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The Influence of Various Types of Prompts on the Comprehensibility of Words in Reverse Speech

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Abstract

Drawing upon previous findings that priming is a necessary condition to hear intelligible words in reverse speech samples, this experiment investigated the influence of various types of prompts on the comprehensibility of reverse speech. Participants were presented with 30 reverse speech samples categorized by three prompt types: Appropriate prompts, Scrambled prompts, and Inappropriate prompts. After reading each prompt and listening to each auditory sample, participants indicated whether they heard two or more of the prompt words in the sample, whether they heard other words in the sample, and, if so, recorded those words heard. The results indicated that participants heard a significant number of both prompt words and other words in Appropriate and Scrambled prompt trials but not in Inappropriate prompt trials. These results support prior findings that people hear words in reverse speech when primed by coherent prompts. However, the finding that participants also heard significant numbers of non-prompt words under two trial conditions requires further investigation into the extent to which people spontaneously "hear" words in reverse speech regardless of prompts.

The Influence of Various Types of Prompts on the Comprehensibility of Words in Reverse Speech

In recent years, a great deal of public speculation has focused on the existence and detrimental effects of subliminal messages in the media. As is often the case when the general public deals with an issue, baseless speculation becomes rumor that is believed to be factual. Vokey and Read (1985), seminal researchers in the empirical study of reverse speech, relate their observations of a traveling preacher who came to their town espousing the evils of back-masking in popular music. In response to the public's serious response to this preacher, Vokey and Read (1985) conducted a series of studies to evaluate whether or not back-masked messages actually effect the behavior of the listener.

Vokey and Read (1985) examined the problem on several levels of analysis, from simple auditory information to complex comprehension. They found that participants could distinguish beyond chance the sex of the speaker, distinguish between two or more male speakers (i.e. are two different samples the same voice?), and discriminate between various languages. This information indicates that people can extract some basic auditory and language information from backward speech, but not of the sort that could affect consciousness or comprehension.

Vokey and Read (1985) then tested whether or not people comprehend coherent information from backward messages. They found that, when asked to judge the number of words in a reversed sentence, participants' word counts approximated the number of *syllables* rather than the number of words. Furthermore, participants were unable to correctly determine whether backward sentences were statements or questions beyond a rate of chance guessing. Thus, though participants are able to draw auditory information from backward speech, they are unable to extract true semantic information.

Finally, Vokey and Read (1985) tested whether or not people are unconsciously influenced by the content of backwards messages. They adapted the Galbraith and Tachsman (1969) study of homophone priming. Vokey and Read (1985) presented a series of backward sentences that contained a low-frequency spelling of an ambiguous word, such as "Climbing a mountain is a remarkable *feat*." When presented forward, such priming yields a significant tendency for participants to spell the low-frequency, presented spelling in a spelling test. However, Vokey and Read (1985) found that backward prompts had no effect upon the participants' spellings of ambiguous words. Finally, Vokey and Read (1985) tested the source of backward messages under the hypothesis that it is the listener him/herself who "hears" a message that does not actually exist using a series of prompts. They found that participants "heard" the phrases proposed by the experimenter at a rate far above chance, yet they heard no such phrases in control sentences. Collectively, these results indicate that, even when present, backward messages exert no subliminal influence upon listeners, and that, in truth, most "subliminal messages" are the cognitive construction of the listener him/herself.

The results of Vokey and Read (1985) clearly suggested that backward and subliminal messages are not nearly as powerful or effective as popular opinion had come to believe. Despite this evidence, though, public speculation and paranoia over backward messages did not fade. Responding to public speculation over backwards satanic messages imbedded in rock music, Begg, Needham, and Bookbinder (1993) tested whether backward messages can impact people's global impressions of the information; specifically, Begg et al. (1993) tested whether the illusory truth effect is maintained with backwards statements as it is with forward. The illusory truth effect indicates that participants in test conditions rate repeated statements as more probably true than new statements. Begg et al. (1993) found that participants were able to

correctly identify new vs. old statements only when the form was consistent; i.e. participants who heard forward messages could correctly identify forward test messages but not backward, and participants who heard backward messages could correctly identify backward but not forward messages. Furthermore, the illusory truth effect was supported with forward statements but not backward statements. Begg et al. (1993) concluded that their results indicated that statements affect subjects only if the form of the test statements is consistent with the form of the presentation of the statements. Thus, backward messages in forward speech or music can have no effect upon listener consciousness because the message would have to be presented backwards once again for it to be recognizable.

Once again, the results of Begg et al. (1993) should have subdued discussion of the danger of subliminal messages. However, fear of backward messages and their effects remains in the public sphere. Several researches (Byrne and Normand, 2000; Kreiner, Altis, and Voss, 2003) have noted with concern the claims of David Oates, a researcher who discusses a discovery he calls "reverse speech." Oates has developed a massive educational and financial enterprise to spread knowledge of reverse speech. His theory proposes that normal human speech is composed of two modes, forward and reverse. Forward speech can be used to lie, but backward speech, which is always present, is unerringly truthful. Oates suggests that this reverse speech can be used to eliminate the privacy of the mind, applications of which can be used in court for testimony, in job selection, and to reveal hidden memories, just to name a few. His theories are explained on the website of his company, Reverse Speech Enterprises (http://www.reversespeech.com).

Byrne and Normand (2000) call into question the validity of Oates' claims. They point out the almost complete lack of empirical evidence to support Oates' theories and summarize

various tentative findings that echo the conclusion of Vokey and Read (1985) that listeners construct the meaning of backward messages themselves, as opposed to "hearing" genuine messages in the backward speech. Byrne and Normand (2000) voice the dangers inherent in trusting Oates' theories, especially if they were to be applied in a legal or clinical setting where individuals' well-being is at stake. They call the research community to respond to Oates' claims and empirically test his theories to determine whether or not they can be trusted.

Kreiner, Altis, and Voss (2003) share Byrne and Normand's (2000) distrust of Oates' conclusions and put his theory to the test. Kreiner et al. (2003) focused their study on whether or not backward messages in speech would have an effect on listeners' language processing. They presented their participants with a series of real word and pseudoword trials using statements drawn from the Reverse Speech Website, about half of which were presented backwards and half of which were presented forward. After each auditory trial, the participant was then presented with a lexical decision task of words either included or not included in the trials in order to detect priming effects from the trials. Kreiner et al. (2003) found that the results of the lexical decision tasks after forward trials showed statistically significant priming effects, but the results of the backward speech trials were statistically insignificant. They concluded that Oates' claim that backward speech has as powerful an effect upon language processing as does forward speech is largely unsupported.

Taken as a whole, research on reverse speech indicates that reverse speech has little to no effect upon the language processing or behavior of the listener. Indeed, some form of priming is almost always necessary for individuals to even hear anything intelligible while listening to reverse speech. However, the majority of studies that have examined reverse speech all use singular, simple types of prompts. We chose to examine whether or not altering prompt types

could have an effect upon listener comprehension of words in reverse speech. In this experiment, we further tested Oates' theories by modifying and expanding upon the study of Kreiner et al. (2003). Like Kreiner et al. (2003), we drew our speech samples directly from Oates' website. We tested the effects of different types of primer prompt words upon listeners' ability to "hear" words in reverse speech samples with three types of prompts. The first type of prompt, Appropriate, was drawn directly from Oates' website. The second, Scrambled, presented the words of Oates' prompt in a scrambled order. The third, Inappropriate, utilized the actual, forward version of Oates' backwards sample as the prompt; in other words, the prompt for these backwards samples was the samples themselves in their forward forms. Furthermore, we wished to examine whether or not participants could hear words in reverse speech in general; do people truly need to be prompted in order to hear coherent messages in reverse speech, or do people automatically "hear" or assign meaning to the sounds of reverse speech? Asking participants whether they heard non-prompt words in each trial tested this question. A repeated measures design was used in which each participant was presented with all ten trials of each type of prompt. Participants were expected to hear the greatest number of prompt words in Appropriate trials due to the fact that these prompts were the phrases that other individuals, such as Oates, identified when they listened to the backward speech. Participants should hear the least number of prompt words in Inappropriate trials because the forward meaning of statements is not conveyed through backward presentation, so participants should be unable to detect the true forward words in their backward form.

Method

Participants

The participants in this study were 62 college students. Of these participants, 21 were male and 28 were female; 13 were missing gender-identification data. Half of the participants were undergraduate students enrolled in an upper level psychology course at a small, liberal arts college who completed this study for class credit. The rest of the participants were volunteers found by the students, often friends or relatives of the students. Volunteers received no compensation for participation in this study.

Materials

Thirty speech samples were selected and downloaded from the Reverse Speech Technologies Web site (http://reversespeech.com). Oates' forward speech examples were selected and then reversed using Amadeus II software, thus making them "reverse speech."

The stimuli were 30 reverse speech trials plus 1 practice trial. These 30 trials were divided into three types: Appropriate prompts, Scrambled prompts, and "Inappropriate" prompts. Actual prompt trials utilize the same prompt suggested by Oates on his website (http://reversespeech.com). For example, the practice trial prompt used in this experiment was the same prompt that Oates suggested for that specific speech segment, "he's shot bad…hold it…try and look up." Scrambled prompt trials presented the participant with a scrambled version of Oates' suggested prompt. For example, Oates suggested the prompt "I ruined the Lord with thee" for one speech sample, but in this experiment the prompt "with thee I the Lord ruined" was presented. Finally, the Inappropriate prompt trials disregarded Oates' prompts and used the speech segment's actual meaning. For example, Oates suggested the prompt "honor stealth" for one reverse speech segment. When played forward, this particular speech segment is actually

"flights or not." The prompt given for this speech segment in this trial was the segment's forward meaning, "flights or not." Prompts for each trial were presented in written form prior to their corresponding audio trials. For example, a typical trial would look like:

Prompt: flights or not

Click here to hear the audio sample, then return to this page using the "back" button.

Record your response in the response packet, then click here to go to the next trial.

Participants recorded their responses in packets. For each trial, the participant answered three questions. The first question, "Did you hear at least two of the words in the prompt when listening to the signal?" evaluated whether or not priming of suggested words could lead participants to "hear" those words in a reverse speech. The second question, "Did you hear some word or words other than those in the prompt?" evaluated participants' ability to detect meaningful speech segments, regardless of priming, in reverse speech samples. The final question, "If yes, what were those words?" evaluated the types of words that participants might have heard other than the prompt words.

Participants were tested on computers with a web browser and speakers. Participants accessed the reverse speech trials through the PS 306, Experimental Psychology, Website (http://www.skidmore.edu/%7Ehfoley/Exp%20Labs/PS306.Lab2.htm).

Procedure

Participants were tested individually at various locations. They could perform the experiment at any computer that had the requisite capabilities. Before beginning, participants were told that the purpose of this study was to examine individuals' ability to understand meaningful speech patters in auditory signals of poor quality and asked to sign an informed consent form.

In the course of a typical trial, the participant began by reading the prompt words. Then, he/she downloaded and listened to the auditory sample. The participant recorded two types of responses to each trial in the response packet. The first response was to indicate whether he/she heard two or more of the prompt words in the auditory sample. The second response was to indicate whether he/she heard any words in the auditory sample that were not given in the prompt. If so, the participant recorded the words he/she heard in a provided space. After providing both responses, the participant then proceeded to the next trial, following the same procedure until he/she had listened to each auditory trial.

Due to the nature of the individualized testing stations, variability arose between participants in the procedure. For example, some participants might have had the prompt in view during the entire course of each trial. Unless this holds true for each participants, the ability to read the prompt words while listening to the auditory samples might have made those participants more likely to hear words than those who could not see the prompt while listening to the sample. Similarly, some participants might have listened to each prompt more than once. If a trial was listened to more than once, then the first listening could arguably be considered a primer. Each subsequent time the participant were to listen to the auditory sample, he/she would already expect what to hear and could, perhaps, draw meaning out of the sample the more times he/she heard it in a carryover/learning effect. Such discrepancies could have influenced the internal validity of the results.

Results

Three One-Way Repeated Measures Analyses of Variance were calculated using a .05 level of significance. These calculations generated F-ratios for each of the three questions posed for each trial (heard prompt, heard any other words, list other words heard). Tukey-Kramer's

HSD test was used for post hoc analysis. The means compared in the post hoc analysis are contained in Table 1.

The first dependent variable to be calculated was the mean number of times that participants thought that they heard at least two of the prompt words in the reversed speech trials. This variable was measured by "yes/no" responses in which the participant indicated whether or not he/she heard prompt words. Overall the type of prompt had a significant effect on the average number of times participants thought that they had heard at least two of the prompt words in the speech trial, $F(2, 122) = 101.24$, $MSE = 3.04$, $p < .001$. Subsequent post hoc tests showed that Appropriate prompt trials resulted in a significantly higher "yes response" mean than Scrambled prompt or Inappropriate prompt trials. Furthermore, Scrambled prompt trials resulted in a significantly higher response mean than Inappropriate prompt trials.

The second dependent variable to be calculated was the mean number of times that participants did not hear prompt words but thought that they heard one other, non-prompt word in the reversed speech trial. This variable was measured by "no" responses and the number of times participants provided a free response of a *single*, self-identified word in the speech trial. Overall the type of prompt did not have a significant effect on the average number of times that participants heard no prompt words but reported hearing a single other word, $F(2, 122) = 258.91$, $MSE = 2.12$, $p = .17$.

The third dependent variable to be calculated was the mean number of times that participants did not hear prompt words but thought that they heard two or more non-prompt words in the reversed speech trial. This variable was measured by "no" responses and the number of times that participants provided a free response of two or more self-identified words in the speech trial. Overall the type of prompt had a significant effect on the average number of

times that participants did not hear prompt words but reported hearing more than two non-prompt words, $F(2, 122) = 8.14$, $MSE = 1.14$, $p < .005$. Subsequent post hoc tests showed that participants reported hearing a significantly greater number of non-prompt words from Appropriate prompt and Scrambled prompt trials than they did from Inappropriate prompt trials.

Discussion

A significant priming effect was found in response to Appropriate and Scrambled prompt trials. These results are consistent with Vokey and Read's (1985) finding that participants were far more likely to "hear" words in a reverse speech sample when the experimenter gave them a prompt for which to listen. Appropriate prompts were drawn directly from Oates' website and are thus words or phrases that other individuals heard in the backward presentation of the sentence. Though Scrambled prompts presented prompt words in a grammatically illogical order, these words, too, were heard by Oates and others while listening to speech samples backwards. Thus, as expected, participants heard a greater numbers of words in the reverse speech samples when given these prompts. These results are also consistent with Begg et al.'s (1993) finding that statements only effect language processing when their formation is consistent across time. Because the Appropriate and Scrambled prompts were derived from a reverse speech sample, they yielded significant priming effects with reverse speech trials. It is for this reason that the Inappropriate prompts yielded such low mean "yes" responses. The inappropriate prompts were actually the forward presentation of the speech trial. Thus, when the speech trial was presented backwards, it was a different formation than the trial, and the prompt was ineffective at producing an effect upon language processing. This finding is particularly pertinent because of the fact that the Inappropriate prompts were the actual meaning of the speech trial; it reinforces the various findings (Vokey and Read, 1985; Begg et al., 1993) that

coherent semantic meaning does not "leak" into the consciousness of a listener through a reverse speech sample.

The two analyses of participant free responses (i.e. words heard other than prompt words) tested the degree to which participants spontaneously heard words without a specific prompt. Upon first examination, it appears that the insignificant results of the analysis of single responses contradict the significant results of the analysis of multiple responses. Ultimately, these two analyses examined the same thing. However, the analysis of the multiple response condition (participants heard two or more non-prompt words) is a more stringent criterion than the single response condition. Thus, it is possible that the single response condition was not a sensitive enough measure to detect significant participant responses. Perhaps with more power, the single response condition would have been significant. The results of the multiple response condition analysis indicate that participants heard a significant number of non-prompt words in the Appropriate and Scramble trials. These results provide a foil for the conclusion of Vokey and Read (1985) that listeners need to be presented with a prompt in order to hear intelligible words in reverse speech. In fact, such results could be seen as supporting Oates' theories. However, another interpretation is possible. It is important to keep in mind the fact that the participants knew that they were supposed to be listening for words embedded in the reverse speech samples. When they heard words without specific prompts, the participants were, indeed, constructing their own meaning for reverse speech. However, the fact that the participants were *trying* to hear words could, in and of itself, be viewed as a type of priming. The question of whether or not people would hear intelligible words in reverse speech without being in a test condition or being expected to hear words still remains.

Overall, the results of this experiment support the general conclusion that reverse speech messages do not have an effect upon listeners' language processing or behavior. By and large, listeners are only able to identify intelligible words in reverse speech when they are first given prompt words for which listen; when prompts are incoherent or form-inconsistent, listeners are generally unable to hear intelligible words. However, the fact that participants did often hear non-prompt words in the Appropriate and Scrambled prompt trials must be examined. Do people hear words in reverse speech and backwards messages even when they are not specifically being told to listen for meaningful words? In order to test such a question, an experiment involving deception would most likely have to be performed. Participants must be presented with reverse speech messages in the context of a "cover task" so that they are not actually attending to the reverse speech with the goal of identifying words. Perhaps if participants were asked to rate the pleasantness or degree of appeal of reversed advertisements and explain their choice, they might report that some seemed more intelligible than others. Such results could indicate that people hear coherent words from all reverse speech and messages, regardless of context. Such an experiment would also be, arguably, more externally valid, perhaps relating reverse speech research more directly to the sphere of public life where the topic remains a subject of speculation and anxiety.

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Table 1.

Average Number of Yes Responses

	Type of Prime		
	Appropriate	Scrambled	Inappropriate
Heard at least two	5.048	4.161	.823
No but heard other	4.097	3.855	3.597
Heard at least two other	2.355	2.113	1.597