Verbatim memory for surface features: Evidence from stress shift

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Introduction. Recall of "surface" features of linguistic expressions is significantly worse than recall of "gist" (i.e., broad semantic content) [1,2,3]. The Regeneration Hypothesis [3] offers an explanation for this discrepancy: surface features are not encoded verbatim in memory at all, and apparent memory for surface features reflects reconstruction based on gist memory. Other theories of memory (Fuzzy-Trace Theory [10], Exemplar Theory [4,5,6]), however, maintain that verbatim memory traces are stored, even if gist is more durable. In particular, phonetic work on episodic memory suggests that superficial acoustic detail is stored in memory [4] and even affects later processing [5,6]. However, this debate is confounded by methodology: the Regeneration Hypothesis is typically supported by evidence from recognition of written, declarative sentences which are manipulated in ways that subtly affect meaning, e.g., active vs. passive voice [7] or lexical choice ("castle" vs. "palace") [3]. Work on Exemplar Theory focuses on auditorily presented, isolated lexical or sublexical units. We bridge this methodological gap with an auditory recognition study that manipulated application of the Rhythm Rule (RR) [8]. Results suggest that participants can access verbatim memory for phonological material.

Design. RR is an optional process that shifts underlying (pen)ultimate primary stress in a word leftward if it is followed by another word with initial primary stress, as in *MISsissippi SENate* (+RR) vs. *MissisSIPpi SENate* (-RR). Because stress shift is not associated with a known interpretational impact, changes in RR application should only be remembered if surface features of language are encoded in memory independently of gist.

Method. Materials consisted of 24 dialogues between speakers A & B, in a 2x2 design [±RR in the stimulus x Old/New Probe] (1), along with 48 filler dialogues. Participants (n = 33) listened to the dialogue and solved a simple math problem as a distractor task. They then heard a probe corresponding to a line from the dialogue, responded whether they had heard the probe before, and rated their confidence from 1-4. Experimental items probed the dialogue's final line, which was always spoken by A and ended with a spliced-in adjective-noun pair eligible for RR; New probes differed only whether RR was applied there. Fillers counterbalanced which line was probed and which speaker produced it, and manipulated sentence-level prosody in New probes.

Results. Using unequal variance signal detection theory [9], we constructed a receiver operating characteristic (ROC) curve, using New as the lure and Old as target (z-transformed ROC in Figure 1). The d' score, a robust measure of sensitivity, was greater than 0 (d'=0.66), indicating participants were sensitive to the difference between trials in which the probe changed (New) and those in which it did not (Old). Participants also had a very strong bias to respond "Yes" (c = -1.05),reflected in the fact 76.4% of new probes received an incorrect "Yes" response, whereas 73.5% of "No" responses were correct. Whether the original target sentence was [+RR] or [-RR] had no significant effect on participant accuracy ($p > 0.5$). Full results are presented in Table 1.

Discussion. Listeners' sensitivity to changes in primary stress placement (Old/New) was significant, even though our manipulation of RR resulted in only subtle, localized differences between the stimulus and New probes; participants actually had heard the initial portion of the auditory input before. The results here indicate that listeners do encode stress in memory, even when it does not have a discernible impact on meaning. That is, surface-level acoustic detail is remembered even in the context of a sentence embedded in a larger discourse. Whether stress placement is encoded in memory as an abstract phonological form, or as an acoustic signal more directly, awaits further investigation.

Example Dialogue

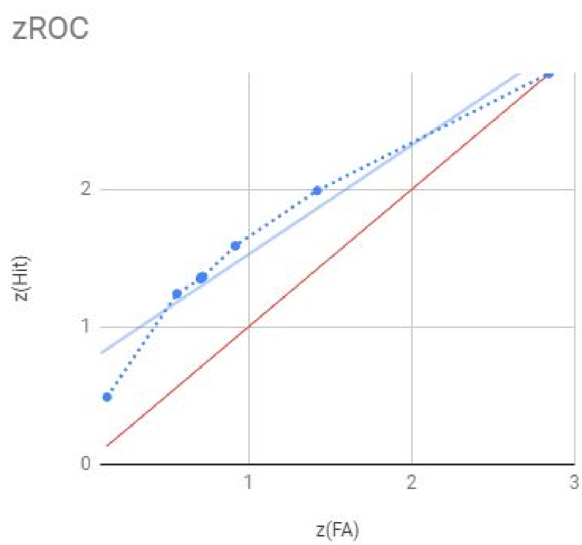
(1) A: Good morning! Aren't you thrilled it's Monday?
B: Why so chipper?
A: Our nonprofit held a fundraising auction.
B: Oh, was that very successful?
A: We surpassed our funding goal, actually!
B: Wow, how did you end up raising so much money?

A: Among other things, we auctioned off a date with a { DEbonair ATHlete [+RR] / deboNAIR ATHlete [-RR] }

Table 1. *Number of responses by condition with confidence ratings (1 = not at all confident, 4 = very confident).*

Stress shift in dialogue Target?	Probe New/Old	"Yes" responses: count, mean conf. (SE)	"No" responses: Count, mean conf. (SE)
Stress Shift [+RR] "DEbonair ATHlete"	New "deboNAIR ATHlete"	157, 3.64 (0.049)	55, 2.96 (0.103)
	Old "DEbonair ATHlete"	197, 3.75 (0.034)	17, 3.00 (0.192)
No Stress Shift [-RR] "deboNAIR ATHlete"	New "DEbonair ATHlete"	167, 3.68 (0.047)	45, 3.18 (0.116)
	Old "deboNAIR ATHlete"	195, 3.70 (0.038)	19, 2.79 (0.181)

Figure 1. *zROC for detection of Old (Target) / New (Lure) probes (d' = 0.66, c = -1.05)*



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