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The Effects of Context Dependency in Recognition Memory and Source Memory

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by

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Abstract

Past studies have shown context dependency effects for recognition memory but not for source memory. The current study aims at replicating the findings of context dependency effects in recognition memory and investigating the potential context dependency effects in source memory. Two hundred and sixteen participants were randomly assigned to matching or mismatching study and test conditions with either ambient noise or pink noise serving as the context manipulation needed to measure context dependency effects on recognition and source memory. Neither recognition memory nor source memory displayed context dependency, but there was a significant main effect of encoding condition for pink noise and main effect of test for ambient noise. Pink noise present during encoding seemed to reduce accuracy of source memory judgments while ambient noise present during test seemed to reduce accuracy of source memory judgments.

The Effects of Context Dependency in Item Memory and Source Memory

The study environments that students immerse themselves in often contain ambient noise, whereas testing environments are generally quieter. The ambient noise, which can consist of background music, loud roommates, talkative friends, or bustling family members, may either serve as part of the environmental context or may instead hamper encoding or retrieval if noise is present during study or test conditions. That noise might distract someone is intuitive, but whether that noise acts as part of the surrounding environmental context and serves as a cue to memory retrieval is not. One study differentiated between context dependency and noise interference by testing students in noisy or silent conditions that matched or mismatched with the noisy or silent study conditions (Grant, Brendahl, Clay, Ferrie, Grover, McDorman, & Dark, 1998). The aforementioned context dependency effects arise when there are notable discrepancies in memory test performance between matching and mismatching conditions at encoding and retrieval (e.g., Grant, Brendahl, Clay, Ferrie, Grover, McDorman & Dark, 1998; see Smith & Vela, 2001, for a review). More specifically, better test performance is often achieved because encoding conditions matched retrieval conditions compared to mismatching environments. This phenomenon arises because aspects of the study environment incorporated in the memory trace for the studied material are used to enhance the retrieval of the memory trace in a test condition with similar environmental characteristics to those present during encoding (Grant et al., 1998). In this way context dependency can be tested through the matching or mismatching environments at encoding and retrieval, and the degree to which ambient noise interferes with encoding or retrieval can also be observed.

One assumes that the presence of noise in either study or test environments decreases overall performance regardless of matching or mismatching conditions, but interestingly Grant et al. (1998) discovered in their study that such is not the case. They found that matching study and test condition improved performance even when the matching conditions included noise at both encoding and retrieval. Thus, ambient noise operates as an environmental context cue rather than a memory inhibitor when the noise is present at both study and test conditions (Grant et al., 1998). However, their findings applied to tests of recall and recognition memory. Participants read the to-be-remembered material in noisy or silent conditions and then completed tests in the matching or mismatching environment. A short-answer recall test was given first and a multiple-choice recognition test given next, following the encoding of meaningful text material. Results from both tests revealed better memory when the encoding and retrieval environments matched, even when both involved noisy conditions.

One goal of the proposed study is to investigate the generality of this noise-related context dependency. A key modification is the inclusion of a source memory test instead of only a recognition memory test. One useful distinction is that between item memory (e.g., recall or recognition of individual studied items) and source memory (e.g., memory for details related to items). One example of source memory is memory for temporal order, such as being able to recall words from a list in the order they were encoded. In fact, order memory is particularly disrupted in studies of short-term recall when irrelevant noise or sounds are presented along with the to-be-remembered information (e.g., Salamé & Baddeley, 1982, as cited in Beaman, 2005). This phenomenon has been dubbed the *irrelevant sound effect* (Beaman, 2005; Beaman & Jones, 1997, as cited in Beaman, 2005). The sound present under these conditions is termed 'irrelevant' because the individuals that are being tested are made aware of the noise but are instructed to ignore it, thereby making the noise irrelevant to the task itself (Beaman, 2005). One hypothesis is that environmental noise affects detail aspects of memories (e.g., order, perceptual details, spatial location), but not memory for the simple occurrence of those items, or at least less of an effect on memory for occurrence. Grant et al. (1998) surprisingly found a context-dependency effect for occurrence in conditions of such irrelevant noise, but it is possible that tests of source memory would show disruption akin to that found in the irrelevant sound effect literature. Moreover, irrelevant sounds have sometimes been shown to disrupt memory for prose (e.g., Banbury & Berry, 1998, as cited in Beaman, 2005), and thus the actual reliability of Grant et al.'s context-dependency finding will be assessed.

Irrelevant sounds could be damaging to an individual performing a task because the noise disrupts the encoding process and also because it possibly impairs the learning of new material (Beaman, 2005). However, the degree of disruption depends on the nature of the sounds heard: If the noises vary over a period of time, they are predicted to cause irrelevant sound interference during a task (Banbury & Berry, 2005). Such sounds follow the trends outlined in the Changing State Hypothesis, which suggests that the disruptive effects are caused by the changing-state of the sounds rather than by the mere presence of the sounds themselves (Banbury & Berry, 2005). Therefore, if the irrelevant sound effect in serial recall relies on the changing-state of noise during a task, then the effects of noise interference during encoding and retrieval may potentially decrease when the noise is uniform and continuous.

Because memory for temporal order is likened to source memory, the presence of nonuniform noises in an environment can also negatively affect the accuracy of source memory. Source memory is founded on the source monitoring framework (Johnson, Hashtroudi, & Lindsay, 1993), which is a research framework used to interpret the ways in which people assign memories to particular sources. These sources in turn are comprised of multiple dimensions, such as the environment, that define a specific experience (Lindsay, 2008). Sources may include the person from whom a fact was learned, places in which information was heard, or the time at which something was learned. Details in memories are used to infer the likely source of a memory (Johnson, et al., 1993). Additionally, according to the concept of *transfer appropriate processing* the encoded material is best retrieved through the reinstatement of study conditions in the present retrieval conditions (Morris, Bransford, & Franks, 1977). Transfer appropriate processing focuses not only on the quality of processing during encoding but on the relationship between the learned information and the type of test implemented. It states that the strength of memory depends on the appropriateness of the test instead of on the level at which the information was processed (Morris et al., 1977). It then follows that past encoded information can be cued more effectively if current thought processes resemble those implemented during encoding.

However, if during the initial event, the perceptual processing of the environment the encoding of to-be-remembered information is disrupted by ambient noises, the associations between characteristics of the environments and encoded material will be more loosely held in memory and harder to recall at retrieval (Lindsay, 2008). This scenario would be predicted by the levels-of-processing framework proposed by Craik and Lockhart (1972) which predicts memory duration by accounting for the depth or quality of processing at encoding (as cited in Morris, Bransford, & Franks, 1977). They predicted that a shallow processing of information at encoding would lead to poor memory traces at retrieval. Fortunately, cues used to trigger source memory do not depend on the information encoded in just one singular event. Instead, cues are dependent on both the revival of incidental information encoded during many different prior experiences and the general information associated with those cues (Lindsay, 2008).

In this manner, deficits in source memory due to the presence of changing-state noise for a particular event can be compensated with the cued recall of episodic information encoded in past experiences related to the experience in which the memory trace originated. In such situations the presence or absence of ambient nonuniform noise during retrieval is not taken into account. If irrelevant sound is in fact present during retrieval, then presumably source monitoring performance will decrease because of interference with retrieval processes (Lindsay, 2008).

The extent to which context dependency occurs when irrelevant noise is presented during matching and mismatching conditions for encoding and retrieval of source memory remains unresolved. As discussed earlier, Grant et al. (1998) found environmental context dependency effects for item memory in matching conditions even when ambient noise was present. It is important to note that the auditory stimulus used to create the noisy condition was a recording of muffled cafeteria sounds. The tape did not contain any discernable conversations, merely fragments of sentences and other abstract sounds. We are interested in examining the outcome of such a situation and determining the effects of context dependency compared to irrelevant sound effects regarding item and source memory. To do this we replicated and extended the Grant et al. experiment, testing item memory and source memory in matching and mismatching quiet and noisy conditions at encoding and retrieval. We tested item and source memory in the presence of not only uniform sounds but also nonuniform sound in order to measure the possible effects of irrelevant sound interference. It is unclear whether the noise stimulus in Grant et al. should be characterized as uniform or as non-uniform (i.e., changing state). Thus, in the proposed study two levels of uniformity will be tested in separate experiments.

EXPERIMENT 1

Method

Participants

One hundred and eight Louisiana State University students served as participants in this experiment. Participants in the experiment were randomly assigned to four groups of twenty seven, as described subsequently. Participants were given partial credit to apply in various psychology courses.

Design

Experiment 1 was designed to investigate the effects of distracting or silent environments on recognition memory and on source memory. Source memory was assessed by asking participants to remember whether stimuli were learned on the left or right side of a computer screen. The experiment includes conditions in which people encode and/or retrieve information in standard, relatively silent environments. For noisy environments, Experiment 1 incorporated uniform sound in the form of pink noise that was presented to the participants. This study represented a 2 (encoding environment) × 2 (test environment) × 2 (source) mixed factorial design resulting in two between-subject factors (uniform vs. silent conditions in study and test contexts). The source factor, with stimuli shown on the left versus right side of the computer screen, was a within-subjects factor.

Stimuli

The experimenters equipped the participants with a set of headphones from which they heard the uniform noise. Pink noise is a noise whose intensity is inversely proportional to its frequency and produces constant energy per octave; it is intermediate between white noise and red (Brownian) noise. The pink noise recording used for this experiment was downloaded off of a website over the Internet.

The MRC Psycholinguistic Database was used to compile a list of ninety words, which are listed in the appendix. The parameters used to produce the words were as follows: Kucera-Francis written frequency min= 1 and max= 10; only uncapitalized nouns; concreteness rating min= 500 and max= 700. The words were randomly split into three sets of thirty words each. For a given participant, two sets of 30 were shown during encoding and all three sets were shown at test. Which sets were assigned as encoded was rotated across participants. The words shown on the left side of the computer screen appeared in a blue color, and the words shown on the right side of the computer screen appeared in a red color. This position assignment was also counterbalanced across participants.

The source memory test required participants to identify the ninety words displayed as shown on the ‘left’ or ‘right’ side of the screen or ‘new’ (words not shown during the encoding context). Identifying words as ‘old’ (either ‘left’ or ‘right’) or ‘new’ provided an estimate of recognition memory accuracy, whereas the distinction between ‘left’ and ‘right’ provided an estimate of source memory accuracy.

Procedure

Upon arrival, participants were questioned to determine if any visual and/or auditory impairments were present and were asked to sign a consent form, emphasizing that their participation was voluntary. The participants were then placed in front of a computer. They were also given a set of headphones. Participants were told that a succession of words would appear on the computer screen. The participants were instructed to pay close attention to the words, because their memory for the words would be tested later. The words were shown for 3 seconds each, with a 750 msec intertrial interval.

All participants were asked to wear the headphones only during the encoding and test conditions. Participants in the noisy conditions (at encoding and/or retrieval) were informed that they would hear moderately loud noise over the headphones, but that the noise should be ignored and their focus should be on the encoding and/or retrieval task. Participants assigned to any silent conditions were told that they would not hear any noise coming from the headphones during the encoding and/or retrieval phase.

A distracter task was implemented between the encoding and retrieval phases. During the distracter task, the participants were given a single sheet of three digit multiplication math problems to complete for three minutes. The headphones were taken off during this time.

The source memory test was administered after the distracter task was completed. Depending on one's assigned condition, the memory test was given under either silent or noisy conditions. In noisy conditions, participants were asked to ignore any noise coming from the headphones.

Once the test was completed, the participants were informed of the nature of the experiment and thanked for their participation. The total time for each experimental session was approximately twenty minutes.

Results

An alpha level of .05 was used to test the hypotheses for the analyses. The hit and false alarm proportions used to determine the corrected recognition proportion scores were obtained in the following manner: If during test the subject correctly identified an 'old' word as 'old, then the subject made a hit regardless of which side of the screen it was presented. If during test the subject identified a new word as an 'old' word, then the response was a false alarm. Hits were divided by the total number of words shown during study (60) and false alarms were divided by the number of new items shown at test (30) to obtain the hit and false alarm proportions, respectively. The false alarm proportion was then subtracted from the hit proportion to get the corrected recognition proportion score, with false alarms being an index of one's likelihood of guessing during the test. The mean hit rate proportions, false alarm rate proportions, and corrected recognition proportion scores for study and test conditions are shown in Table 1. The recognition memory results were interpreted by using a 2 (encoding: quiet vs. pink noise) x 2 (test: quiet vs. pink noise) between-subjects factorial ANOVA on corrected recognition proportion scores. Both main effects were not significant: for encoding, F (1,96) = .23, $p > .05$, and for test, F (1,96) = 2.57, $p > .05$. The interaction between encoding and test was also not significant, F (1,96) = 0.00, $p > .05$.

Source memory was defined as follows. The left CSIM scores represent the proportion of words shown on the left correctly identified as 'left' words out of words on the left identified as 'left' or 'right.' Similarly, the right CSIM scores represent the proportion of words shown on the right correctly identified as 'right' words out of words on the right identified as 'left' or 'right.' The ACSIM scores are the average proportion of correct 'left' and 'right' source memory decisions. The ACSIM scores are an average of these two CSIM scores and provide an overall measure of source memory accuracy. The mean 'left' CSIM, 'right' CSIM, and ACSIM proportions for quiet and noisy contexts during encoding and test are listed in Table 2. A 2 (encoding: quiet vs. pink noise) x 2 (test: quiet vs. pink noise) between-subjects factorial ANOVA was conducted to measure context effects on source memory using ACSIM proportion scores. There was a significant main effect of encoding condition, F (1,96) = 6.54, $p < .05$, $\eta_p^2 = .06$, with better source memory following quiet encoding conditions, but the main effect of test condition was not significant, F (1,96) = .10, $p > .05$, $\eta_p^2 = .00$. The interaction between encoding and test was also not significant, F (1,96) = .11, $p > .05$, $\eta_p^2 = .00$.

Discussion

Varying study and test conditions did not have a significant effect on recognition memory. Contrary to the Grant et al. (1998) paper, matching and mismatching quiet and noise contexts for study and test did not change the amount of words correctly identified during the test phase as 'old' versus 'new'. Thus, context effects did not play a role in recognition memory performance, nor was there an effect of distracting noise in general. However, although there were no significant results, there is a subtle trend in the corrected recognition proportion scores between types of context during test. Overall, recognition memory was better when noise was present during test and even better when the encoding context was quiet. This slight difference in performance could have occurred if the subject had regarded the noise during test as distracting, requiring him/her to focus more on the memory decisions. Greater focus when deciding which words were 'old' or 'new' could have led to more accurate memory decisions and generally higher recognition proportion scores. However, these are just possible explanations for the trends, keeping in mind the results were still not significant.

The analysis of variance for the ACSIM scores for source memory showed that general context (noise or quiet) did have a significant effect on source memory. A closer look at the ACSIM scores reveals the nature of the context effects on encoding: quiet encoding contexts yielded higher ACSIM scores than noisy encoding conditions, suggesting that source memory followed the levels of processing model. Therefore, distraction in the form of pink noise during encoding decreased source memory regardless of retrieval contexts. Context dependency was not observed for source memory in this experiment.

EXPERIMENT 2

Method

Participants

One hundred and eight Louisiana State University students served as participants in this experiment. Participants in the experiment were randomly assigned to four groups of twenty seven, as described subsequently. Participants were given partial credit to apply in various psychology courses.

Design, Stimuli, and Procedure

The design of Experiment 2 was identical to the design of Experiment 1 with the exception of type of noise used for noisy contexts. Experiment 2 incorporated non-uniform ambient noise instead of uniform pink noise. All stimuli used in this experiment were the same as the stimuli used in Experiment 1 except the noise recording. The noise implemented was a stream of ambient noise recorded during lunch hours (11 AM – 1PM) of the Louisiana State University Union. A 30-second long digital audio clip was looped continuously when noise was assigned to be played. Experiment 2 followed the exact same procedure as Experiment 1.

Results

An alpha level of .05 was used to test the hypotheses for the analyses. The results were interpreted in the same way as in Experiment 1—recognition memory first and then source memory. The mean hit, false alarm, and corrected recognition score proportions for encoding and test conditions are shown in Table 3, whereas the source memory measures are displayed in Table 4. A 2 (encoding: quiet vs. ambient noise) x 2 (test: quiet vs. ambient noise) between-subjects factorial ANOVA on corrected recognition scores was conducted to measure recognition memory. Both main effects were not significant: for encoding, F (1,101) = .12, p > .05, and for test, F (1,101) = 1.44, p > .05. The interaction between encoding and test was also not significant, F (1,101) = .07, p > .05.

A 2 (encoding: quiet vs. ambient noise) x 2 (test: quiet vs. ambient noise) between-subjects factorial ANOVA was conducted using ACSIM proportion scores to measure context effects on source memory. There was a significant main effect of test condition, F (1,101) = 6.51, p < .05, η_p^2 = .06, but the main effect of encoding condition was not significant, F (1,101) = .09, p > .05, η_p^2 = .00. Source memory decisions were more accurate with silence during the test, whereas this factor played no role at encoding. The interaction between encoding and test was also not significant, F (1,101) = .48, p > .05, η_p^2 = .00.

Discussion

As in Experiment 1, neither recognition memory nor source memory demonstrated context dependency. However, as was the case in Experiment 1, there was a subtle trend in the corrected recognition proportion scores between test contexts. Recognition was better when there was silence during test than when there was ambient noise present during test regardless of encoding context. Examining the ambient noise the participants were exposed to during test could explain this result. The multiple muffled conversations that the ambient noise clip was composed of could have disrupted the participants' concentration making it harder to focus on the memory decisions. The ambient noise during test context could be likened to a scenario where an individual in a room full of people having various conversations simultaneously is trying to remember if a given word was studied previously or is a new word. The talking mass could detract focus from the individual leading to a decreased ability in discerning an 'old' word from a 'new' word, and, consequently, reducing overall performance in recognition memory. Nevertheless, the recognition memory results were statistically insignificant and any perceived trends and explanations are just conjectures.

The analysis of variance on the ACSIM scores measuring source memory performance yielded significant results concerning test context (quiet vs. ambient noise). Participants performed better source memory decisions in a quiet test context rather than a noisy test context regardless of encoding context. Thus, this experiment shows that source memory accuracy is unaffected by ambient noise during encoding but can be influenced by test context.

General Discussion

This research was aimed at replicating the findings of the Grant, Brendahl, Clay, Ferrie, Groves, McDorman, and Dark (1998) research regarding context dependency and recognition memory and also designed to investigate whether or not source memory demonstrated context dependency. In particular, whether noise present during encoding and/or test of an unrelated word list would have an effect on strength of recognition and source memory. Contrary to the Grant et al. results, this study showed that context dependency did not play a role in recognition memory. These opposing findings could be due a difference between the two experiments in learning material used to measure recognition memory and type of memory test implemented after encoding. The Grant et al. study used an article on psychoimmunology, which could be considered meaningful learning material, as the encoding material and both a multiple choice and short answer test on the previously read article, while the current study used an unrelated word list, which would not be considered meaningful material, as the encoding material and a simple identification test asking whether the displayed words were 'left', 'right', or 'new'.

Compared to studies that have not found context dependency effects using nonmeaningful encoding material, experiments using meaningful encoding material have shown context dependency effects in recognition memory (Grant et al., 1998); thus, this study's lack of significant results for context dependency in recognition memory could have been because we used nonmeaningful instead of meaningful encoding material. Moreover, the multiple choice test that Grant et al. used could have led to generally better test performance because participants were not given a 'none of the above' option, which would be akin to the 'new' option in the test for this experiment. Therefore, whether accurate or inaccurate, the participant always made a 'hit' because he/she was forced to make some memory decision using previously learned material, and no false alarms could be made because they were not given the option to opt out of any memory decisions. This would lead to higher hit rates and consequently higher recognition scores, which would attribute to a significant result. On the other hand, the test for this experiment allowed the participant the option of not having to make an 'left' or 'right' decision and instead answering 'new', thereby potentially producing more false alarms and an overall lower recognition score and insignificant result. These differences could be accounted for by exactly replicating the Grant et al. experiment using meaningful encoding material and similar memory test to determine if context effects would arise.

The current study also investigated if context dependency affected source memory, a factor that was not incorporated in the Grant et al. research. The Experiment 1 and 2 results for source memory did not show significant context dependency effects, but it did show significant main effects of encoding condition and test condition, respectively. Interestingly, regardless of the encoding condition, ambient noise—but not pink noise—during test decreased source memory performance more than when there was silence during test. In other words, participants in quiet test conditions made more accurate source memory decisions while participants in noisy test conditions made worse source memory decisions. Because source monitoring relies on the efficacy of both encoding an initial event and the subsequent retrieval of the event, disruptions during memory acquisition and/or source memory judgments will impair source monitoring accuracy (Johnson, Hashtroudi, & Lindsay, 1993). Moreover, it has been suggested that irrelevant or 'changing-state' noise impairs source memory because the ambient noise interferes with the retrieval process (Lindsay, 2008).

Thus, the presence of ambient noise during encoding may not have disrupted acquisition enough to produce a significant main effect of encoding, but ambient noise during test had a sufficiently pronounced disruption in the revival of the memory trace associated with the source memory decision to produce an overall decrease in performance for those individuals recalling word sources in the presence of ambient or ‘changing-state’ noise.

The main effect of encoding condition in Experiment 1 suggests that quiet encoding conditions result in better source memory compared to uniform noise encoding conditions. These particular findings seem to hint that source memory follows the level of processing framework wherein quiet encoding conditions lead to overall better memory performance than noisy encoding conditions regardless of condition at retrieval (as stated in Morris, Bransford, Franks, 1977). Worse memory performance following pink noise encoding conditions could possibly be explained by examining the current practical uses of pink noise. Pink noise is very similar in sound to a distant waterfall, and many people find this sound very soothing. So, if pink noise, which may be perceived as calming, is played during encoding, then the individual will not be as alert during learning and will not encode the information as efficiently as those individuals who are not being relaxed by the sound. If the information is not strongly encoded within the memory trace then, retrieval of the source information will be worse.

No known experiments have been done on the source memory and context dependency making it difficult to ascertain the causes of the effects seen in this experiment. Moreover, because of the opposing results of Experiment 1 and 2 it is difficult to consolidate the two studies. The possible explanations mentioned above for Experiment 1 could also apply to

Experiment 2 and vice versa; therefore, no clear explanation can be given to account for these unusual findings. Future experimenters might benefit from attempting to replicate the results found in this experiment regarding source memory to increase the findings' reliability. Moreover, the type of learning material used during encoding could be changed in order to determine if meaningful versus nonmeaningful learning material has an effect on source memory performance when environmental context is manipulated. Finally, the type of noise used during encoding and testing could be manipulated so that distinct words can be heard in the ambient noise recording instead of just a stream of fragmented conversations.

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Table 1

Experiment 1: Mean Hit Proportions, False Alarm Proportions, and Corrected Recognition Proportion scores for Quiet and Noisy (Pink) Encoding and Test conditions.

	Hits	False Alarms	Corrected Recognition
Quiet Encoding			
Quiet Test	.79	.22	.57
Noisy Test	.77	.15	.62
Noisy Encoding			
Quiet Test	.71	.16	.55
Noisy Test	.81	.20	.61

Table 2

Experiment 1: Mean Left CSIM, Right CSIM, and ACSIM scores for Quiet and Noisy (Pink) Encoding and Test conditions.

	Left CSIM	Right CSIM	ACSIM
Quiet Encoding			
Quiet Test	.71	.72	.72
Noisy Test	.74	.71	.73
Noisy Encoding			
Quiet Test	.64	.73	.68
Noisy Test	.67	.67	.67

Table 3

Experiment 2: Mean Hit Proportions, False Alarm Proportions, and Corrected Recognition Proportion scores for Quiet and Noisy (Ambient) Encoding and Test conditions.

	Hits	False Alarms	Corrected Recognition
Quiet Encoding			
Quiet Test	.80	.20	.60
Noisy Test	.77	.20	.57
Noisy Encoding			
Quiet Test	.76	.15	.62
Noisy Test	.80	.23	.57

Table 4

Experiment 2: Mean Left CSIM, Right CSIM, and ACSIM scores for Quiet and Noisy (Ambient) Encoding and Test conditions.

	Left CSIM	Right CSIM	ACSIM
Quiet Encoding			
Quiet Test	.72	.75	.73
Noisy Test	.65	.73	.69
Noisy Encoding			
Quiet Test	.74	.76	.75
Noisy Test	.72	.66	.68

Appendix

oven	doll	vault
lily	ant	yawn
wheat	thief	athlete
apple	spoon	warrior
diamond	pig	harp
eagle	robber	icicle
flea	linen	keg
salad	monkey	eel
soda	napkin	garbage
ivy	vinegar	nephew
chalk	zoo	oyster
sultan	circus	snail
punch	biscuit	volcano
maple	garlic	sponge
ambulance	pants	berry
babe	rum	crow
satin	wand	oatmeal
necklace	butterfly	pearl
noose	umbrella	bean
fiddle	toy	hockey
duck	rocket	vegetable
grape	balloon	rat
chocolate	mistress	pickle

Appendix

elephant	frog	moss
worm	coke	skate
lotion	hail	cigar
menu	princess	relic
sunshine	lamb	swamp
tulip	scissors	shield
armor	maze	witch