condition (right) on Roskilde Festival's replacement event Summer Days, summer 2021.

Figure 2 Examples of different waste fraction labelling systems. From left to right: Label and illustration for "Plastic Containers", Squamish-Lillooet Regional District. Illustration for "Plastic Recycling" distributed by ItaliaTools. Picture of bin with label and illustration for "PET Recycling" photographed in a park in Switzerland. Label and illustration for "Plastic Recycling" from the Danish national pictogram system.

This project investigates the behavioural effects obtained during the pilot study at Roskilde Festival 2021 through a stimuli identification study and nine waste sorting laboratory studies attempting to replicate and investigate potential explanations of the Pilot Study Findings and potential boundary conditions.

Laboratory Study 0: Stimuli Selection

The aim of Laboratory Study 0: Stimuli Selection is to develop a stimulus set for the remainder of the studies in the project. The goal is to ensure comparability of the stimuli used in the following studies on relevant parameters across waste fractions. This is to reduce the risk that potential effects of the resulting studies are solely due to the selected stimuli.

The stimuli identified in this study and to be sorted in the following studies will be referred to as "transfer" stimuli. Items on waste fraction signage will be referred to as "reference" stimuli.

Participant recruitment

We will attempt to recruit three populations of participants. Inclusion criteria for all populations are age > 18, normal or corrected-to-normal vision, and colour-sight. The populations differ in recruitment platform, nationality, and language requirements.

Population 1: Recruited for online participation through Prolific, a research participant recruitment tool previously positively evaluated (Palan & Schitter, 2018; Peer et al., 2017, 2021). Prolific offers particular large participant pools of US and UK citizens, why recruitment might focus on these. An additional inclusion criterium for this population is sufficient English proficiency.

Population 2: Recruited for online participation through Danish and Swedish agencies specialising in participant recruiting (e.g., Enkätfabriken, Bilendi, Norstat, SurveyMonkey Audience, and similar). Participants are recruited amongst Danish and Swedish citizens and an additional inclusion criterium for this population is sufficient Danish/Swedish proficiency.

Population 3: Recruited for physical participation through posters, e.g., around Lund University Campus. Like population 2, participants are recruited amongst Danish and Swedish citizens and an additional inclusion criterium for this population is sufficient Danish/Swedish proficiency.

Participants are compensated for their participation following the practices of the specific platform (e.g., minimum $8 per hour, preferably $14 for Prolific) or the guidelines of Lund University (gift cards of approximately the value of a movie ticket (~150 SEK) per hour). Where possible, the compensation consists of both a base pay for participating and an extra pay-out for each successful trial to incentivise effort.

The final number of participants is estimated following pilot studies of effect sizes to ensure that enough but neither too many participants are recruited. Our best estimate based on power analyses of effect sizes from previous studies suggest roughly 200-400 participants per study.

Method and Measures

We will employ the following method:

1) Participants are presented with the overall aim of the study and asked for informed consent. The consent form is attached to the application.

2) Participants are shown images of waste items (e.g., a banana peel). The waste items will be inspired by previous studies on waste sorting (e.g., Wu et al., 2018) and insights on common waste items in Danish and Swedish households. For a preliminary example, please see in Table 10 in Appendix 1 (page 15). For each item, participants will do some or all of the following:

    a. Identify the waste item. This can be done by asking the participant "What is this"?

    b. Evaluate the waste item's frequency. This can, for example, be done by asking the participant a question like "how many times have you disposed of this item in the last week?".

    c. Evaluate the waste item's prototypicality. This will be evaluated in relation to waste fractions (e.g., "residuals", "bio waste", etc) and can, for example, be done by asking the participant a question like "how representative of [fraction] do you think [waste item] is?".

    d. Evaluate the waste item's conceptual centrality. This can, for example, be done by combining typical measures of concept centrality across participants such as pairwise rating or spatial arrangement method (for a comparison, see Verheyen et al., 2022; and Verheyen & Storms, 2021). The output of these centrality measures allows us as researchers to map items in a spatial domain according to how similar participants consider them to be. The closer to the centrum of this mapping, the higher the conceptual centrality.

From the set of stimuli tested in Study 0, we will include a stimulus in the finished stimulus set if it is sufficiently well recognised and allows us to design the final stimuli set so that each waste fraction (e.g., "residuals", "bio waste", etc) has similar characteristics and overall distributions of frequency, prototypicality, and concept centrality as the other fractions.

Laboratory Study 1: Replicating Pilot Study Findings Digitally

At the pilot experiment during Roskilde Festival 2021, signs that had physical exemplars (reference stimuli) attached to them increased the likelihood that a waste item (transfer stimuli) was sorted correctly with 16.1% compared to the control condition (see Figure 1 above). The aim of this study is to replicate the effects found in the Pilot Study and to investigate if the facilitating effect is due to the number of exemplars presented.

Participant Recruitment

Participants will be recruited as in "Laboratory Study 0: Stimuli Selection".

Method and Measures

We will employ the following method:

1) Participants are presented with the overall aim of the study and asked for informed consent.

2) Participants are directed to a digital experimental platform developed for the study.

3) Sequentially, participants are shown images of waste items (identified in Laboratory Study 0: Stimuli Selection) and asked to sort them into waste fractions (e.g., "residuals", "bio waste", etc). This sorting task can take two design forms (the selection of which will depend on programming and statistical restrictions):

    a. A binary design where participants are shown only one fraction and a question like "does this item belong in this bin" with response options such as "yes" and "no".

    b. A multiple-option design where participants are shown multiple fractions and asked a question like "in which bin does this item belong"? Figure 3 below presents an example of such design.

4) Participants might also receive questions similar to those in the stimuli identification study (Laboratory Study 0: Stimuli Selection) to evaluate their understanding of the presented waste items as well as questions evaluating their thought process such as "why did you select this bin" or "which other bin(s) did you consider?", questions about their environmental attitude, and questions about the difficulty of the decision.

The independent variable is the contents/design of the waste fraction signage as described under "Conditions" below. The design is a between-fractions within-participants structure meaning that each participant can experience multiple conditions consisting of combinations of treatment variable values (where more than one treatment variable is present), but only one condition for each waste fraction to reduce learning effects. Each waste fraction will be assigned one of these conditions at random following a pre-defined structure ensuring that all conditions occur close to equally often across waste fractions (e.g., "residuals", "bio waste", etc). In conditions where the signage contain reference stimuli, they will be selected at random for each participant unless otherwise stated in this project description. Therefore, we might also evaluate data from across the following studies on the effect of whether the transfer stimuli is among the reference stimuli on the dependent variables below.

The dependent variables are the speed and accuracy of participants' categorisation decisions. The choice of speed and accuracy allows our findings to be mapped onto models of cognition such as the drift diffusion model (DDM, for an introduction, see e.g., Forstmann et al., 2016; Ratcliff & McKoon, 2008). To get insight into the process of selecting an alternative, the platform will also record the trajectory of participants' mouse movements. This type of measure has previously been found to mirror internal deliberation processes in categorization tasks (Duran & Dale, 2014; Freeman et al., 2008; McKinstry et al., 2008; Spivey et al., 2005).

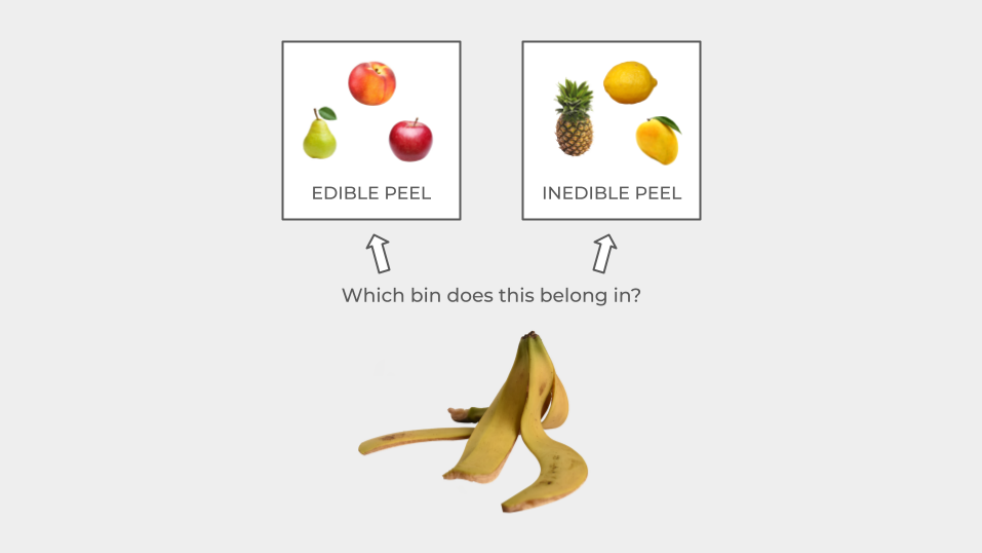

Figure 3 Example of the experimental setup. In this case, the participant is to sort a banana peel, the transfer item, and has to choose between the categories developed for this study, "edible peel" and "inedible peel" which are presented using three pictured exemplars without the transfer item present amongst them.

Conditions

The experimental conditions are digital variants of the two waste signage designs used in the Pilot Study. Furthermore, the experimental condition is varied by the number of reference stimuli presented. Table 1 below presents the three levels of the treatment variable:

Treatment Variable	Baseline condition	Experimental conditions
Number of reference stimuli	**0 reference stimuli:** Coloured quadrant with single white pictogram and rule describing the waste fraction.	**1, 2, …, n reference stimuli:** Same as baseline with one or more images of reference stimuli attached to the sign.

Table 1 Values of the treatment variable in Laboratory Study 1: Replicating Pilot Study Findings. The baseline and experimental conditions correspond to those of the Pilot Study (depicted in Figure 1 on page 1).

Laboratory Study 2: Investigating Visual Abstraction

The aim of study 2 is to investigate the role of visual abstraction of waste signage for facilitating waste sorting decisions.

The experimental conditions in "Laboratory Study 1: Replicating Pilot Study Findings Digitally" contain reference stimuli that deviate visually from the same study's baseline condition in several ways:

1) The reference stimuli (exemplars) are coloured (as opposed to white in the baseline) which Rousta et al. (2015) find to improve waste sorting
2) The reference stimuli are images (as opposed to icons in the baseline) which Rousta et al. (2015) find to improve waste sorting
3) The reference stimuli are in the same physical state (ready for disposal) as the transfer stimulus (waste items to be sorted). Findings by Trudel & Argo (2013) suggest that the state of the transfer stimuli is imperative for waste sorting and according to Tversky (1977) the link between prototype and instance is directional, meaning that congruence between the two might have an effect.

The aim of this study is to evaluate the impact of each of these factors on waste sorters' ability to sort and in turn inform future waste sorting signage designs.

Participant Recruitment

Participants will be recruited as in "Laboratory Study 0: Stimuli Selection".

Method and Measures

Method and measures will be the same as in "Laboratory Study 1: Replicating Pilot Study Findings".

Conditions

The experimental conditions are combinations of the two values of the three treatment variables presented in Table 2 below. Combining them in a 2x2x2 experimental design creates 2^3 (8) experimental conditions.

Treatment Variable	Values of Experimental Conditions in Pilot Study and Study 1	Values of Experimental Conditions in Pilot Study and Study 1
Colouring of reference stimuli	Waste fraction signage presents reference stimuli in white (for icons) or B/W (for images)	Waste fraction signage presents reference stimuli in colour
Fidelity of reference stimuli	Waste fraction signage presents low-fidelity (icons referring to) reference stimuli	Waste fraction signage presents high-fidelity (images of) reference stimuli
Congruence of physical state	Waste fraction signage presents reference stimuli in mint condition	Waste fraction signage presents reference stimuli in the state of disposal

Table 2 Treatment variables in Laboratory Study 2: Investigating Visual Abstraction.

Laboratory Study 3: Investigating Category Abstraction

The aim of study 3 is to investigate the role of category abstraction of waste signage for facilitating waste sorting decisions.

The signs used in the Pilot Study Intervention (see Figure 1 above) and evaluated digitally above (see "Laboratory Study 1: Replicating Pilot Study Findings Digitally") contain multiple reference stimuli while the baseline signs contain only one. Several theories within the study of categorisation suggest explanations for this:

1) More reference stimuli might cause a more thorough memory trace of the category (for an introduction to the "exemplar account" of categorisation, see e.g., Medin & Schaffer, 1978; Nosofsky, 1984, 1988)

2) With multiple refence stimuli, it is more likely that the prototypicality of the refence stimuli increases (for an introduction to the "prototype account" of categorisation, see e.g., Posner & Keele, 1968, 1970; Rosch et al., 1976; Rosch & Mervis, 1975; Smith et al., 1974)

3) It is more likely that the reference stimuli contain a stimulus often instantiated as representing that category (exemplar account based on frequency of instantiation)

4) The reference stimuli showcase the breadth of the category (the border section aspect of prototype accounts).

This study will evaluate which of these theoretical explanations might best explain the effect observed in the Pilot Study (and hopefully replicated in "Laboratory Study 1: Replicating Pilot Study Findings") and in turn support waste sorting abilities. The first will be investigated through a re-analysis of the results from "Laboratory Study 1: Replicating Pilot Study Findings", while the latter three informs the conditions presented below.

Participant Recruitment

Participants will be recruited as in "Laboratory Study 0: Stimuli Selection".

Method and Measures

Method and measures will be the same as in "Laboratory Study 1: Replicating Pilot Study Findings".

Conditions

The experimental conditions are combinations of values of the four treatment variables presented in Table 3 below. They can all be continuous if instantiated as the average value for the presented reference stimuli. A design using only extreme cases would render this experimental design with at least 2^3 (88) experimental conditions.

Treatment Variable	Control value	Theory-based value
Prototypicality	Waste fraction signage presents reference stimuli of low category prototypicality	Waste fraction signage presents reference stimuli of high category prototypicality
Frequency of instantiation	Waste fraction signage presents less frequent (e.g., bottom 10 quartile) reference stimuli	Waste fraction signage presents more frequent (e.g., top 10 quartile) reference stimuli
Conceptual centrality	Waste fraction signage presents conceptually peripheral reference stimuli	Waste fraction signage presents conceptually central reference stimuli

Table 3 Treatment variables and their values in Laboratory Study 3: Investigating Category Abstraction.

Laboratory Study 4: Investigating Cognitive Load

While the previous studies investigate aspects potentially explaining the findings of the Pilot Study, the following studies focus on how to improve waste sorting further. This study investigates aspects of cognitive load that might affect waste sorting behaviour following inspiration from previous studies finding that the number of categories affect the number of reference stimuli required (Donald et al., 1973; Homa & Chambliss, 1975). Furthermore, this study investigate the effects of task-irrelevant cognitive loads as the demand on working memory might hinder participants performance (for an example on the effect of cognitive load on social categorisation, see Spears et al., 1999) and are quite likely in real-world settings. In this study, the following factors that potentially affect cognitive load are investigated:

1) How colour consistency in waste sorting signage affects waste sorting
2) How the number of waste fractions (e.g., "residuals", "bio waste", etc) affects waste sorting
3) How the number of refence stimuli (in combination with the number of waste sorting fractions) affect waste sorting
4) How task-relevant cognitive load (such as describing reference stimuli with lines of text instead of with imagery) affect waste sorting performance
5) How task-irrelevant cognitive load (such as backwards counting or n-back tasks) affect waste sorting performance

The aim of this study is to evaluate each of these in relation to speed and accuracy of waste sorting.

Participant Recruitment

Participants will be recruited as in Laboratory Study 0: Stimuli Selection.

Method and Measures

Method and measures will be the same as in Laboratory Study 1: Replicating Pilot Study Findings.

Conditions

The experimental conditions are combinations of values of the five treatment variables presented in Table 4 below. Number of waste fractions and reference stimuli can both be continuous, rendering this experimental design with at least 2^5 (32) experimental conditions.

Treatment Variable	Possible values	
Colour consistency	Waste fraction signage presents reference stimuli and rule on neutral (e.g., white) background	Waste fraction signage presents reference stimuli and rule on (fraction-specific) coloured background
Number of Waste Fractions	Few (e.g., 3) to many (e.g., 8) waste fractions are present	
Number of reference stimuli	Waste fraction signage presents few (e.g., 1) to many (e.g., 5) reference stimuli	
Task-relevant cognitive load	Participants are not tasked with task-relevant cognitive load	Participants are tasked with task-relevant cognitive load
Task-irrelevant cognitive load	Participants are not tasked with task-irrelevant cognitive load	Participants are tasked with task-irrelevant cognitive load

Table 4 Treatment variables and their values in Laboratory Study 4: Investigating Cognitive Load.

Laboratory Study 5: Investigating Negative Reference Stimuli

Negative reference stimuli refer to stimuli advertised as *not belonging in the category*. In other words, all the reference stimuli mentioned thus far has been positive, they have *belonged* to the category. An ongoing study by Hunter et al., suggest that mixing positive reference stimuli (i.e., what should go into the bin) with negative reference stimuli (what should *not* go into the bin) improves waste sorting. Likewise, Corral & Carpenter (2020) find that transfer is increased when both correct and incorrect examples are used. Contrary, Wu et al. (2018) find no effect of negative reference stimuli. With our stimuli graded by conceptual centrality and prototypicality, we can investigate this further and more detailed.

This study aims to investigate under which conditions negative stimuli affect waste sorting.

Participant Recruitment

Participants will be recruited as in Laboratory Study 0: Stimuli Selection.

Method and Measures

Method and measures will be the same as in Laboratory Study 1: Replicating Pilot Study Findings.

Conditions

The experimental conditions are combinations of the values of the two treatment variables presented in Table 5 below. Combining them creates 5 experimental conditions.

Treatment Variable	Transfer stimuli among reference stimuli	Transfer stimuli not among reference stimuli
Waste signage presents positive reference stimuli only	Transfer stimuli among positive reference stimuli	
Waste signage presents positive and negative reference stimuli	Transfer stimuli among positive reference stimuli Transfer stimuli among negative reference stimuli	Transfer stimuli not among reference stimuli
Waste signage presents negative reference stimuli only	Transfer stimuli among negative reference stimuli	

Table 5 Treatment variables and their values in Laboratory Study 5: Investigating Negative Reference Stimuli.

Laboratory Study 6: Investigating Boundary-Spanning Reference Stimuli

This study aims to investigate whether border-spanning reference stimuli should best be presented as positive reference stimuli for the waste fraction they belong in or as negative reference stimuli for the waste fraction in which they do not belong in (but are conceptually mapped).

For example, it is possible that the effect of positive and negative reference stimuli is particularly important for reference stimuli spanning conceptual borders. In prototype theory, conceptual spaces are delimited by straight boarders perpendicular to the prototypes of the category. This can cause atypical items belonging to a category to "span" the border between that and another category. This is particularly likely when categories are artificially developed (such as waste fractions). An example is a pizza box, which might be closer to the prototype of the waste fraction "cardboard", but correctly belongs in the fraction "residuals" due to its grease-impermeable coating.

Participant Recruitment

Participants will be recruited as in Laboratory Study 0: Stimuli Selection.

Method and Measures

Method and measures will be the same as in Laboratory Study 1: Replicating Pilot Study Findings.

Conditions

The two experimental conditions are the location of border-spanning reference stimuli as presented in Table 6 below.

Treatment Variable		
Border-spanning reference stimuli location	Waste fraction signage presents conceptual border spanning instances as positive reference stimuli of the correct category	Waste fraction signage presents conceptual border-spanning instances as negative reference stimuli of the wrong category

Table 6 Treatment variables and their values in Laboratory Study 6: Investigating Boundary-Spanning Reference Stimuli.

Laboratory Study 7: Comparing Rules and Reference Stimuli

The aim of this study is to investigate whether rules or reference stimuli better support waste sorting behaviour.

Participant Recruitment

Participants will be recruited as in Laboratory Study 0: Stimuli Selection.

Method and Measures

Method and measures will be the same as in Laboratory Study 1: Replicating Pilot Study Findings.

Conditions

The experimental conditions are combinations of the values of the two treatment variables presented in Table 7 below. Combining them creates 3 experimental conditions (as it makes little sense to present waste fraction signage with neither rules nor reference stimuli).

Treatment Variable	Reference stimuli present	Reference stimuli absent
Rule description present	Waste fraction signage presents sorting rule and the combination of reference stimuli found to be most effective in previous studies	Waste fraction signage presents sorting rule (e.g., "paper", "glass", or "plastics") only
Rule description absent	Waste fraction signage presents only the combination of reference stimuli found to be most effective in previous studies	N/A

Table 7 Treatment variables and their values in Laboratory Study 7: Comparing Rules and Reference Stimuli.

Laboratory Study 8: Investigating Unintuitive Categories

This study investigates the generalisability of findings thus far onto unintuitive categories and onto novel contexts to rule out the possibility of this only working with familiar rules. See Figure 4 below for examples of arbitrary/unintuitive categories with fruits and vegetables as examples. The aim of this study is to evaluate

whether the developed and most efficacious signage conditions generalize to when participants are faced with novel and previously unencountered sorting rules.

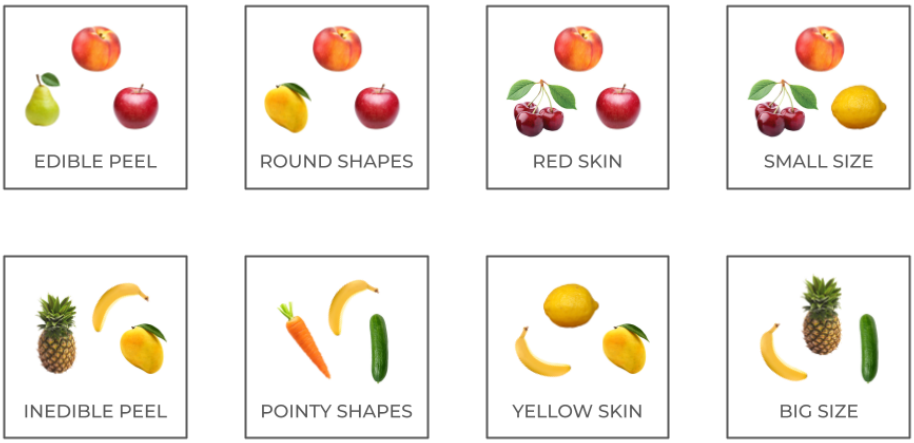

Figure 4 Examples of arbitrary/unintuitive categories for fruits and vegetables.

Participant Recruitment

Participants will be recruited as in Laboratory Study 0: Stimuli Selection.

Method and Measures

Method and measures will be the same as in Laboratory Study 1: Replicating Pilot Study Findings.

Conditions

The experimental conditions are combinations of the two values of the two treatment variables presented in Table 8 below. Combining them in a 2x2 experimental design creates 2^2 (4) experimental conditions.

Treatment Variable		
Rule intuitivity	Waste fraction signage present arbitrary/unintuitive categories (e.g., food and plastics combined)	Waste fraction signage present logical categories (e.g., food and plastics separately)
Rule familiarity	Waste fraction signage present categories typical of the geographical context (e.g., Danish waste fractions to Danish participants)	Waste fraction signage present categories atypical of the geographical context (e.g., American waste fractions to Swedish participants)

Table 8 Overview of treatment variables and their values in Laboratory Study 8: Investigating Unintuitive Categories.

Laboratory Study 9: Generalising Outside of the Laboratory

This study investigates the extent findings are limited by the computer environment in which earlier studies are run.

Participant recruitment

Participants will be recruited as in "Laboratory Study 0: Stimuli Selection". Importantly, for this study, half the participants must be part of Population 3 (see "Laboratory Study 0: Stimuli Selection").

Method and Measures

Method and measures will be the same as in Laboratory Study 1: Replicating Pilot Study Findings, except that participants will sort physical waste items into bins or similar.

Conditions

The waste signage design will be the one found to be most effective in the previous Laboratory Studies, but half the participants will experience it digitally and the other half physically as presented in Table 9 below.

Treatment Variable		
Medium of waste sorting	Participants sorting waste in the digital platform used hitherto	Participants sorting physical waste into physical bins

Table 9 Overview of treatment variables and their values in Laboratory Study 9: Generalising Outside of the Laboratory.

References

Corral, D., & Carpenter, S. K. (2020). Facilitating transfer through incorrect examples and explanatory feedback. *Quarterly Journal of Experimental Psychology*, *73*(9), 1340–1359. https://doi.org/10.1177/1747021820909454

Donald, H., Joseph, C., Don, C., David, G., & Steven, S. (1973). Prototype abstraction and classification of new instances as a function of number of instances defining the prototype. *Journal of Experimental Psychology*, *101*(1), 116–122. https://doi.org/10.1037/h0035772

Duran, N. D., & Dale, R. (2014). Perspective-taking in dialogue as self-organization under social constraints. *New Ideas in Psychology*, *32*(1), 131–146. https://doi.org/10.1016/j.newideapsych.2013.03.004

Forstmann, B. U., Ratcliff, R., & Wagenmakers, E. J. (2016). Sequential sampling models in cognitive neuroscience: Advantages, applications, and extensions. *Annual Review of Psychology*, *67*, 641–666. https://doi.org/10.1146/annurev-psych-122414-033645

Freeman, J. B., Ambady, N., Rule, N. O., & Johnson, K. L. (2008). Will a category cue attract you? Motor output reveals dynamic competition across person construal. *Journal of Experimental Psychology: General*, *137*(4), 673–690. https://doi.org/10.1037/a0013875

Homa, D., & Chambliss, D. (1975). The relative contributions of common and distinctive information on the abstraction from ill-defined categories. *Journal of Experimental Psychology: Human Learning and Memory*, *1*(4), 351–359. https://doi.org/10.1037/0278-7393.1.4.351

McKinstry, C., Dale, R., & Spivey, M. J. (2008). Action Dynamics Reveal Parallel Competition in Decision Making. *Psychological Science*, *19*(1), 22–24. https://doi.org/10.1111/j.1467-9280.2008.02041.x

Medin, D. L., & Schaffer, M. M. (1978). Context theory of classification learning. *Psychological Review*, *85*(3), 207–238. https://doi.org/10.1037/0033-295X.85.3.207

Nosofsky, R. M. (1984). Choice, similarity, and the context theory of classification. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *10*(1), 104–114. https://doi.org/10.1037/0278-7393.10.1.104

Nosofsky, R. M. (1988). Exemplar-based accounts of relations between classification, recognition, and typicality. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *14*(4), 700–708. https://doi.org/10.1037/0278-7393.14.4.700

Palan, S., & Schitter, C. (2018). Prolific.ac—A subject pool for online experiments. *Journal of Behavioral and Experimental Finance*, *17*, 22–27. https://doi.org/10.1016/j.jbef.2017.12.004

Peer, E., Brandimarte, L., Samat, S., & Acquisti, A. (2017). Beyond the Turk: Alternative platforms for crowdsourcing behavioral research. *Journal of Experimental Social Psychology*, *70*, 153–163. https://doi.org/10.1016/j.jesp.2017.01.006

Peer, E., Rothschild, D., Gordon, A., Evernden, Z., & Damer, E. (2021). Data quality of platforms and panels for online behavioral research. *Behavior Research Methods*, *54*(4), 1643–1662. https://doi.org/10.3758/s13428-021-01694-3

Posner, M. I., & Keele, S. W. (1968). On the genesis of abstract ideas. *Journal of Experimental Psychology*, *77*(3, Pt.1), 353–363. https://doi.org/10.1037/h0025953

Posner, M. I., & Keele, S. W. (1970). Retention of abstract ideas. *Journal of Experimental Psychology*, *83*(2, Pt.1), 304–308. https://doi.org/10.1037/h0028558

Ratcliff, R., & McKoon, G. (2008). The Diffusion Decision Model: Theory and Data for Two-Choice Decision Tasks. *Neural Computation*, *20*(4), 873–922. https://doi.org/10.1162/neco.2008.12-06-420

Rosch, E., & Mervis, C. B. (1975). Family resemblances: Studies in the internal structure of categories. *Cognitive Psychology*, *7*(4), 573–605. https://doi.org/10.1016/0010-0285(75)90024-9

Rosch, E., Simpson, C., & Miller, R. S. (1976). Structural bases of typicality effects. *Journal of Experimental Psychology: Human Perception and Performance*, *2*(4), 491–502. https://doi.org/10.1037/0096-1523.2.4.491

Rousta, K., Bolton, K., Lundin, M., & Dahlén, L. (2015). Quantitative assessment of distance to collection point and improved sorting information on source separation of household waste. *Waste Management*, *40*, 22–30. https://doi.org/10.1016/j.wasman.2015.03.005

Smith, E. E., Shoben, E. J., & Rips, L. J. (1974). Structure and process in semantic memory: A featural model for semantic decisions. *Psychological Review*, *81*(3), 214–241. https://doi.org/10.1037/h0036351

Spears, R., Haslam, S. A., & Jansen, R. (1999). The effect of cognitive load on social categorization in the category confusion paradigm. *European Journal of Social Psychology*, *29*(5–6), 621–639. https://doi.org/10.1002/(SICI)1099-0992(199908/09)29:5/6<621::AID-EJSP969>3.0.CO;2-W

Spivey, M. J., Grosjean, M., & Knoblich, G. (2005). Continuous attraction toward phonological competitors. *Proceedings of the National Academy of Sciences*, *102*(29), 10393–10398. https://doi.org/10.1073/pnas.0503903102

Trudel, R., & Argo, J. J. (2013). The Effect of Product Size and Form Distortion on Consumer Recycling Behavior. *Journal of Consumer Research*, *40*(4), 632–643. https://doi.org/10.1086/671475

Tversky, A. (1977). Features of similarity. *Psychological Review*, *84*(4), 327–352. https://doi.org/10.1037/0033-295X.84.4.327

Verheyen, S., & Storms, G. (2021). Whether the Pairwise Rating Method and the Spatial Arrangement Method yield comparable dimensionalities depends on the dimensionality choice procedure. *Methods in Psychology*, *5*, 100060. https://doi.org/10.1016/j.metip.2021.100060

Verheyen, S., White, A., & Storms, G. (2022). A Comparison of the Spatial Arrangement Method and the Total-Set Pairwise Rating Method for Obtaining Similarity Data in the Conceptual Domain. *Multivariate Behavioral Research*, *57*(2–3), 356–384. https://doi.org/10.1080/00273171.2020.1857216

Wu, D. W. L., Lenkic, P. J., DiGiacomo, A., Cech, P., Zhao, J., & Kingstone, A. (2018). How does the design of waste disposal signage influence waste disposal behavior? *Journal of Environmental Psychology*, *58*, 77–85. https://doi.org/10.1016/j.jenvp.2018.07.009

Appendix 1: PROVISIONAL List of Waste Items

Biologicals	Carboard	Glass	Hazardous	Metal	Paper	Plastics	Residual
Apple core	Shoe box	Wine bottle	Battery (AA)	Canned foods can	Magazine	Plastic bag	Diaper
Banana peel	Tissue box	Jam jar	Whipped cream spray	Beverage can	Letter/mail	Water bottle	Bandages
Orange peels	Cereal box	Soda bottle	Paint pot	Single-use tray	Newspaper	Soap/detergent bottle	Chips/coffee bag
Cake	Mail order box	Fractured glass	Nail polish	Tin foil	Receipt	Potato chips bag	Cigarette bud
Cereal (soaked)	Egg container	Medicine jar	Spray deodorant	Small metal box	Gift wrapping	Plastic straw	Vacuuming bag
Candy	Toilet paper roll		Spray paint	Metal wire basket	Envelope	Candy bag	Elastic wrapper
Pasta scraps	Postcard		LED bulb	Nails	Commercials	Bubble wrap	Menstruation products
Eggshells	Brown paper bag			Broken fork	Flyers	Take-away container	Cigarette package
Nut shells	Frozen dinner box					Yoghurt tub	Pizza box
Coffee grains							Pommes/hot dog tray
Fresh herbs							Balloons

Table 10 Provisional overview of items tested in the stimuli validation experiment