

Noun and verb naming: Phonological facilitation effects on naming latencies and viewing times in agrammatic vs. anomic aphasia

Abstract

Phonological facilitation effects during noun and verb naming were examined in groups of agrammatic and anomic aphasic individuals and healthy controls. Phonologically related vs. unrelated auditory primes were presented simultaneously with target pictures to be named while naming latencies and eye-fixations (viewing times) were measured. Controls showed reduced naming latencies and viewing times following phonologically related, compared to unrelated, primes for both nouns and verbs. Agrammatic participants showed phonological facilitation for verb, but not noun naming; whereas, anomic participants showed the opposite pattern, suggesting phonological facilitation effects interact with differential lexical deficits in aphasia.

Introduction

Naming deficits are pervasive in all types of aphasia. However, the nature of lexical deficits and their underlying processes in different types of aphasia are unclear. This study examined the effects of phonological priming during noun and verb naming in individuals with agrammatic and anomic aphasia, using an auditory-picture phonological priming paradigm. Previous research with healthy speakers has shown that naming latencies are decreased under phonological priming conditions, e.g., when the picture (*bed*) is presented for naming with a phonologically related prime (*belt*), compared to an unrelated prime (*ring*) (e.g., Roelofs, 1997). Such facilitation effects have also been shown in eyetracking studies, in that fixation times to pictured objects are shorter in phonologically related, compared to unrelated conditions, suggesting that speakers fixate on pictures during naming attempts until word forms are retrieved (Meyer & van der Meulen, 2000).

Researchers have used phonological priming to investigate the nature of lexical processing in aphasia. However, few studies have used this method to examine naming ability and the findings to date are mixed. For example, in a lexical decision task, Milberg et al. (1988) found no evidence of phonological facilitation in individuals with nonfluent aphasia, but individuals with fluent aphasia showed oversensitivity to phonological primes. Conversely, Baum (1997), in a lexical decision task, reported the opposite pattern from Milberg et al. (1988). Wilshire & Saffran (2005) suggested that phonological priming may show selective facilitation effects depending on the nature of lexical deficits that individuals present. In examining two aphasic individuals (IG, GL)' noun naming, they found that IG who is impaired in lexical selection benefited from begin-related phonological primes (e.g., *belt-bed*), while GL who is impaired in phoneme selection benefited from end-related primes (e.g., *rat-bat*). The present study further explores the nature of phonological facilitation during word production by examining groups of individuals with agrammatic vs. anomic aphasia in both noun and verb naming.

Participants

Twenty age-matched controls, 16 individuals with a mild-to-moderate agrammatic aphasia, and 9 individuals with a mild-to-moderate anomic aphasia participated in the

study. All were native speakers of English with normal or corrected-to-normal vision and hearing.

Materials & Procedures

Twenty object (nouns) and 20 action (verb) pairs were selected for experimental trials. Twenty related and 20 unrelated prime words (all nouns) selected for each word category. The same pictured item (*bed*) was presented for naming once with a related prime (*belt*) and once with an unrelated prime (*nail*). All target items and prime stimuli were monosyllabic, matched for frequency of occurrence, phonological neighborhood density, and word length between related vs. unrelated conditions.

The prime words were presented auditorily (free field) simultaneously with computer generated picture pair (Figure 1). Participants were asked to sequentially name both pictures as fast and accurately as possible from left to right and were told not to pay attention to the auditory words presented. Noun and verb conditions were presented in blocks, counterbalanced order across participants. Participants' naming latencies and eye fixation times for the left target picture were measured. Fixation data were not obtained from three aphasic participants per group due to technical difficulties. Prior to the study, the ability to name all experimental pictures was assessed and only aphasic participants who performed at least 50% correct naming of both nouns and verbs were included in the study.

Results

The results are summarized in Table 1. Incorrect naming, disfluent (e.g., uh, uh, pencil), or repaired responses (pencil-no-boot) were considered errors and not included in data analysis. In addition, any response produced more than 2,000 msec (controls) and 5,000 msec latencies (aphasic participants) following trial onset was excluded from data analysis.

Noun naming

For the healthy controls, the mean naming latencies were shorter following phonologically related, compared to unrelated primes ($t(19) = 6.51, p < .001$). A parallel pattern also was seen for fixation times ($t(19) = 2.83, p < .01$). However, unlike the healthy controls, the agrammatic participants did not show reliable facilitation effects for either naming latencies or fixation times (p 's $> .05$). Conversely, the anomic participants showed phonological facilitation effects for both naming latencies ($t(8) = 2.57, p < .05$) and fixation times ($t(5) = 3.11, p < .05$).

Verb naming

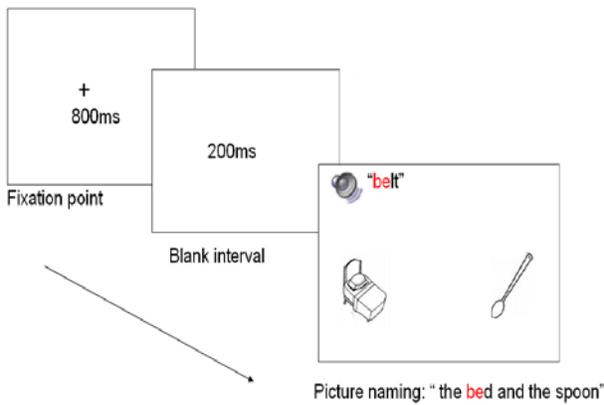
For the healthy controls, both naming latencies and fixation times were shorter in the presence of phonologically related versus unrelated primes ($t(19) = 6.15, p < .001$ for latencies; $t(19) = 3.15, p < .01$ for fixation times). The agrammatic participants also showed a significant facilitation effects for both naming latencies ($t(15) = 3.39, p < .01$) and fixation times ($t(12) = 3.30, p < .01$), contrary to their performance in noun naming. However, the anomic aphasic speakers showed no evidence of phonological facilitation for either naming latency or fixation time (p 's $> .05$) in the verb naming condition.

Discussion

Control participants showed phonological facilitation effects in nouns, consistent with findings from young speakers (e.g., Meyer & van der Muelen, 2000). Further, the phonological facilitation effects appeared in verb naming as well, suggesting that noun primes facilitates retrieval of verbs under the presence of overlapping phonological information. Interestingly, agrammatic and anomic participants showed a double dissociation with regard to phonological facilitation effects and word category. Whereas the agrammatic speakers showed significant facilitation effects in the verb naming condition, this effect was not apparent in the noun naming condition; conversely, the anomic participants showed phonological facilitation effects in the noun, but not the verb, naming condition. The presence of phonological facilitation effects in both groups suggest that aphasic participants did not fail to process auditory primes per se. Rather, the two groups differ in using phonological information from the primes to retrieve nouns vs. verbs, suggesting an interaction between phonological facilitation and lexical deficits. Both theoretical and clinical implications of these findings will be discussed.

Figure 1. Sample tasks for noun and verb naming

Noun Naming



Verb Naming

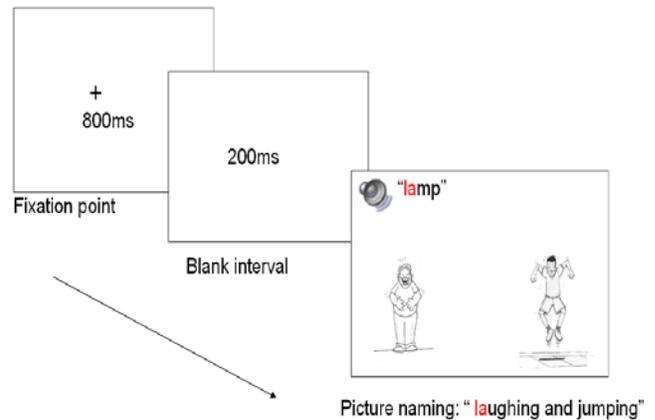


Table 1. Mean naming latencies and fixation times for the left picture (in milliseconds, with standard errors).

Participants	Naming Latency			Fixation Time			Errors (%)	
	Related	Unrelated	<i>p</i> -value	Related	Unrelated	<i>p</i> -value		
<i>Phonological Facilitation Effects in Nouns</i>								
Controls	788 (37)	817 (36)	**	364 (16)	399 (19)	**	4	3
Nonfluent	2564 (235)	2731 (243)	n.s.	1506 (173)	1561 (151)	n.s.	18	17
Fluent	1594 (265)	1851 (391)	*	760 (78)	928 (104)	*	22	20
<i>Phonological Facilitation Effects in Verbs</i>								
Controls	846 (31)	896 (32)	***	391 (23)	399 (19)	**	28	24
Nonfluent	1996 (159)	2684 (300)	**	839 (92)	964 (118)	**	10	7
Fluent	1811 (416)	1851 (375)	n.s.	930 (89)	979 (131)	n.s.	24	25

*** $p < .001$, ** $p < .01$, * $p < .05$, paired t-tests, 2-tailed

