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Chapter 2

The Picture Superiority Effect (PSE) is a highly robust and replicable phenomenon; in recognition memory paradigms, the PSE generally presents as an increase in recollection in both healthy younger and older samples (Ally et al., 2008; Ally & Budson, 2007; Curran & Doyle, 2011; Rajaram, 1996). However, the level at which stimuli distinctiveness impacts successful recognition is currently unclear, and there is little consistency across studies with regard to what constitutes a ‘picture’, with many experiments utilising line-drawn illustrations (van der Meulen et al., 2012; Westerberg et al., 2013; Wolk et al., 2011) while others use photographs (Embree et al., 2012; Pitarque, 2016; Troyer et al., 2016, 2012; Wang et al., 2013). Methodological differences make it difficult to reconcile the effects of drawing vs. photograph. It is unclear whether the magnitude of picture superiority effects are mediated by the format pictures are presented in, and to our knowledge, no study has systematically matched items across formats in an effort to determine the point at which stimuli distinctiveness impacts recognition. Throughout a number of planned recognition experiments, we aim to systematically compare the impact different stimuli formats (written words, line-drawings, and photographs) have on the recollection and familiarity processes.

In order to make such comparisons, and ensure any differences in memory test performance are indeed attributable to stimuli format, we must ensure the same to-be-remembered concepts are similarly depicted across different ‘levels’ of stimuli format. The formats we have chosen to compare present common, everyday objects in either: i) written word format; ii) line-drawn illustrations; iii) photographs. Two of our stimuli formats were obtained from a pool provided by Rossion & Pourtois (2004); these objects consisted of line-drawings and their written-word labels.

To examine our research questions, it was necessary to develop a standardised pool of photographic stimuli that would act as an extension to the set of drawings/words obtained from Rossion

& Pourtois (2004). The currently outlined research will act as a precursor to the planned recognition memory experiments, and will seek to determine which of the three photograph variations we have already selected for each item most closely resembles the depiction in the line-drawings by Rossion and Pourtois (2004). We aim to achieve this by gathering normative data for all of the newly-obtained photographs, and then comparing this to the existing normative data for the line-drawings, in order to select the most suitable photograph variations to take forward into the proposed memory experiments. The data we plan to collect includes: i) the most commonly used name; ii) how familiar the object is; iii) how complex the image is; iv) whether the colour the object is currently depicted in is essential; and v) how closely the current depiction matches ones' mental image for the object). In addition to furthering our own research goals, the newly established set of photographic stimuli (and accompanying normative data) may also be useful to a range of other cognitive researchers looking for up-to-date, high quality stimuli.

The aim is to establish a new set of photograph stimuli for use in future planned memory experiments; the selected photographs will be supported by pilot data that help ensure they accurately depict the everyday objects in a similar fashion as those presented in line-drawings by Rossion & Pourtois (2004).

Whilst every effort has been made to source photographs that depict the everyday objects in a similar fashion to the line-drawings, the inherent subjectivity of this process may lead to images that are not an accurate 'match' of the objects they were chosen to depict; for example, the photograph chosen to convey "bottle" may inaccurately provoke the label "wine" in the majority of participants. To address this issue - and ensure all photographs objectively depict the same objects as their line-drawn counterparts when included in the planned memory experiments

- I am seeking to collect pilot data that will inform the selection of photograph stimuli. Participants will view a sample of the potential photographs and be asked to provide the name of the object currently depicted. This process will produce data that will either support the chosen photographs (e.g. 100% of participants labelled the object "bottle", which accurately matches the intentions of the researchers), or refute particular photographs (e.g. on 50% of participants labelled the item "bottle", whilst the other 50% used the label "wine"). Photographs showing poor agreement across participant-generated labels, or those where the majority of produced labels differ from that intended by the researcher, can be replaced with more accurate depictions prior to inclusion in the planned memory experiments.

Normative data is to be obtained for a newly-developed set of realistic object stimuli. This new set of stimuli consists of 816x high-quality photographs of innocuous everyday items (e.g. shoe – see example below). Items were matched with those from an existing set of line-drawn, illustrative stimuli (Rossion & Pourtois, 2004), with a goal of ultimately assessing how different stimuli formats impact recognition (realistic photographs vs. illustrations). In order to publish the new stimuli set – and later compare recognition for these items against recognition for line-drawn illustrations (Rossion & Pourtois, 2004) – the following normative data is required: i) the most commonly used name; ii) how familiar the item is; iii) how complex each depiction of the item is; iv) whether the colour is diagnostic (regularly seen in this colour vs. can be seen in a range of colours);
v) how well the current depiction matches mental images of the object.

The proposal to gather such normative data was made by reviewers during my progression, and it will form an important basis for the photographs that will be taken forward into planned memory research. For each item (e.g. shoe), we selected 3x potential photograph variations; in an effort to reduce researcher bias, we will rely on the newly-acquired normative data to determine which photograph variation best ‘matches’ the items from the set of line-drawings (Rossion & Pourtois, 2004).

Experiment 2

Method

Participants

A total of 374 subjects completed the online experiment (see Table 1 for a breakdown of the gender and age of the sample). This sample size provided 20 data points for each of the five response types, while also ensuring the experiment did not last too long for participants (approx 25-mins). Subjects were recruited from both voluntary participation websites such as Prolific Academic¹ (where they received payment at the rate of £5/hr), and via the in-school research participation system² (where they received course participation credits).

Table 1: Gender and age (*sd*) of the current sample.

Gender	N	Age	
Female	197	33.18	(11.26)
Male	170	33.23	(10.28)
Non-binary	2	23.50	(-)
Unspecified	5	29.40	(6.11)
Total	374	33.10	(10.76)

To meet our YA requirements, all participants were required to be aged between 18-59 years (actual obtained range: 18-59 years). As our experiment involved typing the English labels for a range of image stimuli, subjects were also asked whether English was their first language; all but one participant indicated that English was indeed their first language (99.73%).

Materials

A pool of 136 line-drawings (Rossion & Pourtois, 2004) - depicting common, everyday objects - were brought forward from the previous experiment. These items (along with their written-word labels) formed two unique stimuli formats that would be used in future recognition experiments (words and drawings), but in this study, they were simply used as a reference in the photograph matching process. Corresponding photographs were obtained online with the aim of depicting the everyday objects in a similar manner to the drawings; due to the inherent subjectivity of this latter task, three different photographs were found for each everyday object, with the aim of taking the best 'match' forward. An emphasis was placed on variety across these variations, with the aim of obtaining at least one photograph that very closely resembled the line-drawn depiction, and another offering a more modern depiction. Some items were substituted due to unique restrictions that meant they could not easily be translated into photographic format (for example, the shapes "arrow" and "star" can not be represented similarly as photographs). Photo stimuli were obtained by searching open-source, copyright-free image websites (e.g. Unsplash³;

¹<https://www.prolific.co/>

²<https://keelepsychology.sona-systems.com/>

³<https://unsplash.com/>

Pexels⁴) for photographs that depicted the same everyday objects as the line-drawings (the full list of image references can be found in Appendix A).

The matching process produced a total of 408 unique photographs. All were imported into Adobe Photoshop (20.0.04 Release), where the background was removed to isolate the object of interest from other potentially distracting visual details. This was completed manually using the magnetic lasso and polygonal lasso tools (edges were either feathered by 1px or left unfeathered). The orientation of isolated objects was adjusted to ensure they matched as closely as possible with their line-drawn counterpart (e.g. all photograph variations of the item ‘boot’ were adjusted so the toe was facing left and the heel facing right, as in the line drawing); this was often achieved by flipping or mirroring the object to ‘correct’ the direction.

Despite isolating objects from their background, a small number of photographs still contained irrelevant and potentially distracting details. For example, in one photograph variation of the item ‘piano’, there was a sign on the object that may have impacted how the item was named or rated. Such details were removed as best as possible using the clone stamp and content-aware fill tools. Any obvious text (e.g. brand names) and numbers were also removed from photographs using the same method (see Figure 10). The primary aim of the current study was to obtain photographs that could be clearly distinguished as a unique stimuli format among words and line drawings; it is conceivable that combining these formats (i.e. inadvertently including photographs that also contain written words) might affect recognition performance in ways that are not directly comparable to items defined only by a single category. Any text in our photographs was therefore removed, apart from a couple of exceptions whereby such details happened to be integral to the depiction of the object (e.g. the numbers found on a ruler or clock).

All photographs were exported from Photoshop in “.png” format in both their original colour and in greyscale (by setting saturation levels to 0). Final edits were completed in Adobe Lightroom (Classic, 8.2 Release): exposure (brightness) adjustments were made on images that appeared too light or too dark; highlights were decreased if some areas were too bright compared to the rest of the photograph; shadows were raised if some areas were too dark compared to the rest of the photograph; noise reduction was applied to some items after isolating the subject had inadvertently made unwanted noise/grain more visible. The changes made to each image were systematically applied to both the colour and greyscale versions (e.g. if one variation of “shoe” had an exposure increase of .010 for the colour version, the greyscale version also received an exposure increase of .010). Some colour-specific adjustments were made to the colour photographs only, however; common photo artefacts such as chromatic aberration (purple fringing) were corrected, along with white balance normalisation. Finally, all photographs were placed on a 600x600 pixel white background, and made to fill this frame as much as possible (i.e. some items were restrained by height, whilst others were restrained by width).

⁴<https://www.pexels.com/>

Original



Manipulated



Figure 10: Examples of text removal in photograph items.

Design

This was a descriptive study; a mix of qualitative and quantitative data were gathered in the absence of hypothesis testing. Across three blocks, all participants provided five types of response toward photograph stimuli: i) Naming; ii) Familiarity; iii) Visual Complexity, iv) Colour Diagnosticity; and v) Mental Imagery Agreement. Excluding the Naming task (consisting of a typed single-word answer), all responses were provided on a 5-point ordinal scale. Within par-

ticipants, the maximum number of response type provided for any one item was two; Naming and Familiarity responses were paired in one block, Visual Complexity and Colour Diagnosticity responses were paired in another, and Mental Imagery Agreement responses were always presented in a separate block. The order of these three blocks was counterbalanced across participants. Toward each individual photograph, participants made only one or two types of response before moving on to the next item, and the same items were not repeated to participants. For each photograph, the five types of required data were obtained by counterbalancing between participants (e.g. for the first variation of the “cat” photograph, the Naming and Familiarity data was obtained from one participant, the Visual Complexity and Colour Diagnosticity data was obtained from another, and the Mental Imagery Agreement data was obtained from another).

Procedure

Data collection was conducted via two online platforms; i) Qualtrics⁵ - a survey platform that allowed for straightforward collection of consent, demographics, and computer compatibility data, and ii) Pavlovia⁶ - an open-source experiment hosting platform for studies programmed in Javascript (Peirce et al., 2019).

In the Naming and Familiarity block, participants were first asked “What is the name of the item depicted?”. Subjects were instructed to name each photograph as briefly and unambiguously as possible, with one name only, and respond by typing their answer into the response box. If they did not know the name of an item, or had a tip-of-the-tongue experience, participants were instructed to type “no” for their answer (the term “don’t know” was avoided so as not to encourage subjects to deviate from single-word responses, as instructed). Following the naming judgement, with the same photograph still present on-screen, participants were next asked “How familiar is the item depicted?”. Subjects were instructed to judge each photo according to how usual or unusual the item was in their realm of experience; specifically, familiarity was defined as “the degree to which you come in contact with, or think about, the concept”, and encouraged participants to rate the concept itself rather than the particular way it was currently shown. Participants selected one value from the 5-point scale, ranging from very unfamiliar (1) to very familiar (5), and were encouraged to use the full range of the scale throughout the set of photographs.

In the Visual Complexity and Colour Diagnosticity block, participants were first instructed to respond to the question “How visually complex is this picture?” using a 5-point scale that ranged from “very simple” (1) to “very complex” (5). Complexity was defined to subjects as “the amount of detail in the picture”; in contrast to the familiarity ratings, participants were encouraged here to rate the complexity of the picture itself, rather than the real-life item. If the photograph shown was greyscale, subjects would simply move on to the next item. If the item shown was in colour, however, participants were also required to make a colour diagnosticity judgement. This concept was defined as “how typical / normal the colour of the item is”, instructing subjects to rate on a 5-point scale ranging from “Not at all diagnostic (i.e. this item could be in any other colour equally well)” (1) to ”Highly diagnostic (i.e. this item appears only in this colour in real life). Participants

⁵<https://www.qualtrics.com/uk/>

⁶<https://pavlovia.org/>

were instructed to utilise the full range of options on the scale when making visual complexity and colour diagnosticity judgements. After making these ratings, a fixation cross was presented during a 1s interstimulus interval.

Due to the slight change in procedure and increased task complexity, Mental Imagery Agreement ratings were always acquired in an individual block (i.e. not alongside any other response types). First, participants were presented with a written label for 3s (e.g. “cat”) and told to focus their attention on the word. Once the written word disappeared, a beep tone was played alongside the instruction “close your eyes and imagine this item” (subjects were encouraged to close their eyes and begin imagining the item as soon as they heard the tone, but the written instruction were included as a further prompt). After 3s a second beep tone sounded to alert subjects to open their eyes, where they were presented with a photograph of the item they had been instructed to imagine. On a 5-point scale, participants were asked to “rate the agreement between your mental image and the picture”, from “low agreement” (1) to “high agreement” (5). The degree of agreement was defined as “how similar your mental image of the item is to the picture shown”. A fixation cross was displayed for 1s before the next word item was shown.

All responses were self-paced; the timing was only controlled during the study/imagine section of the Mental Imagery Agreement block.

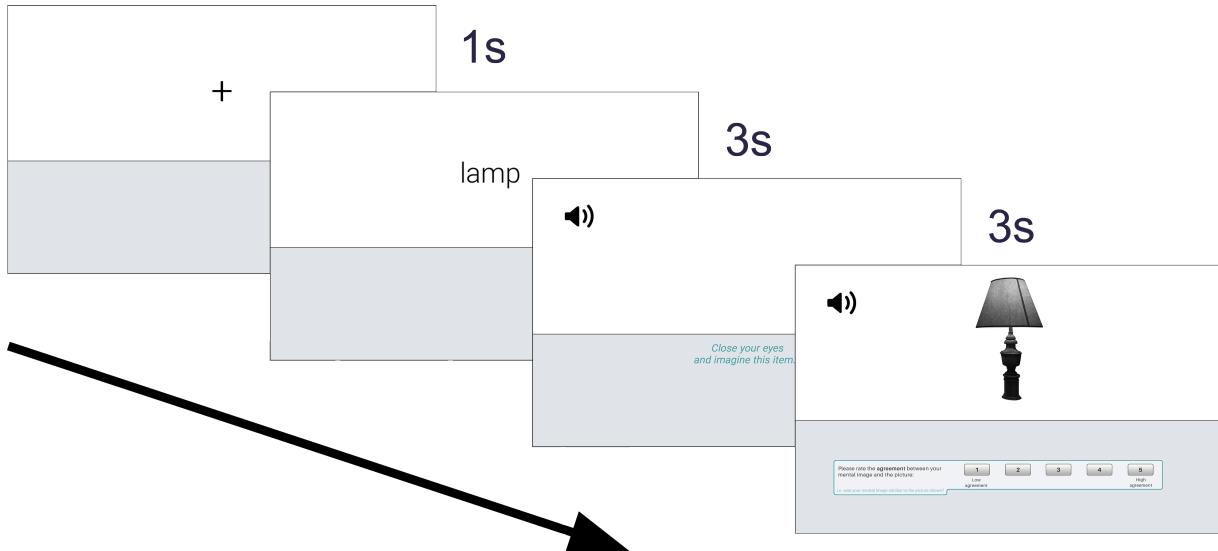


Figure 11: Data collection procedure for Mental Imagery Agreement responses.

Data preperatsion

The naming responses for each photograph item were manually assessed for spelling and typing errors. Automatic spell checking software was avoided in an effort to avoid inadvertently introducing unique names that were not actually given by participants. The vast majority of errors were unambiguous and easy to correct (e.g. “anker” = “anchor”, “peguin” = “penguin”, “ssnowman” = “snowman”), or consisted of transforming plural words to singular (or vice versa, depending on the form of the intended label - e.g. “sock” to “socks”). Some responses were a

little more ambiguous, and necessitated comparison to the photographs they were in response to for additional clarity (e.g. a photograph depicting a plug that would fit into North American electrical sockets was labelled as “usplug” - given the nature of our UK-based sample, it’s likely the subject was responding: “U.S. (i.e. United States) plug”.

There were instances where subjects provided a sensible and correctly spelled English word, but that were clearly typos when examined against the photograph they were in response to (e.g. “dock” for a photograph depicting a duck, “frock” for a frog, and “beer” for a “bear”, etc). The most ambiguous spelling error to correct was “bittle”, which was provided by more than one participant and to more than one item; separate inspections of the photographs participants were responding to made this easy to correct though, with one participant clearly meaning to respond “bottle”, whilst the other meant to respond “beetle”. Though participants were instructed to only give a single label for each item, some multiple word responses were found (without spaces) during the spell checking process. On such occasions, a judgement was made regarding whether multiple words were retained, or whether the response could be shortened into a single word. A general rule was applied whereby if the other words provided additional information, they were retained (e.g.“maledeer” - presumably “male deer” - was kept as a two-word answer). Multiple word responses were generally shortened into a single word when the intended label for the item was clearly present, and no information was lost in the process (e.g. “haircomb” was shortened to the intended answer “comb”). It is noted that there was some inherent subjectivity in this process, though as such items were not common among straightforward responses, their overall effects are estimated to be negligible.

Finally, there were some responses that were changed to “no” as they were clearly intended to signify that the responder did not know the name of the item shown; the experiment instructed participants to type “no” in these instances, though the labels “none” and “idk” (common abbreviation for “I don’t know) were provided instead. There was also a single response that was manually changed to “no”, as the provided label was a single letter and thus entirely unclear what the intended answer should be. All manipulations to naming responses can be found in Appendix C.

Naming: Most frequent name; Percentage of subjects giving this most frequent name; H: similar to b), but also takes into account the number of different names given for the item. See “Indices” for formula. Mean reaction times (RTs) and standard deviations (SDs).

Mean ratings were calculated for Familiarity, Visual Complexity, Colour Diagnosticity, and Mental imagery agreement.

Results

To compare responses across stimuli formats, separate one-way ANOVAs were conducted on the following variables:

(Naming) H (Naming) RT

(Familiarity) Mean (Familiarity) RT

(Visual Complexity) Mean (Visual Complexity) RT

(Colour Diagnosticity) Mean (Colour Diagnosticity) RT

(Mental Imagery Agreement) Mean (Mental Imagery Agreement) RT

Significant differences will be followed up with post-hoc pairwise multiple comparison tests

Naming

Experiment 3

Method

Participants

A total of 158 subjects completed the online experiment (see Table 4 for a breakdown of the gender and age of the sample).

To meet our YA requirements, all participants were required to be between 18-59 years of age (actual range: 18-58). As our experiment involved English word stimuli, we also asked subjects whether English was their first language; the vast majority (95.57%) reported that English was indeed their first language.

The current sample was comprised of participants sourced from voluntary participation websites such as Prolific Academic⁷ (72.78%), where payment at the rate of £5/hr was given, and via the in-school research participation system⁸ (15.19%), where they received course participation credits. A small number of participants were also recruited from Psychological Research on the Net⁹ (12.03%).

Table 4: Gender and age (SD) of the current sample.

Gender	N	Age
Female	96	29.53000 (10.18)
Male	58	31.36000 (11.19)
Questioning	1	21.00000 (-)
Unspecified	3	50.33333 (4.93)
Total	158	30.54000 (10.84)

⁷<https://www.prolific.co/>

⁸<https://keelepsychology.sona-systems.com/>

⁹<https://psych.hanover.edu/research/exponnet.html>

Results

Overall hits, false alarms (FAs), and recognition

Separate 3 (stimuli format: words, drawings, photographs) \times 2 (response-option condition: RFG-judgments, RFBG-judgments) mixed ANOVAs were conducted on the mean proportion of hits and false alarms (FAs; see Table 5).

Table 5: Mean proportion of hits and FAs by stimuli format and response-option condition.

	Hits	FAs
Stimuli format		
Words	0.55	0.21
Drawings	0.76	0.09
Photographs	0.86	0.05
Response option		
RFG	0.78	0.13
RFBG	0.74	0.11

Proportion of total hits

For the proportion of hits, there was a significant main effect of stimuli format [$F(1.75, 273.58) = 229.89, MSE = 0.02, p < .001$]. The interaction effect was not significant [$F(1.75, 273.58) = 0.74, MSE = 0.02, p = .461$]. Post-hoc comparisons for the main effect of stimuli format showed that photographs ($M = 0.86$) produced a significantly higher proportion of hits than both words ($M = 0.55$) [$t(312) = -20.96, p < .001$] and drawings ($M = 0.76$) [$t(312) = -6.55, p < .001$]. Drawings ($M = 0.76$) also produced a significantly higher proportion of hits compared to words ($M = 0.55$) [$t(312) = -14.41, p < .001$].

Proportion of total FAs

For the proportion of FAs, there was a significant main effect of stimuli format [$F(1.46, 227.29) = 106.64, MSE = 0.01, p < .001$]. The interaction effect was not significant [$F(1.46, 227.29) = 1.22, MSE = 0.01, p = .287$]. Post-hoc comparisons for the main effect of stimuli format showed that photographs ($M = 0.05$) produced a significantly lower proportion of FAs than both words ($M = 0.21$) [$t(312) = 13.98, p < .001$] and drawings ($M = 0.09$) [$t(312) = 3.34, p = .003$]. Drawings ($M = 0.09$) also produced a significantly lower proportion of FAs compared to words ($M = 0.21$) [$t(312) = 10.65, p < .001$].

Overall performance accuracy

For overall performance accuracy, there was a significant main effect of stimuli format [$F(1.93, 300.97) = 586.13, MSE = 0.02, p < .001$]. The interaction effect was not significant [$F(1.93, 300.97) = 2.02, MSE = 0.02, p = .136$]. Post-hoc comparisons for the main effect of stimuli format showed that photographs ($M = 0.81$) produced significantly better performance accuracy than both words ($M = 0.34$) [$t(312.00) = -33.25, p < .001$] and drawings ($M = 0.67$) [$t(312) = -9.57, p < .001$]. Drawings ($M = 0.67$) also produced significantly better performance accuracy compared to words ($M = 0.34$) [$t(312) = -23.69, p < .001$].

Discrimination (d') and response bias (c)

To assess the roles of discrimination and response bias, separate 3 (stimuli format: words, drawings, photographs) x 2 (response-option condition: RFG-judgments, RFBG-judgments) mixed ANOVAs were conducted on d' (d-prime; measure of sensitivity) and c -scores (decision criterion; see Table 6).

Table 6: Mean d' and c scores by stimuli-format and response-option condition.

	d'	c
Stimuli format		
Words	1.06	0.39
Drawings	2.18	0.32
Photographs	2.78	0.22
Response option		
RFG	0.10	0.01
RFBG	0.10	0.02

d' (discrimination)

For d' scores, there was a significant interaction between stimuli format and response-option [$F(2.00, 311.73) = 3.60, MSE = 0.26, p = .029$] (see Figure 1).

Photographs ($M = 2.86$) facilitated better discrimination between hits / FAs than both words ($M = 1.13$) [$t(312.00) = -21.66, p < .001$] and drawings ($M = 2.13$) [$t(312) = -9.13, p < .001$] in the RFG group. Drawings ($M = 2.13$) also showed significantly higher d' scores compared to words ($M = 1.13$) [$t(312) = -12.53, p < .001$]. In the RFBG group, the same pattern was evident; photographs ($M = 2.69$) facilitated better discrimination than both words ($M = 0.98$) [$t(312) = -20.79, p < .001$] and drawings ($M = 2.24$) [$t(312) = -5.53, p < .001$]. Again, drawings ($M = 2.24$) also showed significantly higher d' scores than words ($M = 0.98$) [$t(319.09) = -10.22, p < .001$].

Comparisons of stimuli format across the response-option groups showed that d' scores for photographs did not significantly differ between the RFG ($M = 2.86$) and RFBG ($M = 2.69$) conditions [$t(319.09) = 1.43, p = .709$], nor for drawings (RFG: $M = 2.13$, RFBG: $M = 2.24$, [$t(319.09) = -0.96, p = .932$]), nor for words (RFG: $M = 1.13$, RFBG: $M = 0.98$, [$t(319.09) = 1.39, p = .736$]).

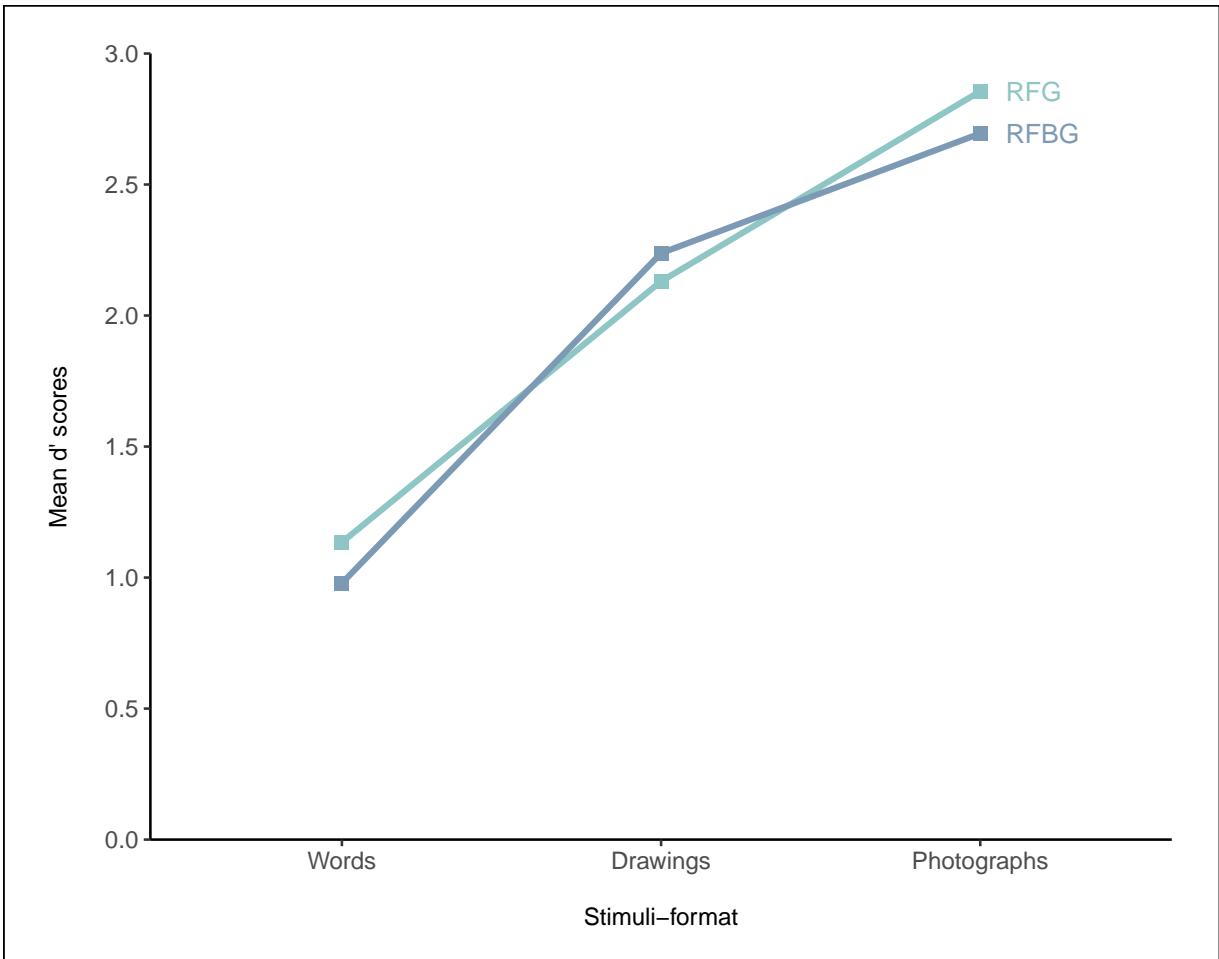


Figure 1: Interaction plot between stimuli format and response-option for d' scores

c (response bias)

For c -scores, there was a significant main effect of stimuli format [$F(1.74, 272.11) = 10.25, MSE = 0.13, p < .001$]. The interaction effect was not significant [$F(1.74, 272.11) = 0.62, MSE = 0.13, p = .518$]. Post-hoc comparisons for the main effect of stimuli format showed that photographs ($M = 0.22$) produced significantly lower c -scores (and thus a less conservative response bias) than both words ($M = 0.39$) [$t(312) = 4.52, p < .001$] and drawings ($M = 0.32$) [$t(312) = 2.53, p = .032$]. There was no difference in c -scores between drawings ($M = 0.32$) and words ($M = 0.39$) [$t(312) = 1.99, p = .116$].

Hits assigned Recollection, Familiarity, and Guessing

To determine the effects of stimuli format and response-option on accurate recognition memory judgments, separate 3 (stimuli format: words, drawings, photographs) x 2 (response-option condition: RFG-judgments, RFBG-judgments) mixed ANOVAs were conducted on the mean proportion of hits assigned Recollection, Familiarity, and Guessing (see Figure 2).

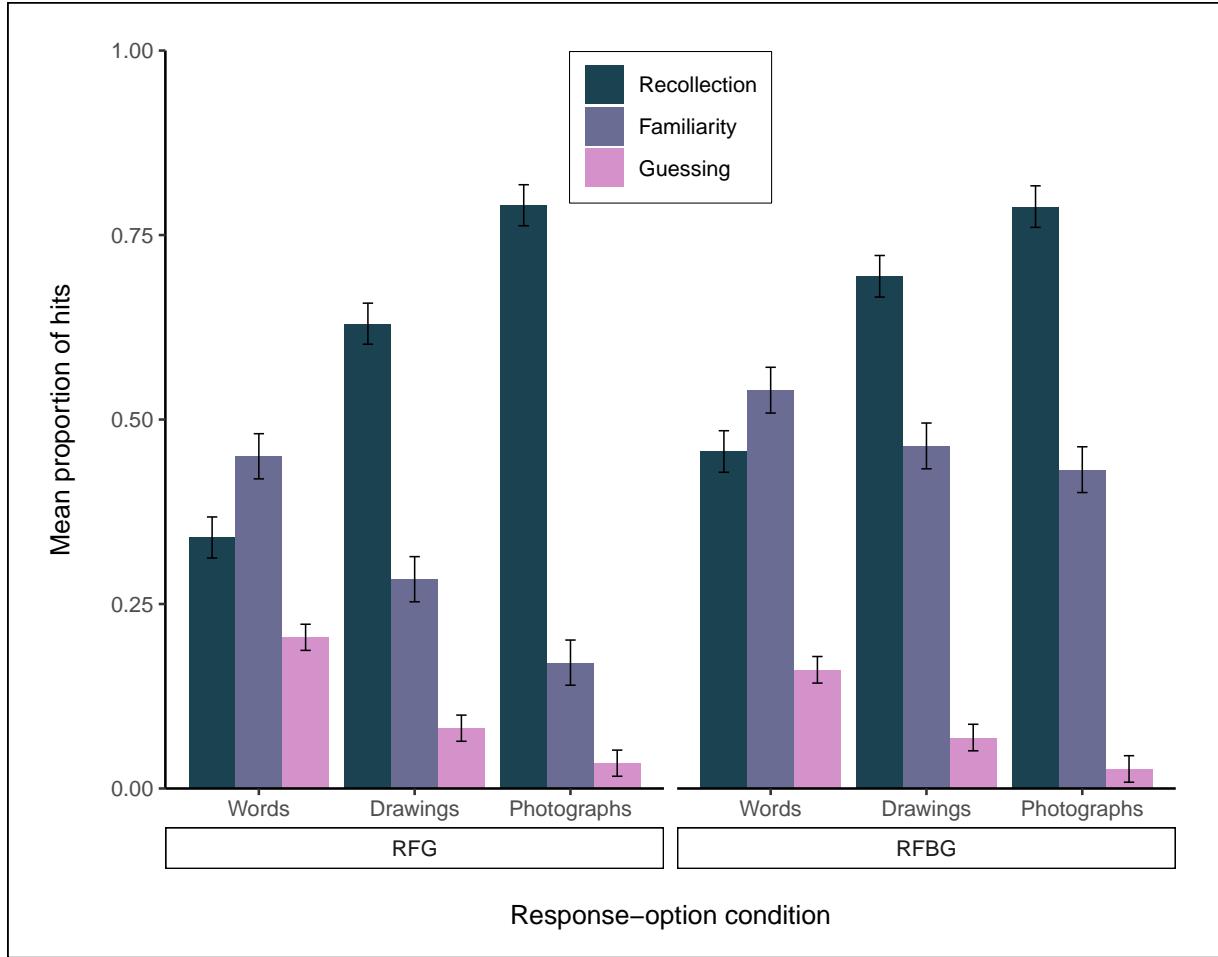


Figure 2: Proportion of hits assigned Recollection, Familiarity, and Guessing, by stimuli format and response-option condition.

Recollection (hits)

For hits assigned Recollection, there was a significant interaction effect [$F(1.77, 273.98) = 5.32, MSE = 0.03, p = .007$] (see Figure 4). Photographs ($M = 0.79$) resulted in more Recollection hits than both words ($M = 0.34$) [$t(310) = -17.90, p < .001$] and drawings ($M = 0.63$) [$t(310) = -6.38, p < .001$] in the RFG group. Drawings ($M = 0.63$) also resulted in more Recollection hits than words ($M = 0.34$) [$t(310) = -11.52, p < .001$] in the RFG group. In the RFBG group, there was an identical pattern; photographs ($M = 0.79$) resulted in more Recollection hits than both words ($M = 0.46$) [$t(310) = -12.62, p < .001$]

and drawings ($M = 0.69$) [$t(310) = -3.59, p = .005$]. Drawings ($M = 0.69$) also resulted in more Recollection hits than words ($M = 0.46$) [$t(310) = -9.03, p < .001$] in the RFBG group. Comparisons of stimuli format across the response-option groups showed no difference in the number of Recollection hits for photograph stimuli between the RFG ($M = 0.79$) and RFBG ($M = 0.79$) conditions [$t(278.97) = 0.05, p > .999$]. The same pattern was evident for drawings (RFG: $M = 0.63$, RFBG: $M = 0.69$ [$t(278.97) = -1.62, p = .584$]). Word stimuli, however, produced significantly more Recollection hits in the RFBG group ($M = 0.46$) compared to the RFG ($M = 0.34$) group [$t(278.97) = -2.94, p = .041$].

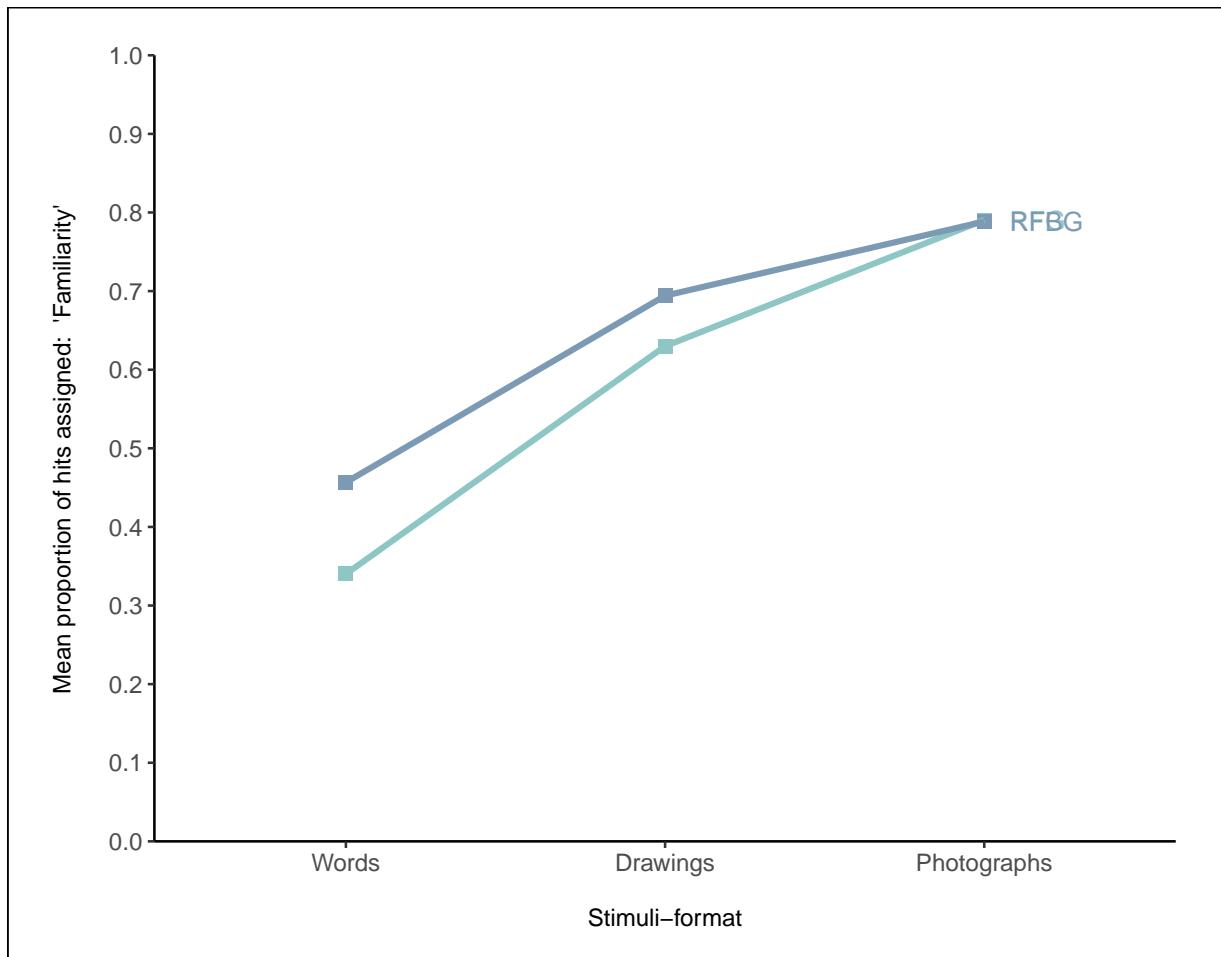


Figure 4: Interaction plot between stimuli format and response-option for the mean proportion of hits assigned 'Familiarity'.

Familiarity (hits)

For hits assigned Familiarity, there was a significant interaction between stimuli format and response-option [$F(1.52, 236.21) = 8.68, MSE = 0.04, p = .001$] (see Figure 4). Within the RFG condition, words ($M = 0.45$) resulted in more Familiarity hits than both drawings ($M = 0.28$) [$t(310) = 5.84, p < .001$] and photographs ($M = 0.17$) [$t(310) = 9.80,$

$p < .001]$. Drawings ($M = 0.28$) also produced more Familiarity hits compared to photographs ($M = 0.17$) [$t(310) = 3.96, p = .001$].

Within the RFBG condition, words ($M = 0.54$) still produced more Familiarity hits than photographs ($M = 0.43$) [$t(310) = 3.61, p = .005$]. However, there was no difference in the number of Familiarity hits when comparing words ($M = 0.54$) to drawings ($M = 0.46$) [$t(310) = 2.53, p = .118$]. Another difference from the within-RFG findings is the number of Familiarity hits for drawings ($M = 0.46$) did not differ from photographs ($M = 0.43$) in the RFBG condition [$t(310) = 1.08, p = .890$].

Comparisons across response-option conditions showed that drawings produced significantly more Familiarity hits in the RFBG ($M = 0.46$) condition compared to RFG ($M = 0.28$) [$t(289.15) = -4.14, p = .001$]. A similar pattern was also evident for photographs (RFG: $M = 0.17$, RFBG: $M = 0.43$ [$t(289.15) = -6.00, p < .001$]). Words, however, showed no difference in the number of Familiarity hits between the RFG ($M = 0.45$) and RFBG ($M = 0.54$) conditions [$t(289.15) = -2.06, p = .314$].

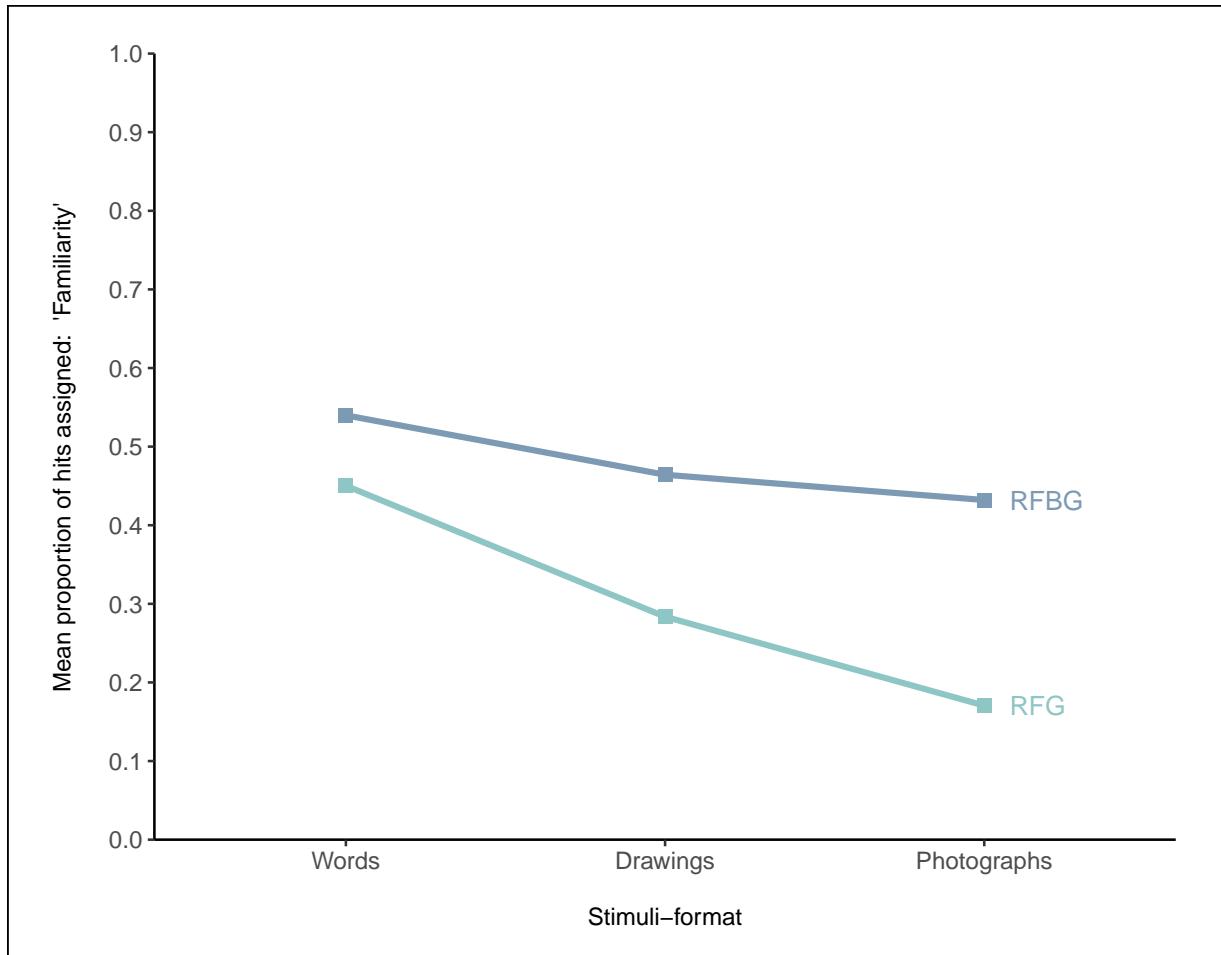


Figure 4: Interaction plot between stimuli format and response-option for the mean proportion of hits assigned 'Familiarity'.

Guessing (hits)

For hits assigned Guessing, there was a significant main effect of stimuli format [$F(1.32, 204.20) = 71.22, MSE = 0.02, p < .001$]. The interaction effect was not significant [$F(1.32, 204.20) = 1.12, MSE = 0.02, p = .308$]. Post-hoc comparisons for the main effect of stimuli format showed that words ($M = 0.18$) produced significantly more Guessing hits than both drawings ($M = 0.08$) [$t(310) = 8.19, p < .001$] and photographs ($M = 0.03$) [$t(310) = 11.61, p < .001$]. Drawings ($M = 0.08$) also produced significantly more Guessing hits compared to photographs ($M = 0.03$) [$t(310) = 3.43, p = .002$].

FAs assigned Recollection, Familiarity, and Guessing

To determine the effects of stimuli format and response-option on false alarms, separate 3 (stimuli format: words, drawings, photographs) \times 2 (response-option condition: RFG-judgments, RFBG-judgments) mixed ANOVAs were conducted on the mean proportion of FAs assigned Recollection, Familiarity, and Guessing (see Figure 5).

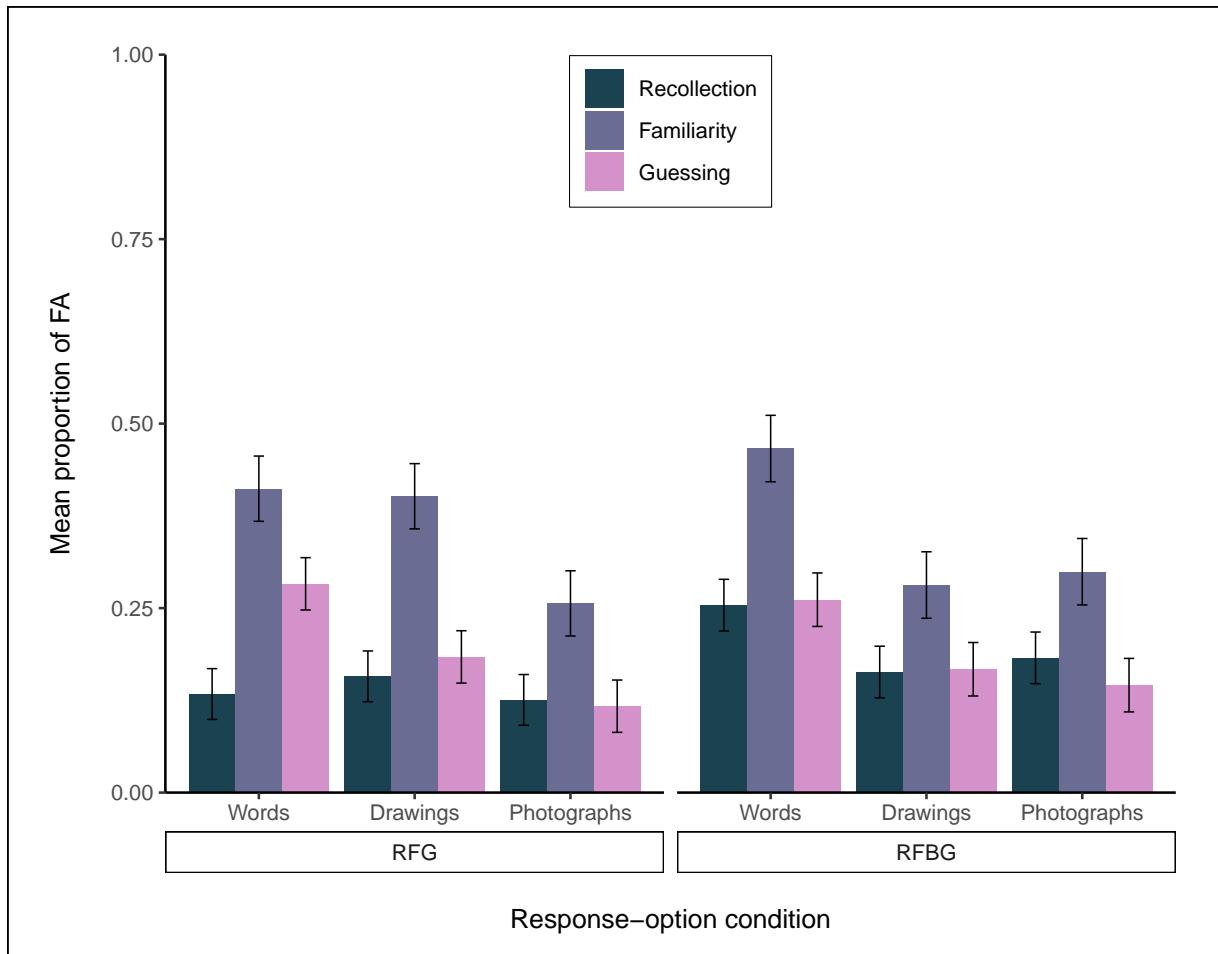


Figure 5: Proportion of FAs assigned Recollection, Familiarity, and Guessing, by stimuli format and response-option condition.

Recollection (FAs)

For FAs assigned Recollection, there was no significant main effect of stimuli format [$F(1.94, 301.96) = 1.11, MSE = 0.07, p = .328$] or interaction [$F(1.94, 301.96) = 2.02, MSE = 0.07, p = .136$].

Familiarity (FAs)

For FAs assigned Familiarity, there was a significant interaction between stimuli format and response-option [$F(1.98, 309.33) = 3.33, MSE = 0.11, p = .038$] (see Figure 6). Within the RFG condition, words ($M = 0.41$) resulted in more Familiarity FAs than photographs ($M = 0.26$) [$t(312) = 2.96, p = .039$], but not drawings ($M = 0.40$) [$t(312) = 0.20, p > .999$]. The number of Familiarity FAs did not differ between drawings ($M = 0.40$) and photographs ($M = 0.26$) [$t(312) = 2.76, p = .066$] in the RFG condition.

Within the RFBG condition, words ($M = 0.47$) again produced more Familiarity FAs than photographs ($M = 0.30$) [$t(312) = 3.06, p = .029$]. However, words ($M = 0.47$) also produced more Familiarity FAs than drawings ($M = 0.28$) [$t(312) = 3.39, p = .010$]. As before, the number of Familiarity FAs did not differ between drawings ($M = 0.28$) and photographs ($M = 0.30$) in the RFBG condition [$t(312) = -0.33, p = .999$].

Comparisons across response-option conditions showed no differences in the number of Familiarity FAs, for any stimuli format: words (RFG: $M = 0.41$, RFBG: $M = 0.47$ [$t(404.98) = -0.86, p = .955$]); drawings (RFG: $M = 0.40$, RFBG: $M = 0.28$ [$t(404.98) = 1.91, p = .400$]); photographs (RFG: $M = 0.26$, RFBG: $M = 0.30$ [$t(404.98) = -0.68, p = .984$]).

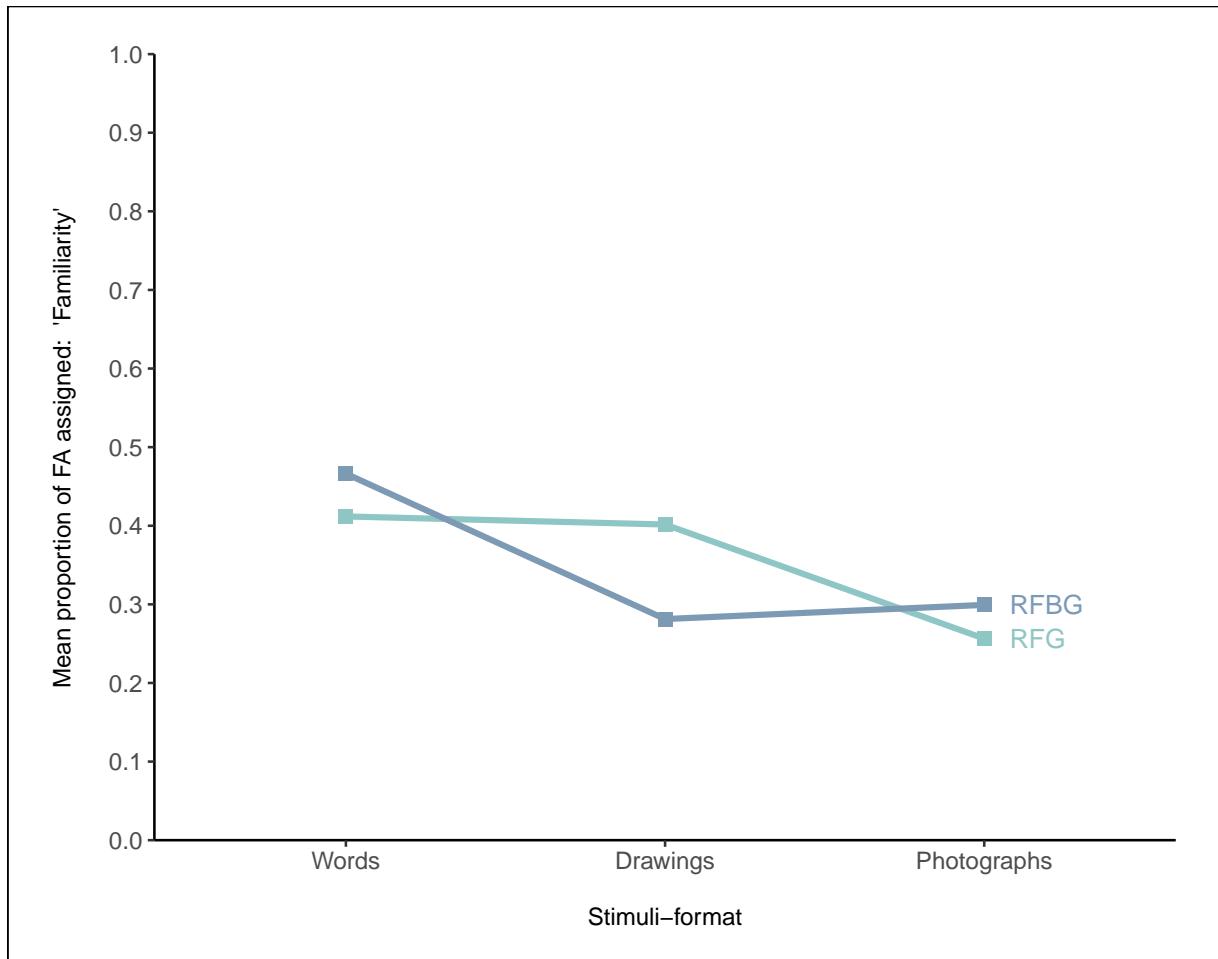


Figure 6: Interaction plot between stimuli format and response-option for the mean proportion of FAs assigned 'Familiarity'.

Guessing (FAs)

For FAs assigned Guessing, there was a significant main effect of stimuli format [$F(1.93, 300.68) = 9.44, MSE = 0.09, p < .001$]. The interaction effect was not significant [$F(1.93, 300.68) = 0.35, MSE = 0.09, p = .699$]. Post-hoc comparisons for the main effect of stimuli format showed that words ($M = 0.27$) produced significantly more Guessing FAs than both drawings ($M = 0.18$) [$t(312) = 2.91, p = .011$] and photographs ($M = 0.13$) [$t(312) = 4.25, p < .001$]. There was no difference in the proportion of FAs assigned Guessing between drawings ($M = 0.18$) and photographs ($M = 0.13$) [$t(312.00) = 1.33, p = .378$].

Experiment 4 (Colour)

Method

The objective of Experiment 4 was to examine PSE response patterns in younger adults toward colour stimuli, across two response-option conditions (RF-judgments / RFB-judgments). A 3x2 mixed factorial design was utilised, consisting of a within-subjects variable of stimulus type (words / colour line-drawings / colour photographs) and a between-subjects variable of response-option (RF-judgments / RFBG-judgments).

Participants

A total of 161 subjects completed the online experiment (see Table 7 for a breakdown of the gender and age of the sample).

To meet our YA requirements, all participants were required to be between 18-59 years of age (actual range: 18-57). As our experiment involved English word stimuli, we also asked subjects whether English was their first language; the vast majority (96.89%) reported that English was indeed their first language.

The current sample was comprised of participants sourced from voluntary participation websites such as Prolific Academic¹⁰ (86.34%), where payment at the rate of £5/hr was given, and via the in-school research participation system¹¹ (13.66%), where they received course participation credits.

Table 7: Gender and age (SD) of the current sample.

Gender	N	Age	
Female	97	31.78	(11.18)
Male	60	31.77	(10.3)
Non-binary	1	19.00	(-)
Transgender	1	32.00	(-)
Unspecified	2	38.50	(3.54)
Total	161	31.78	(10.76)

¹⁰<https://www.prolific.co/>

¹¹<https://keelepsychology.sona-systems.com/>

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Appendices

Appendix A

Table 2: Photograph sources.

Item	Image source	Item_1	Image source_1
anchor1	https://www.freeimages.com/photo/anchor-for-wooden-ship-1450171	bicycle1	https://unsplash.com/photos/TTJNeS4th34
anchor2	https://pixabay.com/photos/anchor-rust-erosion-metal-iron-571382/	bicycle2	https://unsplash.com/photos/tG36rvCeqng
anchor3	https://pixabay.com/photos/anchor-floor-anchors-water-ship-248608/	bicycle3	https://free-images.com/display/bicycle_city_stockholm_260411.html
apple1	https://unsplash.com/photos/l9oA-MlbUvc	book1	https://morguefile.com/p/174370
apple2	https://unsplash.com/photos/GbY8Xg5iTOA	book2	https://free-images.com/display/books_old_book_stack.html
apple3	https://www.pexels.com/photo/healthy-apple-fruits-natural-102104/	book3	https://free-images.com/display/book_antique_library_old.html
ashtray1	https://unsplash.com/photos/ui8jGS3FJkl	boot1	https://free-images.com/lg/6ab3/brown_mens_boots.jpg
ashtray2	https://cdn.pixabay.com/photo/2015/01/09/11/24/ashtray-594154_1280.jpg	boot2	https://images.unsplash.com/photo-1542838776-096d877b5aa2?ixlib=rb-1.2.1&ixid=eyJhcHBfaWQiOjEyJncHBfaWQiOjEyM
ashtray3	https://cdn.pixabay.com/photo/2016/04/20/13/40/ashtray-1341199_1280.jpg	boot3	https://unsplash.com/photos/QosA0iWdEsw
balloon1	https://unsplash.com/photos/vt-pyldkvIU	bottle1	https://unsplash.com/photos/AA4eKzQGXRxk
balloon2	https://unsplash.com/photos/slpibXlhizI	bottle2	https://www.pexels.com/photo/bottle-drinking-glass-wine-glass-40831/
balloon3	https://www.pexels.com/photo/closeup-photography-of-two-teal-and-three-pink-inflated-balloons-1851361/	bottle3	https://pixabay.com/photos/glass-a-bottle-of-composition-623803/
banana1	https://unsplash.com/photos/fS_lWTE3Umk	bowl1	https://free-images.com/display/bowl_dish_yellow_ceramic.html
banana2	https://unsplash.com/photos/pFECUXvWaWU	bowl2	https://unsplash.com/photos/Mz__Onr1AM8
banana3	https://www.pexels.com/photo/fruits-orange-banana-57556/	bowl3	https://www.pexels.com/photo/focused-photography-of-blue-ceramic-bowl-951340/
barrel1	https://pixabay.com/photos/barrel-wine-barrel-wooden-barrels-2632044/	bread1	https://pixabay.com/photos/bread-homemade-delicious-baked-4017877/
barrel2	https://pixabay.com/photos/whiskey-barrels-barrels-whisky-2611816/	bread2	https://pixabay.com/photos/long-bread-no-cores-cores-rye-bread-1576179/
barrel3	https://pixabay.com/photos/barrels-whisky-wooden-barrels-2631415/	bread3	https://pixabay.com/photos/bread-homemade-food-fresh-table-1319583/
basket1	https://unsplash.com/photos/qG37GMUDAJ0	broom1	https://www.freeimages.com/photo/broom-shadow-1490808
basket2	https://www.pexels.com/photo/basket-brick-wall-bricks-checkered-274050/	broom2	https://www.freeimages.com/photo/broom-1534034
basket3	https://unsplash.com/photos/y4n914GQV8	broom3	https://www.freeimages.com/photo/a-broom-1418081
bear1	https://morguefile.com/p/990525	brush1	https://pixabay.com/photos/symbolic-wealth-money-like-dirt-3156550/
bear2	https://unsplash.com/photos/hztya2tQqB8	brush2	https://www.pexels.com/photo/brush-shoe-brush-wooden-brush-scrubber-45059/
bear3	https://www.pexels.com/photo/nature-animal-bear-teddy-bear-46175/	brush3	https://free-images.com/display/brush_goat_hair_brush_0.html

(continued)

(continued)

Item	Image source	Item_1	Image source_1
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
candle1	https://unsplash.com/photos/uU_xyIcKM0Q	NA	NA
candle2	https://unsplash.com/photos/9UO_Syk5lg	NA	NA
candle3	https://unsplash.com/photos/_OuJbfPC6i8	NA	NA
cannon1	https://free-images.com/display/cannon_mont_orgueil_castle.html	NA	NA
cannon2	https://free-images.com/display/cannon_cannonballs_history_war.html	NA	NA
cannon3	https://free-images.com/display/cannon_weapon_wheel_gun.html	NA	NA
carrot1	https://unsplash.com/photos/wvCNxhERU3Y	NA	NA
carrot2	https://pixabay.com/photos/carrots-carrot-tops-vegetable-1112020/	NA	NA
carrot3	https://pixabay.com/photos/carrot-leaf-flora-nature-vegetable-317998/	NA	NA
celery1	https://www.pexels.com/photo/green-celery-carrots-and-pepper-flakes-garlic-34494/	NA	NA
celery2	https://pixabay.com/photos/celery-vegetables-vegetable-green-692867/	NA	NA
celery3	https://pixabay.com/photos/celery-vegetables-healthy-vitamins-74333/	NA	NA
chain1	https://morguefile.com/p/1024987	NA	NA
chain2	https://morguefile.com/p/956076	NA	NA
chain3	https://unsplash.com/photos/ydhN7dJBVRw	NA	NA
chair1	https://unsplash.com/photos/R8EaLeUHjNg	NA	NA
chair2	https://unsplash.com/photos/9xpnm41NKM	NA	NA
chair3	https://pixabay.com/photos/chair-wood-furniture-643246/	NA	NA
cherry1	https://unsplash.com/photos/INprSEBbfG4	NA	NA
cherry2	https://unsplash.com/photos/4LwWLbFRck4	NA	NA
cherry3	https://www.pexels.com/photo/red-cherry-fruit-768009/	NA	NA
chicken1	https://unsplash.com/photos/KtB6rFi_iaM	NA	NA

(continued)

Item	Image source	Item_1	Image source_1
chicken2	https://www.pexels.com/photo/selective-focus-photography-of-white-hen-1405930/	NA	NA
chicken3	https://www.pexels.com/photo/photo-of-chicken-1562389/	NA	NA
chisel1	https://pixabay.com/photos/tools-work-repair-hammer-2145771/	NA	NA
chisel2	https://free-images.com/display/hoggjern_spikeruttrekker.html	NA	NA
chisel3	https://free-images.com/display/dluta_plaskie_001.html	NA	NA
clock1	https://www.pexels.com/photo/brown-wooden-framed-clock-showing-2-19-191703/	NA	NA
clock2	https://pixabay.com/photos/time-clock-watch-pendulum-wood-3360517/	NA	NA
clock3	https://unsplash.com/photos/LBx_Jc6in9M	NA	NA
cloud1	https://unsplash.com/photos/bGh3TlzGGE	NA	NA
cloud2	https://www.pexels.com/photo/atmosphere-blue-blue-sky-cloud-216631/	NA	NA
cloud3	https://www.pexels.com/photo/air-atmosphere-background-beautiful-479333/	NA	NA
comb1	https://morguefile.com/p/93824	NA	NA
comb2	https://unsplash.com/photos/500suyTCSuw	NA	NA
comb3	https://free-images.com/display/scissors_comb_barber_beauty.html	NA	NA
corn1	https://www.pexels.com/photo/agriculture-bright-cereal-close-up-547263/	NA	NA
corn2	https://www.pexels.com/photo/agriculture-beans-corn-food-142520/	NA	NA
corn3	https://pixabay.com/photos/vegetable-corn-cut-out-2489368/	NA	NA
crown1	https://pixabay.com/photos/crown-kings-bavaria-germany-europe-759296/	NA	NA
crown2	https://pixabay.com/photos/king-crown-history-romania-1304612/	NA	NA
crown3	https://morguefile.com/p/1098037	NA	NA
deer1	https://unsplash.com/photos/B8xmtkWLRVo	NA	NA
deer2	https://unsplash.com/photos/mDxafj7gOuI	NA	NA
deer3	https://unsplash.com/photos/wLOcX5GMFnU	NA	NA
doll1	https://free-images.com/display/doll_toys_handbag_girl.html	NA	NA
doll2	https://free-images.com/display/doll_porcelain_doll_toy_0.html	NA	NA
doll3	https://free-images.com/display/doll_antique_girl_baby.html	NA	NA
donkey1	https://pixabay.com/photos/donkey-colt-grey-ride-horses-2653298/	NA	NA

(continued)

Item	Image source	Item_1	Image source_1
donkey2	https://pixabay.com/photos/dwarf-donkey-donkey-beast-of-burden-3728449/	NA	NA
donkey3	https://pixabay.com/photos/donkey-animal-farm-mammal-domestic-316467/	NA	NA
door1	https://unsplash.com/photos/ABL6vCKYKNQ	NA	NA
door2	https://unsplash.com/photos/RodWueEulfk	NA	NA
door3	https://pixabay.com/photos/door-contemporary-within-wall-3036579/	NA	NA
dress1	https://www.pexels.com/photo/women-standing-wall-1140907/	NA	NA
dress2	https://www.pexels.com/photo/standing-woman-on-white-snow-1653219/	NA	NA
dress3	https://free-images.com/display/img_3652_w.html	NA	NA
dresser1	https://www.shutterstock.com/image-photo/wooden-dresser-isolated-on-white-chest-617721857	NA	NA
dresser2	https://www.shutterstock.com/image-photo/four-drawers-modern-dresser-isolated-on-437085094	NA	NA
dresser3	https://www.shutterstock.com/image-photo/old-vintage-antique-chest-drawers-mahogany-307299242	NA	NA
drum1	https://pixabay.com/photos/drums-tools-percussion-music-1696802/	NA	NA
drum2	https://pixabay.com/photos/drums-snare-musical-instrument-322726/	NA	NA
drum3	https://free-images.com/display/boben_snare_zgornji_del.html	NA	NA
duck1	https://www.pexels.com/photo/brown-white-black-duck-162059/	NA	NA
duck2	https://unsplash.com/photos/wNeRmO0Xxm	NA	NA
duck3	https://unsplash.com/photos/GBFvpWDNsGw	NA	NA
eagle1	https://www.pexels.com/photo/depth-of-field-photography-of-white-and-brown-eagle-perching-on-gray-stone-632452/	NA	NA
eagle2	https://unsplash.com/photos/eYCMOVrJpbI	NA	NA
eagle3	https://free-images.com/display/bald_eagle_white_tailed.html	NA	NA
fence1	https://unsplash.com/photos/O9HQGKpGMLw	NA	NA
fence2	https://pixabay.com/photos/fence-wood-fence-fence-element-3238491/	NA	NA
fence3	https://www.shutterstock.com/image-photo/brown-wooden-fence-isolated-on-white-1012998937	NA	NA
fish1	https://unsplash.com/photos/egSqtHrxKDQ	NA	NA
fish2	https://pixabay.com/photos/fish-swim-water-animal-underwater-3322230/	NA	NA
fish3	https://free-images.com/display/fish_for_dinner.html	NA	NA

(continued)

Item	Image source	Item_1	Image source_1
flag1	https://unsplash.com/photos/ypbcd9f_Oos	NA	NA
flag2	https://pixabay.com/photos/flag-fly-china-beijing-color-540874/	NA	NA
flag3	https://pixabay.com/photos/red-flag-warning-beach-ocean-3132583/	NA	NA
flower1	https://unsplash.com/photos/EfhCUc_fjrU	NA	NA
flower2	https://unsplash.com/photos/GqPhbmoLUIs	NA	NA
flower3	https://www.pexels.com/photo/shallow-focus-photography-of-white-daisy-1028705/	NA	NA
flute1	https://pixabay.com/photos/flute-music-instrument-played-wind-893911/	NA	NA
flute2	https://free-images.com/display/music_irish_flute_music.html	NA	NA
flute3	https://pixabay.com/photos/piano-music-flute-classic-2656397/	NA	NA
foot1	https://www.pexels.com/photo/black-under-amour-sneakers-163535/	NA	NA
foot2	https://upload.wikimedia.org/wikipedia/commons/5/56/Foot_on_whitebackground.jpg	NA	NA
foot3	https://www.pexels.com/photo/close-up-photography-of-hands-and-feet-1076584/	NA	NA
frog1	https://unsplash.com/photos/wonpCSUrW4o	NA	NA
frog2	https://www.pexels.com/photo/frog-green-eye-35669/	NA	NA
frog3	https://www.pexels.com/photo/amphibian-animal-beautiful-biology-414224/	NA	NA
giraffe1	https://www.pexels.com/photo/photograph-of-giraffe-1319515/	NA	NA
giraffe2	https://unsplash.com/photos/UqB0TfldqNE	NA	NA
giraffe3	https://unsplash.com/photos/JRjod5VG0V0	NA	NA
glasses1	https://unsplash.com/photos/fAVhvFVrt2U	NA	NA
glasses2	https://www.pexels.com/photo/black-framed-clubmaster-style-eyeglasses-131018/	NA	NA
glasses3	https://www.pexels.com/photo/brown-framed-eyeglasses-947885/	NA	NA
goat1	https://www.pexels.com/photo/nature-animal-creature-goat-37910/	NA	NA
goat2	https://pixabay.com/photos/goat-billy-goat-goatee-goat-buck-1803931/	NA	NA
goat3	https://pixabay.com/photos/goat-horns-animal-mammals-2378000/	NA	NA
grapes1	https://unsplash.com/photos/QTgOjDCiJEo	NA	NA
grapes2	https://unsplash.com/photos/SxIRJsdHtGo	NA	NA
grapes3	https://morguefile.com/p/1082953	NA	NA
guitar1	https://unsplash.com/photos/MEL-jJnm7RQ	NA	NA

(continued)

Item	Image source	Item_1	Image source_1
guitar2	https://pixabay.com/photos/guitar-music-acoustic-instrument-923229/	NA	NA
guitar3	https://free-images.com/display/acoustic_guitar_guitar_music.html	NA	NA
hammer1	https://unsplash.com/photos/lCIZBVw5W5A	NA	NA
hammer2	https://www.pexels.com/photo/photo-of-gray-and-black-curve-claw-hammer-1166385/	NA	NA
hammer3	https://pixabay.com/photos/claw-hammer-hammer-tool-2202195/	NA	NA
hand1	https://unsplash.com/photos/TqfrYn9IDSA	NA	NA
hand2	https://www.pexels.com/photo/photo-of-hand-on-wall-1578238/	NA	NA
hand3	https://images.pexels.com/photos/1035598/pexels-photo-1035598.jpeg?cs=srgb&dl=adult-african-american-1035598.jpg&fm=jpg	NA	NA
harp1	https://pixabay.com/photos/harp-plucked-string-instrument-195636/	NA	NA
harp2	https://www.shutterstock.com/image-photo/celtic-irish-harp-classical-traditional-string-773328949	NA	NA
harp3	https://www.shutterstock.com/image-photo/classical-music-instrument-pedal-harp-765451057	NA	NA
horse1	https://unsplash.com/photos/Huza8QOO3tc	NA	NA
horse2	https://www.pexels.com/photo/agriculture-animal-close-up-country-side-463735/	NA	NA
horse3	https://pixabay.com/photos/horse-isolated-brown-animal-3108994/	NA	NA
house1	http://www.idesignarch.com/wp-content/uploads/Bellevue-Bungalow_1.jpg	NA	NA
house2	https://unsplash.com/photos/gVG8cRjHF-8	NA	NA
house3	https://unsplash.com/photos/561igiTyvSk	NA	NA
iron1	https://www.pexels.com/photo/green-white-phillips-iron-53422/	NA	NA
iron2	https://www.pexels.com/photo/iron-small-appliances-home-appliances-59980/	NA	NA
iron3	https://pixabay.com/photos/iron-old-house-work-budget-3215788/	NA	NA
jacket1	https://unsplash.com/photos/_BDBEP0ePQc	NA	NA
jacket2	https://unsplash.com/photos/ZumF1pEZkoM	NA	NA
jacket3	https://unsplash.com/photos/ifYt0sKdJYk	NA	NA
kettle1	https://www.pexels.com/photo/white-kettle-1921673/	NA	NA
kettle2	https://unsplash.com/photos/zF4IR0QM0IE	NA	NA
kettle3	https://unsplash.com/photos/XZs_iEWF_BM	NA	NA

(continued)

Item	Image source	Item_1	Image source_1
kite1	https://pixabay.com/photos/kite-fly-wind-fun-1159538/	NA	NA
kite2	https://unsplash.com/photos/RGPBLfxs0uA	NA	NA
kite3	https://pixabay.com/photos/kite-blue-sky-2093235/	NA	NA
knife1	https://unsplash.com/photos/_Skvg1Izyxc	NA	NA
knife2	https://pixabay.com/photos/food-fork-knife-table-plate-2803655/	NA	NA
knife3	https://www.pexels.com/photo/brown-biscuit-near-slice-of-butter-on-clear-glass-bowl-162786/	NA	NA
ladder1	https://pixabay.com/photos/head-wooden-ladder-ladder-3282513/	NA	NA
ladder2	https://unsplash.com/photos/_4fN83uC1nA	NA	NA
ladder3	https://www.pexels.com/photo/bookcase-books-bookshop-bookstore-220326/	NA	NA
lamp1	https://unsplash.com/photos/X7aoE7SggcA	NA	NA
lamp2	https://morguefile.com/p/679256	NA	NA
lamp3	https://pixabay.com/photos/night-table-lamp-light-bedside-table-843461/	NA	NA
leaf1	https://unsplash.com/photos/uZxT3njDQYc	NA	NA
leaf2	https://www.pexels.com/photo/close-up-photo-of-maple-leaf-837266/	NA	NA
leaf3	https://www.pexels.com/ja-jp/photo/1640613/	NA	NA
lemon1	https://unsplash.com/photos/KzDKyDi8wos	NA	NA
lemon2	https://www.pexels.com/photo/photo-of-yellow-lemon-on-gray-surface-952365/	NA	NA
lemon3	https://www.pexels.com/photo/close-up-photography-of-lemons-1414122/	NA	NA
lion1	https://unsplash.com/photos/ZxNKxnR32Ng	NA	NA
lion2	https://pixabay.com/photos/lion-king-of-the-jungle-animal-1200198/	NA	NA
lion3	https://pixabay.com/photos/lion-wild-predator-big-cat-mane-805390/	NA	NA
lips1	https://unsplash.com/photos/yI2rJVuNWFQ	NA	NA
lips2	https://unsplash.com/photos/CDDiTc_gM9U	NA	NA
lips3	https://www.pexels.com/de-de/foto/afroamerikanischer-mann-bart-black-male-blitz-2719416/	NA	NA
lobster1	https://pixabay.com/photos/lobster-lobsters-live-food-meal-164479/	NA	NA
lobster2	https://pixabay.com/photos/lobster-cook-food-seafood-healthy-1726627/	NA	NA
lobster3	https://pixabay.com/photos/lobsters-lobster-food-ide-1527602/	NA	NA

(continued)

Item	Image source	Item_1	Image source_1
lock1	https://www.pexels.com/photo/close-up-door-golden-keyhole-67537/	NA	NA
lock2	https://www.pexels.com/photo/close-up-photo-of-padlock-hanging-on-chain-link-fence-1806043/	NA	NA
lock3	https://pixabay.com/photos/padlock-lock-chain-key-security-597495/	NA	NA
mittens1	https://pixabay.com/photos/mittens-gloves-knitted-pels-1177211/	NA	NA
mittens2	https://pixabay.com/photos/mittens-mitten-hot-winter-autumn-3014337/	NA	NA
mittens3	https://morguefile.com/photos/morguefile/1/mittens/pop	NA	NA
monkey1	https://unsplash.com/photos/3cTt3zw89RU	NA	NA
monkey2	https://unsplash.com/photos/Q7Zhb7jx8Vg	NA	NA
monkey3	https://unsplash.com/photos/7As7milmu8s	NA	NA
moon1	https://unsplash.com/photos/TRXSkmJb40c	NA	NA
moon2	https://unsplash.com/photos/Dc3YQuyr2pU	NA	NA
moon3	https://unsplash.com/photos/8u5UkFaHe9s	NA	NA
mouse1	https://pixabay.com/photos/wood-mouse-nager-cute-mouse-rodent-2826216/	NA	NA
mouse2	https://free-images.com/display/mouse_rodent_cute_mammal_3.html	NA	NA
mouse3	https://www.pexels.com/photo/animal-cute-little-mouse-301448/	NA	NA
nail1	https://www.pexels.com/photo/brown-hammer-near-silver-nail-162644/	NA	NA
nail2	https://www.freeimages.com/photo/nail-1423326	NA	NA
nail3	https://free-images.com/display/metal_nails_steel_metallic.html	NA	NA
needle1	https://unsplash.com/photos/8wDm3cr48Xc	NA	NA
needle2	https://unsplash.com/photos/meIntAXztBw	NA	NA
needle3	https://pixabay.com/photos/needle-cotton-thread-sewing-1306832/	NA	NA
nose1	https://pixabay.com/photos/woman-model-sister-beautiful-scarf-2322776/	NA	NA
nose2	https://images.pexels.com/photos/2813027/pexels-photo-2813027.jpeg?auto=compress&cs=tinysrgb&dpr=1&w=500	NA	NA
nose3	https://unsplash.com/photos/dya-QyN-dE8	NA	NA
onion1	https://www.pexels.com/photo/red-brown-white-and-purple-onions-and-garlic-displayed-159250/	NA	NA
onion2	https://pixabay.com/photos/onion-bulbs-food-fresh-healthy-84722/	NA	NA
onion3	https://pixabay.com/photos/closeup-close-up-colour-cook-1238405/	NA	NA

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Item	Image source	Item_1	Image source_1
orange1	https://pixabay.com/photos/citrus-diet-food-fresh-fruit-2791/	NA	NA
orange2	https://cdn.pixabay.com/photo/2016/03/27/20/02/food-1284047_340.jpg	NA	NA
orange3	https://cdn.pixabay.com/photo/2015/12/21/15/05/mandarine-1102717_340.jpg	NA	NA
ostrich1	https://pixabay.com/photos/ostrich-male-savannah-feathers-341989/	NA	NA
ostrich2	https://pixabay.com/photos/bouquet-africa-bird-flightless-bird-4032399/	NA	NA
ostrich3	https://pixabay.com/photos/ostriches-bird-bouquet-strauss-3927186/	NA	NA
peach1	https://unsplash.com/photos/rqABly7c9j0	NA	NA
peach2	https://unsplash.com/photos/jVYnBn3M9R0	NA	NA
peach3	https://pixabay.com/photos/fruits-healthy-vitamins-eat-diet-2202431/	NA	NA
peacock1	https://pixabay.com/photos/peacock-turkey-ave-feathers-3485601/	NA	NA
peacock2	https://unsplash.com/photos/g0q4rAG_aEs	NA	NA
peacock3	https://pixabay.com/photos/peacock-bird-nature-peacock-eye-818219/	NA	NA
peanut1	https://www.pexels.com/photo/food-peanuts-shell-healthy-9603/	NA	NA
peanut2	https://www.pexels.com/photo/peanuts-209371/	NA	NA
peanut3	https://pixabay.com/photos/food-nuts-peanut-walnut-1648323/	NA	NA
pear1	https://pixabay.com/photos/fruit-grow-pear-food-desktop-3121966/	NA	NA
pear2	https://pixabay.com/photos/pear-light-shallow-depth-of-field-2228918/	NA	NA
pear3	https://www.freeimages.com/photo/pears-1322881	NA	NA
pencil1	https://www.pexels.com/photo/blank-empty-envelope-paper-236713/	NA	NA
pencil2	https://unsplash.com/photos/3BkgveM3y_k	NA	NA
pencil3	https://www.pexels.com/photo/white-notes-beside-a-pencil-on-brown-wooden-surface-733854/	NA	NA
penguin1	https://unsplash.com/photos/eA_Da4OfNTU	NA	NA
penguin2	https://www.pexels.com/photo/animal-beaks-bird-cold-209096/	NA	NA
penguin3	https://pixabay.com/photos/penguin-bird-arctic-zoo-animal-2630530/	NA	NA
pepper1	https://unsplash.com/photos/OddJmL-gTCY	NA	NA
pepper2	https://www.pexels.com/photo/food-healthy-vegetables-red-57426/	NA	NA

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Item	Image source	Item_1	Image source_1
pepper3	https://pixabay.com/photos/paprika-salad-food-healthy-3212137/	NA	NA
piano1	https://pixabay.com/photos/piano-grand-piano-black-instrument-179726/	NA	NA
piano2	https://pixabay.com/photos/wing-piano-bechstein-grand-piano-2538035/	NA	NA
piano3	https://free-images.com/display/piano_andres_bello.html	NA	NA
pipe1	https://unsplash.com/photos/N3nFwJkR9jE	NA	NA
pipe2	https://pixabay.com/photos/smoking-pipe-tobacco-tube-smoking-3081720/	NA	NA
pipe3	https://pixabay.com/photos/pipe-brown-canvas-old-design-2193716/	NA	NA
pitcher1	https://www.pexels.com/photo/agriculture-animal-blue-sky-breakfast-533307/	NA	NA
pitcher2	https://pixabay.com/photos/lemons-copy-space-food-healthy-2121578/	NA	NA
pitcher3	https://pixabay.com/photos/jug-pitcher-metal-metal-jug-1677576/	NA	NA
pliers1	https://pixabay.com/photos/tools-devices-work-craft-allen-379591/	NA	NA
pliers2	https://pixabay.com/photos/old-tools-pliers-tongs-equipment-1355143/	NA	NA
pliers3	https://pixabay.com/photos/pliers-tool-craft-profession-325631/	NA	NA
plug1	https://pixabay.com/photos/outlet-electricity-electric-plug-1329193/	NA	NA
plug2	https://pixabay.com/photos/nema-ac-power-plugs-2202272/	NA	NA
plug3	https://free-images.com/display/socksets_plug_electric_plug.html	NA	NA
potato1	https://unsplash.com/photos/B0s3Xndk6tw	NA	NA
potato2	https://www.pexels.com/photo/yellow-oval-potato-51157/	NA	NA
potato3	https://www.pexels.com/photo/closeup-photo-of-potatoes-162673/	NA	NA
pumpkin1	https://unsplash.com/photos/Q0EtW2PKS7k	NA	NA
pumpkin2	https://www.pexels.com/photo/delicious-food-harvest-ingredients-41964/	NA	NA
pumpkin3	https://www.pexels.com/photo/agriculture-color-fall-farm-265258/	NA	NA
rabbit1	https://unsplash.com/photos/jAEgMxEXR3U	NA	NA
rabbit2	https://unsplash.com/photos/2d0HqAw1kuE	NA	NA
rabbit3	https://pixabay.com/photos/rabbit-bunny-pet-cute-isolated-740621/	NA	NA

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Item	Image source	Item_1	Image source_1
raccoon1	https://unsplash.com/photos/5elT6kXSDmQ	NA	NA
raccoon2	https://pixabay.com/photos/raccoon-animal-wildlife-forest-1905528/	NA	NA
raccoon3	https://www.freeimages.com/photo/rabid-raccoon-1309083	NA	NA
ring1	https://pixabay.com/photos/engagement-ring-wedding-ring-2093824/	NA	NA
ring2	https://pixabay.com/photos/ring-pearl-gold-shine-jewelry-3030338/	NA	NA
ring3	https://pixabay.com/photos/wedding-ring-ring-silver-2541888/	NA	NA
ruler1	https://unsplash.com/photos/-CtAY9dnZb8	NA	NA
ruler2	https://www.pexels.com/photo/coffee-cup-mug-desk-5251/	NA	NA
ruler3	https://pixabay.com/photos/school-ruler-measure-school-840113/	NA	NA
screw1	https://www.pexels.com/photo/stainless-steel-screw-59994/	NA	NA
screw2	https://morguefile.com/p/650925	NA	NA
screw3	https://free-images.com/display/screws_plugs_equipment_metal.html	NA	NA
seal1	https://pixabay.com/photos/seal-gray-seal-crawling-animals-3997128/	NA	NA
seal2	https://pixabay.com/photos/seal-beach-animal-sea-marine-597838/	NA	NA
seal3	https://unsplash.com/photos/3yMlp-x9yDU	NA	NA
sheep1	https://unsplash.com/photos/RGgm5mib8sM	NA	NA
sheep2	https://unsplash.com/photos/F-QwR2auWSk	NA	NA
sheep3	https://unsplash.com/photos/MdFBcEMBytc	NA	NA
shirt1	https://www.pexels.com/photo/man-in-white-and-blue-plaid-dress-shirt-769749/	NA	NA
shirt2	https://free-images.com/display/shirts_things_top_view.html	NA	NA
shirt3	https://unsplash.com/photos/eSO7_yNJ33E	NA	NA
shoe1	https://www.pexels.com/photo/close-up-of-shoes-247321/	NA	NA
shoe2	https://pixabay.com/photos/wingtip-dress-shoes-leather-shoes-1684700/	NA	NA
shoe3	https://pixabay.com/photos/shoes-menswear-laces-brown-clothes-2369897/	NA	NA
skirt1	https://unsplash.com/photos/I1fHXAdqQgE	NA	NA
skirt2	https://unsplash.com/photos/MPR8F4-QWjs	NA	NA
skirt3	https://www.pexels.com/photo/dress-elegant-fashion-girl-601316/	NA	NA

(continued)

Item	Image source	Item_1	Image source_1
skunk1	https://pixabay.com/photos/skunk-wildlife-portrait-walking-1239764/	NA	NA
skunk2	https://www.shutterstock.com/image-photo/spotted-skunk-standing-on-back-legs-651828148	NA	NA
skunk3	https://www.shutterstock.com/image-photo/spotted-skunk-on-white-background-651828130	NA	NA
snail1	https://unsplash.com/photos/f3aPKwEeraA	NA	NA
snail2	https://unsplash.com/photos/qNcVCcIXcOo	NA	NA
snail3	https://unsplash.com/photos/58a-wW1zURY	NA	NA
snake1	https://www.pexels.com/photo/nature-australia-reptile-snake-106690/	NA	NA
snake2	https://unsplash.com/photos/NOINlvVgyvQ	NA	NA
snake3	https://unsplash.com/photos/jgFBXnK4F_g	NA	NA
snowman1	https://www.pexels.com/photo/photo-of-girl-beside-a-huge-snowman-1797225/	NA	NA
snowman2	https://free-images.com/display/snowman_snow_white_winter_2.html	NA	NA
snowman3	https://free-images.com/display/snowman_winter_snow_frozen.html	NA	NA
sockss1	https://pixabay.com/photos/datang-socks-black-stripes-woman-1495918/	NA	NA
sockss2	https://pixabay.com/photos/sockss-two-grey-deep-wool-woolen-1157528/	NA	NA
sockss3	http://static.freepik.com/free-photo/socks_2922363.jpg	NA	NA
spider1	https://unsplash.com/photos/x2dJcfCNO1A	NA	NA
spider2	https://www.pexels.com/photo/nature-outside-insect-macro-65596/	NA	NA
spider3	https://www.pexels.com/photo/arachnid-close-up-creepy-hairy-599276/	NA	NA
spoon1	https://unsplash.com/photos/VCPR2XX8Mvg	NA	NA
spoon2	https://unsplash.com/photos/KejgVx9bVTc	NA	NA
spoon3	https://unsplash.com/photos/wVTtapquBC0	NA	NA
stool1	https://pixabay.com/photos/stool-stand-ladder-books-get-963179/	NA	NA
stool2	https://www.freeimages.com/photo/wooden-stool-1417502	NA	NA
stool3	https://www.pexels.com/photo/round-red-and-beige-bar-stool-near-wall-2180883/	NA	NA
swan1	https://www.pexels.com/photo/nature-water-animal-river-38248/	NA	NA
swan2	https://unsplash.com/photos/VLoU-CbYjis	NA	NA

(continued)

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Item	Image source	Item_1	Image source_1
swan3	https://www.pexels.com/photo/reflection-of-swan-on-body-of-water-59816/	NA	NA
swing1	https://unsplash.com/photos/wU_KFrosSfs	NA	NA
swing2	https://www.pexels.com/photo/photo-of-three-swing-chairs-942543/	NA	NA
swing3	https://www.pexels.com/photo/empty-swing-850427/	NA	NA
table1	https://unsplash.com/photos/rXDAVb7tvA	NA	NA
table2	https://free-images.com/display/table_chairs_taverna_restaurant.html	NA	NA
table3	https://www.pexels.com/photo/coffee-table-beside-shelves-of-books-2079452/	NA	NA
thimble1	https://pixabay.com/photos/thimble-sewing-seamstress-weaving-2108886/	NA	NA
thimble2	https://pixabay.com/de/photos/couture-n%C3%A4hen-fingerhut-draht-1369917/	NA	NA
thimble3	http://cdn2.freepik.com/image/th/2303334.jpg	NA	NA
thumb1	https://cdn.pixabay.com/photo/2014/08/20/15/35/thumb-422558_180.jpg	NA	NA
thumb2	https://pixabay.com/photos/fingers-gesture-hand-thumbs-up-1867478/	NA	NA
thumb3	https://www.freepik.com/free-photo/happy-african-man-showing-thumbs-up_2911070.htm#page=1&query=thumb%20african&position=21	NA	NA
tiger1	https://unsplash.com/photos/pp11qw5O44U	NA	NA
tiger2	https://www.pexels.com/photo/amur-tiger-angry-animal-animal-photography-533055/	NA	NA
tiger3	https://www.pexels.com/photo/tiger-standing-on-the-grey-concrete-pavement-162203/	NA	NA
toaster1	https://www.pexels.com/photo/white-and-black-two-sliced-bread-toaster-60040/	NA	NA
toaster2	https://www.freeimages.com/photo/colour-toast-1490426	NA	NA
toaster3	https://pixabay.com/photos/kitchen-toaster-kettle-home-874805/	NA	NA
tomato1	https://unsplash.com/photos/UD_j10SKj5g	NA	NA
tomato2	https://unsplash.com/photos/ELYahaFAFo8	NA	NA
tomato3	https://www.pexels.com/photo/two-ripe-tomatoes-793266/	NA	NA
train1	https://unsplash.com/photos/GHWVZvGCEuA	NA	NA
train2	https://unsplash.com/photos/iz7ypXtliMU	NA	NA
train3	https://unsplash.com/photos/7KKQG0eB_TI	NA	NA
tree1	https://www.pexels.com/photo/night-tree-7130/	NA	NA
tree2	https://morguefile.com/p/1101400	NA	NA

(continued)

Item	Image source	Item_1	Image source_1
tree3	https://pixabay.com/photos/oak-tree-individually-nature-354641/	NA	NA
trumpet1	https://pixabay.com/photos/trumpet-horn-wind-instrument-2878665/	NA	NA
trumpet2	https://pixabay.com/images/download/trumpet-7975.jpg?attachment	NA	NA
trumpet3	https://pixabay.com/photos/trumpet-brass-instrument-music-3883792/	NA	NA
turtle1	https://unsplash.com/photos/-R64QTUiG3c	NA	NA
turtle2	https://www.pexels.com/photo/black-tortoise-standing-162307/	NA	NA
turtle3	https://pixabay.com/photos/turtle-isolated-tortoise-panzer-2902628/	NA	NA
vest1	https://www.pexels.com/photo/woman-holding-gray-hat-1537502/	NA	NA
vest2	https://pixabay.com/photos/suit-vest-men-s-match-2737910/	NA	NA
vest3	https://free-images.com/display/businessman_fashion_man_person.html	NA	NA
violin1	https://unsplash.com/photos/kYxlv6TjXLo	NA	NA
violin2	https://pixabay.com/photos/violin-music-instrument-1638742/	NA	NA
violin3	https://www.pexels.com/photo/acoustic-bowed-string-instrument-bowed-stringed-instrument-classical-462447/	NA	NA
watch1	https://unsplash.com/photos/AtXt2oLqYns	NA	NA
watch2	https://unsplash.com/photos/ccncRDICVNk	NA	NA
watch3	https://www.pexels.com/photo/analog-watch-blur-classic-close-up-236915/	NA	NA
well1	https://pixabay.com/photos/fountain-old-middle-ages-old-well-2643789/	NA	NA
well2	https://pixabay.com/photos/wish-well-wishing-well-wishing-704561/	NA	NA
well3	https://free-images.com/display/sibiel_romania_well_house.html	NA	NA
whistle1	https://pixabay.com/sv/photos/handen-tummen-upp-tecken-m%C3%A4nskliga-166442/	NA	NA
whistle2	https://simumak.com/images/HomeSoluciones7.jpg	NA	NA
whistle3	https://www.shutterstock.com/image-photo/silver-sports-whistle-pea-isolated-on-99723956	NA	NA
window1	https://unsplash.com/photos/Aqfpqx46ITI	NA	NA
window2	https://unsplash.com/photos/4gRNmhGzYZE	NA	NA
window3	https://unsplash.com/photos/bakx-4TJaiM	NA	NA
zebra1	http://pngimg.com/download/8963	NA	NA

(continued)

Item	Image source	Item_1	Image source_1
zebra2	https://www.pexels.com/photo/selective-focus-photography-of-zebra-750539/	NA	NA
zebra3	https://pixabay.com/photos/zebra-chapman-burchell-s-zebra-1491253/	NA	NA

Appendix C

Table 3: Spelling corrections / manipulations to naming responses.

Response	Correction	Response	Correction	Response	Correction
idk	no	canle	candle	giaraffe	giraffe
none	no	canon	cannon	glases	glasses
a	no	carrott	carrot	gutair	guitar
anker	anchor	carott	carrot	gitaur	guitar
ancher	anchor	cerlery	celery	gitter	guitar
anchore	anchor	celary	celery	hemmar	hammer
ancor	anchor	cellary	celery	hand5	hand
ashtry	ashtray	celeary	celery	hamp	harp
;ashtray	ashtray	chain2	chain	kacket	jacket
aparagus	asparagus	cockrel	cockerel	kangroo	kangaroo
ballon	balloon	cockaroach	cockroach	lader	ladder
baloon	balloon	cochroach	cockroach	latter	ladder
ballone	balloon	chissel	chisel	leafe	leaf
ballun	balloon	chizel	chisel	lettace	lettuce
balloone	balloon	chestofdraws	chest of drawers	leamon	lemon
bannan	banana	chestofdrawersrss	chest of drawers	leema	lemur
bamnna	banana	chisle	chisel	lobster	lobster
bananna	banana	claranet	clarinet	maledear	maledeer
bannana	banana	combe	comb	mortle	mortar
bananaa	banana	dear	deer	monkeybut	monkeynut
barrell	barrel	deere	deer	mousse	moose
barrele	barrel	draws	drawers	neddle	needle
barel	barrel	doormouse	dormouse	nectarinee	nectarine
barrow	barrel	eagal	eagle	onions	onion
busket	basket	eeagle	eagle	ostrage	ostrich
bellpepp34	bellpepper	eclipses	eclipse	osterich	ostrich
beatle	beetle	eclipes	eclipse	ostrige	ostrich
bettle	beetle	eclipsse	eclipse	ostrisge	ostrich
blueberrys	blueberries	falg	flag	ostritch	ostrich
bycycle	bicycle	footstall	footstool	ostridge	ostrich
bicucle	bicycle	fott	foot	apricorte	apricot
bicyle	bicycle	frog/	frog	nectarin	nectarine
bootle	bottle	girafffe	giraffe	nectrine	nectarine
bolw	bowl	giraffee	giraffe	peacock	peacock
broon	broom	girrafe	giraffe	peacck	peacock

(continued)

Response	Correction	Response	Correction	Response	Correction
broon	broom	girafe	giraffe	pair	pear
brum	broom	giraff	giraffe	oencil	pencil
camal	camel	giaffee	giraffe	penguin	penguin
canddle	candle	girraffe	giraffe	penguun	penguin
penguine	penguin	timbil	thimble	drums	drum
penquin	penguin	thunb	thumb	feet	foot
peguin	penguin	toitouse	tortoise	geese	goose
peper	pepper	tomatoe	tomato	gloves	glove
pestleandmorter	pestleandmortar	grape	grapes	ladders	ladder
tabaccopipe	tobaccopipe	tomoato	tomato	lip	lips
piccalo	piccolo	tortiste	tortoise	mice	mouse
piars	pliers	tortise	tortoise	mittens	mitten
plier	pliers	tortus	tortoise	onions	onion
plyers	pliers	volion	violin	cock	cockerel
pilers	pliers	vioin	violin	cycle	bicycle
pliers	pliers	violen	violin	dolly	doll
vicescripts	vicegrips	vulture	vulture	eyeglass	eyeglasses
usplug	plug	waistcoast	waistcoat	fencing	fence
potatoe	potato	wastecost	waistcoat	haircomb	comb
pottato	potato	wale	well	longdress	dress
pumkin	pumpkin	whistel	whistle	mit	mitten
pumpkim	pumpkin	whsitle	whistle	plugin	plug
pumpkin	pumpkin	whisell	whistle	rule	ruler
rabit	rabbit	whittle	whistle	specs	spectacles
racoон	raccoon	windowd	window	teakettle	kettle
mercat	meerkat	peneut	peanut		
meercat	meerkat	beer	bear		
acoop	scoop	dock	duck		
eele	seal	frock	frog		
seel	seal	glass	glasses		
snakw	snake	glassesbottle	bottle		
ssnowman	snowman	hose	house		
showel	shovel	noise	nose		
soak	socks	paper	pepper		
spon	spoon	harper	hamper		
steplader	stepladder	muscat	muskrat		
sterss	step	bittle	bottle		
sweetcurn	sweetcorn	bittle	beetle		

(continued)

Response	Correction	Response	Correction	Response	Correction
rubarb thinbell	rhubarb thimble	carrots clouds	carrot cloud		
thmble timble	thimble thimble	draw drawer	drawers drawers		