

SHORT PAPER

On the generalization of attitude accessibility after repeated attitude expression

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It is a well-known fact that the influence of attitudes on information processing and behavior is qualified by a host of moderating factors (for an early review, see Wicker, 1969; for a more recent meta-analysis, see Kraus, 1995). One factor that has received a great deal of interest is attitude accessibility, that is, the ease with which an attitude can be retrieved from memory. Theoretically, attitude accessibility can be conceived of as the strength of the association between an attitude object and its summary evaluation (Fazio, 1995, 2007). As a proxy of attitude accessibility, researchers typically rely on the latency of responding to an attitudinal query: The faster an attitude can be expressed, the more accessible it is.

There is ample evidence showing that the influence of attitudes on information processing and behavior increases as a function of higher levels of attitude accessibility (for an early overview, see Fazio, 1995). For example, the likelihood of automatic attitude activation upon encountering an attitude object has

Abstract

The more accessible an attitude is, the stronger is its influence on information processing and behavior. Accessibility can be increased through attitude rehearsal, but it remains unknown whether attitude rehearsal also affects the accessibility of related attitudes. To investigate this hypothesis, participants in an experimental condition repeatedly expressed their attitudes towards exemplars of several semantic categories during an evaluative categorization task. Participants in a control condition performed a non-evaluative task with the same exemplars and evaluated unrelated attitude objects. After a 30-minute interval, participants in the experimental condition were faster than controls to evaluate not only the original exemplars but also novel exemplars of the same categories. This finding suggests that the effect of attitude rehearsal on accessibility generalizes to attitudes towards untrained but semantically related attitude objects.

been shown to increase when an attitude is more accessible (Fazio, Sanbonmatsu, Powell, & Kardes, 1986; for a discussion, see Bargh, Chaiken, Gvender, & Pratto, 1992; Fazio, 1993; for a review, see Fazio, 2001). There is also evidence for a higher degree of biased processing of attitude-inconsistent messages as a function of higher levels of attitude accessibility (e.g., Houston & Fazio, 1989; Monahan, Rhodes, & Roskos-Ewoldsen, 2009; for further examples in the domain of information processing, see Clark, Wegener, & Fabrigar, 2008; Roskos-Ewoldsen & Fazio, 1992; Young & Fazio, 2013). In addition, meta-analyses have demonstrated that attitude accessibility moderates attitude-behavior consistency (Cooke & Sheeran, 2004; Glasman & Albarracín, 2006). For example, it has been shown that attitudes are better predictors of product choice (Fazio, Powell, & Williams, 1989; Kokkinaki & Lunt, 1997) and alcohol consumption (Descheemaeker, Spruyt, & Hermans, 2014) when they are more accessible. Finally,

attitudes are more resistant to change as a function of increasing levels of attitude accessibility (e.g., Bassili & Fletcher, 1991; Hodges & Wilson, 1993).

These observations suggest that experimentally induced changes in attitude accessibility may be exploited as a means to promote behavioral change. One determinant of attitude accessibility is attitude rehearsal (Fazio, 1995). Early studies have shown that repeated attitude expression is an effective means to strengthen attitude accessibility (e.g., Downing, Judd, & Brauer, 1992; Fazio, Chen, McDonel, & Sherman, 1982, Study 3; Powell & Fazio, 1984). As a result, this manipulation has been used in a wide range of experimental studies concerning the role of attitude accessibility (Clark *et al.*, 2008, Study 2; Fazio *et al.*, 1986, Study 3; Holland, Verplanken, & van Knippenberg, 2003; Houston & Fazio, 1989, Study 2; Judd, Drake, Downing, & Krosnick, 1991; Roskos-Ewoldsen & Fazio, 1992, Studies 2 to 4; White, Hogg, & Terry, 2002, Study 2; Young & Fazio, 2013).

Importantly, if it is to be of practical value, a manipulation of attitude accessibility should impact not only attitudes towards attitude objects presented during the intervention itself but also attitudes towards novel but similar attitude objects. Evidence for such a transfer is extremely scarce however. First, with the exception of a single study by Judd, Drake, Downing, and Krosnick (1991), the effect of repeated attitude expression on attitude accessibility was examined only for the exact same attitudes that had been expressed repeatedly during a preceding manipulation phase. Second, in the study by Judd *et al.* (1991, Study 1), changes in attitude accessibility were potentially confounded with changes in familiarity. Judd *et al.* (1991) reported that participants were faster to express their attitude towards a political issue (e.g., nuclear weapons freeze) after having repeatedly expressed their attitude towards a related issue (e.g., nuclear test ban) as compared with an unrelated issue (e.g., right to abortion). Participants were thus more familiar with the related issue as compared with the unrelated issue, which may be sufficient to explain the observations reported by Judd *et al.* (1991). It could be argued, for example, that the time needed to process an issue decreased as a function of increasing levels of familiarity. Finally, even if the effects observed by Judd *et al.* (1991) did result from a genuine change in attitude accessibility, it must be noted that Judd *et al.* (1991) asked their participants to evaluate the second issue immediately after they had evaluated the first issue. It thus remains an open question whether attitude rehearsal can have long-lasting effects on the accessibility of related attitudes. This research question has important practical implications because longer term changes in attitude accessibility would imply longer term changes in the extent to which these related attitudes can impact subsequent information processing and behavior.

Accordingly, the aim of the present study was to substantiate the hypothesis that the effect of repeated

attitude expression on attitude accessibility generalizes to related stimuli even if changes in attitude accessibility are examined only after a relatively long delay (i.e., 30 minutes). During the accessibility manipulation phase, we asked participants in an experimental condition to express their attitudes repeatedly towards exemplars of several categories. Participants in a control condition were asked to judge the same set of stimuli in terms of their non-evaluative attributes and to evaluate a set of unrelated stimuli. We thus ensured that the two groups were equated in terms of the familiarity of the critical test items and the presence of an evaluative mindset (Spruyt, De Houwer, Everaert, & Hermans, 2012; Spruyt, De Houwer, & Hermans, 2009; Spruyt, De Houwer, Hermans, & Eelen, 2007). Afterwards, we tested whether this manipulation had been effective in strengthening attitude accessibility in the experimental condition and, more importantly, whether this effect generalized to novel exemplars of the same semantic categories.

Method

Participants

Fifty-three students (47 women; age: $M=19.7$ years, $SD=2.7$ years) participated in exchange for course credit or were paid 8 euro. All participants were native Dutch speakers and had normal or corrected-to-normal vision. To address an unrelated research question, participants were asked to consume a small amount of alcohol (i.e., beer with an alcohol content lower than 1% alcohol by volume) during a taste test that was administered between the manipulation and the test phase (see procedure section for further details). We therefore used the following exclusion criteria: pregnancy, past or current alcohol abuse, use of medication that should not be combined with alcohol, and a medical condition that contraindicates alcohol consumption. Participants were randomly assigned to the experimental ($n=28$) or the control condition ($n=25$). This study was approved by the ethical committee of the KU Leuven, and all participants gave written informed consent (emphasizing their right to withdraw at any time and the confidentiality and anonymity of the data).

Apparatus and Stimuli

Computer tasks were run on an Advanced Micro Devices Athlon XP computer (Advanced Micro Devices, Sunnyvale, CA, USA) with a 16-in CRT monitor (85 Hz, resolution 1024×768) and a response box with two keys. Affect 4.0 software (Spruyt, Clarysse, Vansteenwegen, Baeyens, & Hermans, 2010) was used to control stimulus presentation and response registration.

During the attitude accessibility manipulation phase, participants were presented with 32 pictures, each depicting an exemplar of one of eight different

semantic categories (four exemplars in each category), i.e., beer, water, fruit, vegetables, mammals, non-mammals, means of transportation, and weapons. During the test phase, we used the original beer, water, fruit, and vegetable exemplars and added four novel exemplars to each of these categories (see Appendix for an exhaustive description of all pictures). All pictures had a dimension of 512×384 pixels and consisted of a figure on a white background. Pictures were presented against the black background of the computer monitor.

Procedure

Participants were tested individually in a sound-attenuated room, and the lights were dimmed during the computer tasks. In between the manipulation phase and the test phase, there was a time interval of approximately 30 minutes ($M = 30$ minutes and 46 seconds; $SD = 4$ minutes and 19 seconds). During this interval, participants completed several measures unrelated to the current research question. In particular, we administered a picture–picture naming version of the evaluative priming task (Spruyt, Hermans, De Houwer, Vandekerckhove, & Eelen, 2007),¹ a bogus taste test with beer and water,² and a choice task in which participants were asked to choose between a bottle of beer and a bottle of water to take home.

During the attitude accessibility manipulation phase, participants in both the experimental and the control condition performed a speeded non-evaluative semantic categorization task (i.e., animate versus inanimate or solids versus liquids) followed by a speeded evaluative categorization task (i.e., positive versus negative). In both tasks, participants were required to categorize the pictures that appeared on the screen as quickly as possible using the two keys of a response box. Crucially, the stimuli that were presented during each task were different in the two conditions (see Table 1 for an overview). In the experimental condition, exemplars of the categories mammals, non-mammals, means of transportation, and weapons were to be categorized as animate versus inanimate during the non-evaluative semantic categorization task, while exemplars of the categories beer, water, fruit, and vegetables were presented during the evaluative categorization task. In the control condition, the reverse was true: Exemplars of the categories beer, water, fruit, and vegetables were

to be categorized as solids versus liquids during the non-evaluative semantic categorization task, while the remaining stimuli were presented during the evaluative categorization task. In this way, the accessibility of the attitudes towards the exemplars of the categories beer, water, fruit, and vegetables was strengthened only in the experimental condition, as these participants had repeatedly expressed their attitudes towards these exemplars. At the same time, participants in the experimental and control condition did not differ in terms of the strength of an evaluative mindset, their experience with the stimuli, or the salience of the categories beer, water, fruit, and vegetables.

During each categorization task in the manipulation phase, the exemplars of the relevant semantic categories (four per category) were presented six times, resulting in 96 trials per task. These trials were divided into six blocks. In each block, all exemplars were presented once in a random order (with the exception that the first two stimuli of the categorization task with beer, water, fruits, and vegetables were solids). Each trial started with a 500-millisecond presentation of a fixation cross and a 500-millisecond blank interval, followed by the presentation of the stimulus until participants responded or 1500 milliseconds had elapsed (in which case the message “TOO SLOW” appeared). The inter-trial interval varied semi-randomly between 500 and 1500 milliseconds with an average set to 1000 milliseconds. The assignment of the left and right keys of the response box to responses was counterbalanced during the non-evaluative semantic categorization task. During the evaluative categorization task, participants were instructed to press the left key for negative stimuli and the right key for positive stimuli. The experimenter was not present while participants completed these categorization tasks.

During the test phase, we used a speeded evaluative categorization task to measure the accessibility of the attitudes towards the four original and the four novel exemplars of the categories beer, water, fruit, and vegetables. Each exemplar was presented three times during three consecutive blocks, resulting in 96 trials. Stimuli were presented randomly within each block (with the exception that the first two stimuli of this task were solids). Instructions and presentation parameters on each trial were identical to those of the evaluative categorization task administered during the manipulation phase, except for the fact that there was no response window (i.e., a trial did not end after 1500 milliseconds if participants had not responded by then). Once again, the experimenter was not present during this task.

Results

One participant was excluded from the analyses because of technical difficulties resulting in a large

¹Pictures of beer and water used during the attitude accessibility manipulation phase served as primes during this task and were each presented 16 times for 200 milliseconds.

²Participants were asked to rate three unidentified brands of beer (alcohol by volume <1%) and three unidentified brands of water on different taste-related characteristics. They were not informed about this taste test until this moment. They were also not informed about the low alcohol content of the different beers. Four students chose not to participate in this taste test but completed all other measures.

Table 1. Design of the attitude accessibility manipulation

Categorization	Control condition	Experimental condition
Semantic	Task: solids versus liquids Stimulus categories: beer, water, fruit, and vegetables	Task: animate versus inanimate Stimulus categories: mammals, non-mammals, weapons, and means of transportation
Evaluative	Task: positive versus negative Stimulus categories: mammals, non-mammals, weapons, and means of transportation	Task: positive versus negative Stimulus categories: beer, water, fruit, and vegetables

number of trials with a response latency of 0 or 1 millisecond during the test phase (i.e., 27.1%). Accordingly, the final sample size was 52 (i.e., 25 participants in the control condition and 27 participants in the experimental condition).

Before calculating mean latencies of responding in the test phase, all response latencies shorter than 150 milliseconds (0.5%) or longer than 1500 milliseconds (0.8%) were excluded.³ Mean response latencies were analyzed by means of a three-way repeated measures analysis of variance with condition (experimental or control) as a between-subjects factor and block (1, 2, or 3) and stimulus type (original or novel) as within-subjects factors (see Figure 1 for means). Greenhouse–Geisser corrections were applied where necessary (Greenhouse & Geisser, 1959).

The analysis of variance revealed a main effect of condition, $F(1, 50) = 5.31, p = .025, \eta_p^2 = .10$, which was qualified by an interaction effect between condition and block, $F(1.49, 74.69) = 16.27, p < .001$, Greenhouse–Geisser $\epsilon = .75, \eta_p^2 = .25$. These effects did not differ between the original and the novel exemplars, as there was no clear evidence for an interaction effect between condition and stimulus type, $F(1, 50) = 2.81, p = .100, \eta_p^2 = .05$, or a three-way interaction effect between condition, block, and stimulus type, $F(2, 100) = 1.04, p = .358, \eta_p^2 = .02$. To further examine the interaction between condition and block, we conducted independent samples *t*-tests for each of the three blocks of trials (Table 2). Results showed that participants in the experimental condition were significantly faster than participants in the control condition to evaluate both the original and the novel exemplars during the first block of trials but this effect disappeared during subsequent blocks. The pattern of significant and non-significant results remained the same when these analyses were repeated focusing solely on the subset of trials with

beer and water exemplars or the subset of trials with fruit and vegetable exemplars.⁴

For the sake of completeness, we also report that there was a main effect of block, $F(1.49, 74.69) = 76.37, p < .001$, Greenhouse–Geisser $\epsilon = .75, \eta_p^2 = .60$, which was qualified by an interaction effect between block and stimulus type, $F(2, 100) = 13.97, p < .001, \eta_p^2 = .22$. As can be seen in Figure 1, mean response latencies decreased over blocks, and this effect was more pronounced for the novel than for the original exemplars. There was no clear evidence for a main effect of stimulus type, $F(1, 50) = 2.96, p = .092, \eta_p^2 = .06$.

Discussion

In the present experiment, it was observed that the requirement to process exemplars of different semantic categories either in an evaluative or in a non-evaluative manner exerted a profound influence upon the speed of evaluation of novel exemplars 30 minutes later. More specifically, participants who were asked to repeatedly evaluate the critical test items during the manipulation phase of the experiment were faster to evaluate novel exemplars of the same categories during a later test phase as compared with participants who were asked to process the exact same stimulus materials in a non-evaluative manner during the manipulation phase. This observation is consistent with the hypothesis that attitude rehearsal strengthens not only the accessibility of the attitude that was repeatedly expressed but also the accessibility of attitudes towards semantically related attitude objects. Importantly, as the experimental and control condition were equated in terms of stimulus familiarity and the presence of an

³In prior research of the first, second, and fourth authors, an alternative outlier elimination method was used. More specifically, outliers were defined as values that deviated more than 2.5 standard deviations from the mean of an individual participant in a particular cell of the design. However, this method requires a substantial number of observations per cell. Accordingly, for the present data, we adopted an alternative method that can be applied independently of the number of observations.

⁴One anonymous reviewer noted that the trained and novel exemplars of the semantic categories “beer” and “water” were perceptually very similar (i.e., different bottles and glasses of beer/water). If participants simply did not distinguish between these exemplars, one could argue that the present findings are insufficient to substantiate the hypothesis that changes in attitude accessibility can transfer from trained to novel exemplars. For two reasons, we consider this scenario to be unlikely. First, the anticipated effects of attitude accessibility were found also when analyzing only trials with fruit and vegetable exemplars, which were clearly distinct (e.g., a banana, a lemon, an apple, etc.). Second, valence ratings collected after the test phase (for an unrelated research question) were clearly different for different brands of beers, $F(4.86, 247.39) = 6.27, p < .001$, Greenhouse–Geisser $\epsilon = .69, \eta_p^2 = .11$, and different brands of water, $F(3.90, 198.74) = 12.49, p < .001$, Greenhouse–Geisser $\epsilon = .56, \eta_p^2 = .20$.

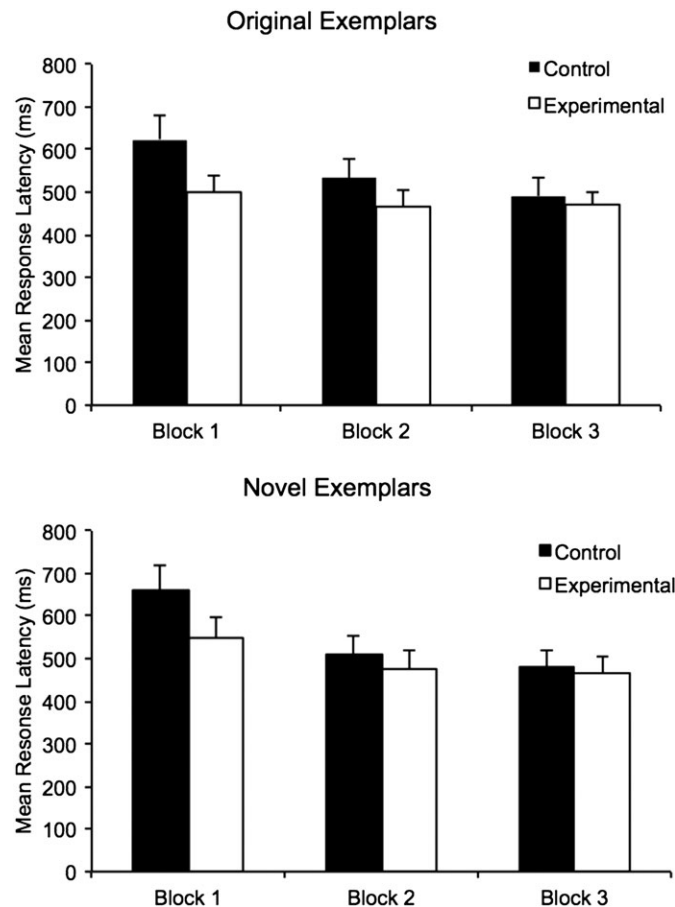


Fig. 1. Mean response latency during the three blocks of the evaluative categorization task in the control ($n = 25$) and the experimental ($n = 27$) condition, shown separately for the original (upper panel) and novel (lower panel) exemplars. Error bars represent 95% CI

Table 2. Comparison of the mean response latency (millisecond) of evaluative categorization of the original and novel exemplars in the control condition versus the experimental condition

Block	Control		Experimental		$t(50)$	p	95% CI	Cohen's d
	M	SD	M	SD				
Block 1	643	130	523	113	3.56	<.001	[52, 187]	0.99
Block 2	521	105	471	96	1.79	.079	[-6, 106]	0.50
Block 3	492	103	474	91	0.68	.497	[-36, 72]	0.19

evaluative mindset, we can safely rule out the possibility that our findings were a by-product of these factors.

Still, it may be argued that the control condition in the present study was not a passive baseline. During the manipulation phase, participants in the control condition were asked to repeatedly categorize the beer, water, fruit, and vegetable exemplars as solids versus liquids. There is evidence that the requirement to process attitude objects in a non-evaluative manner can result in a reduction of subsequent automatic attitude activation (Sanbonmatsu, Posavac, Vanous, Ho, & Fazio, 2007; see also Spruyt et al., 2012, 2009; Spruyt, De Houwer, et al., 2007). It is thus possible that our experimental procedures resulted not only in an increase in attitude accessibility in the experimental condition but also in a reduction of attitude accessibility in the control condition. In both cases, however, the present findings show that changes in attitude

accessibility can transfer to novel but related attitude objects, thereby expanding the scope of earlier studies showing that attitude accessibility moderates the degree to which attitudes impact behavior and information processing (e.g., Fazio, 1995).

It may be noted, however, that the critical between-group difference in attitude accessibility was found only in the first block of the test phase. This finding corresponds with earlier studies by Downing, Judd, and Brauer (1992, Studies 1 and 2) and Powell and Fazio (1984) in which the effect of attitude rehearsal was also limited to the first block of an attitude accessibility measure. This finding is anything but surprising, however, as a measure of attitude accessibility necessarily requires all participants to express their attitudes, thereby reducing inter-individual differences in the time needed to express one's attitudes. Put differently, the reduction of the

attitude-rehearsal effect over blocks is probably due to repeated attitude expression and not to the passage of time. In fact, our results show that the effect of attitude rehearsal can be detected even after a 30-minute delay between the attitude-rehearsal phase and the test phase of the experiment. This extends earlier work by Judd, Drake, Downing, and Krosnick (1991, Study 1), who demonstrated that repeated expression of an attitude towards a political issue can impact the immediate accessibility of attitudes concerning related issues.

As a potential limitation of the present study, one might object that participants performed several filler tasks involving beer and water between the manipulation phase and the test phase of the experiment. It could be argued, for example, that having to rate unidentified brands of beer and water during the taste test must have led to an increase in the accessibility of the attitudes towards beer and water. For two reasons, however, we can rule out the possibility that our findings simply resulted from the fact that participants completed a series of filler tasks. First of all, while fruit and vegetables were never presented during the filler tasks, the effect of attitude rehearsal on attitude accessibility was found also when the analyses were restricted to these exemplars. Second, filler tasks were identical in the control and the experimental condition. Thus, even if it is assumed that these tasks did impact the accessibility of the attitudes towards exemplars of the categories beer and water, such an effect fails to account for the between-group differences that were found in the present study. In fact, it could be argued that the filler tasks must have had a larger impact on attitude accessibility in the control condition than in the experimental condition, as attitude accessibility was already high in the experimental condition because of the accessibility manipulation. So, if anything, the filler tasks reduced rather than increased our chances of finding between-group differences in attitude accessibility. We can therefore firmly conclude that the effect of attitude rehearsal on attitude accessibility can generalize to semantically related attitude objects, even if changes in attitude accessibility are examined after a 30-minute delay.

At a mental-process level, however, we can only speculate about the mechanism that is responsible for this generalization effect. We discuss two possibilities, which are not necessarily mutually exclusive. First, when evaluating a novel attitude object, one might rely on general knowledge about the category to which this attitude object belongs. In this case, one might be faster to evaluate a novel exemplar (e.g., a tomato) because the accessibility of the attitude towards the superordinate semantic category (e.g., vegetables) was increased by repeatedly evaluating different category exemplars during the attitude-rehearsal phase. Second, one might use information about similar exemplars when evaluating novel attitude objects (Smith & Zárate, 1992). In this case, one would be faster to evaluate a novel exemplar (e.g., a tomato) because the accessibility of the attitude towards similar exemplars (e.g., carrot,

lettuce, mushroom, and red pepper) was increased during the attitude-rehearsal phase. To gain more insight in the underlying mechanism, future research could investigate whether the degree to which attitude accessibility generalizes across exemplars is influenced by their category prototypicality and/or the degree of similarity (e.g., the number of shared features).

Irrespective of the outcome of these future studies, the present findings already have important implications. First, attitude researchers are advised to take into account that simply measuring attitudes can be sufficient to strengthen attitude accessibility and, as a consequence, attitude-behavior consistency (Cooke & Sheeran, 2004; Glasman & Albarracín, 2006). Questions can thus be raised concerning the ecological validity of studies in which attitude measures are used to predict behavioral outcomes occurring soon after the attitude registration phase. Second, given that our manipulation of attitude accessibility produced reliable effects in the first block of test trials only (see also Downing *et al.*, 1992; Powell & Fazio, 1984), one must conclude (i) that attitude accessibility can be highly volatile and (ii) that attempts to measure inter-individual differences in attitude accessibility may in fact wipe out those inter-individual differences. Researchers working on attitude accessibility are thus advised to limit the number of measurement trials to an absolute minimum. Finally, our findings imply that experimentally induced changes in attitude accessibility may be exploited as a means to promote behavioral change. It could be an inspiring enterprise to scrutinize this possibility in future studies.

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Appendix: Description of the Pictures Used during the Categorization Tasks

Beer:

Original exemplars: glass of beer, bottle and glass of Hoegaarden, bottle and glass of Jupiler, and bottle and glass of Stella

Novel exemplars: bottle of Corona, bottle and glass of Duvel, bottle and glass of Leffe, and bottle of Vedett

Water:

Original exemplars: glass of water, bottle of Chaudfontaine, bottle of Contrex, and bottle of Evian

Novel exemplars: bottle of Pierval, bottle of Spa, bottle of Vittel, and bottle of Volvic

Fruit:

Original exemplars: banana, cherries, lemon, and pear

Novel exemplars: apple, nectarine, orange, and strawberry

Vegetables:

Original exemplars: carrot, lettuce, mushroom, and red pepper

Novel exemplars: corn, cucumber, leek, and tomato

Mammals: dog, lion, mouse, and porcupine

Non-mammals: crocodile, frog, goldfish, and turtle

Means of transportation: airplane, bike, train, and truck

Weapons: ax, bow, slingshot, and sword