

Auditory distraction in semantic memory: A process-based approach [☆]

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Abstract

Five experiments demonstrate auditory-semantic distraction in tests of memory for semantic category-exemplars. The effects of irrelevant sound on category-exemplar recall are shown to be functionally distinct from those found in the context of serial short-term memory by showing sensitivity to: The lexical-semantic, rather than acoustic, properties of sound (Experiment 1) and between-sequence semantic similarity (Experiments 1–5) but only under conditions in which the task is free, not serial, recall (Experiment 3) and when the irrelevant sound items are dominant members of a semantic category (Experiment 4). The experiments also reveal evidence of a breakdown of a source-monitoring process under conditions of between-sequence semantic similarity (Experiments 2–5). Results are discussed in terms of activation and inhibition accounts and support a dynamic, process-oriented, rather than a structurally based, account of forgetting.

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Irrelevant background sound depresses verbal serial recall appreciably (e.g., Colle & Welsh, 1976; Jones, Madden, & Miles, 1992; Salamé & Baddeley, 1982). The weight of evidence suggests that this disruption results not from the similarity in identity (or content) between what is to be remembered and what is being

ignored (i.e., *interference-by-content*), but from a conflict of processes of seriation: One arising from the rote rehearsal of the to-be-remembered (TBR) items, the other from acoustic-based pre-attentive encoding of order (or ‘streaming’) of the irrelevant sequence (*interference-by-process*; Jones & Tremblay, 2000). However, a small number of studies that have used relatively long lists of semantically homogeneous words as TBR material have yielded results that seem more consistent with the view that auditory distraction is based on a similarity-of-content suggesting, at least, that the interference-by-process view is of limited generality (Beaman, 2004; Neely & LeCompte, 1999). The chief goal of the present series was to reconstrue these effects in an interference-by-process framework using process accounts of retrieval from long-term episodic and semantic memory.

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The two most dominant classes of explanation for auditory distraction with serial recall cleave along the distinction between interference-by-content and interference-by-process (Jones & Tremblay, 2000). In line with classical interference theory, the interference-by-content approach supposes that distraction occurs as a direct and passive consequence of the structural similarity between the post-categorical identity of to-be-ignored (TBI) and TBR items. For example, an account based on the Working Memory model posits that “phonological representations of memory items are liable to a partial loss from decay or interference from other phonological material” (Gathercole & Baddeley, 1993, p. 11) and thus the irrelevant sound effect is mediated by “the degree of phonological similarity between the irrelevant material and the memory items” (Gathercole & Baddeley, 1993, p. 13; Salamé & Baddeley, 1982). Similarly, the account offered by the Feature model of immediate memory (Nairne, 1990) supposes that the disruption is due, in part, to feature adoption: modality-independent features of the irrelevant items are automatically incorporated into, and hence corrupt, traces of TBR items (Neath, 2000).

In the chief alternative approach—the ‘interference-by-process’ account—the key determinant of the disruption is the extent to which both the irrelevant sound and the focal memory task are subject to an ordering (or seriation) process (e.g., Jones & Macken, 1993). Pivotal to this approach is the changing-state hypothesis (see, e.g., Jones et al., 1992) which posits that the degree of acoustic change within the sound dictates the extent to which the sound yields information about order, a by-product of primitive, acoustic-based, perceptual organization processes (Macken, Tremblay, Houghton, Nicholls, & Jones, 2003). These irrelevant order cues conflict with the similar, but this time deliberate, seriation (or subvocal serial rehearsal) of the TBR items.

Evidence in favor of the interference-by-process account include the finding that even changing-state non-speech sounds such as tones—which bear little or no resemblance to the TBR items—produce disruption that is qualitatively isomorphic with that from irrelevant speech (Jones & Macken, 1993). In line with this account, short-term memory tasks that do not involve or encourage the use of a serial rehearsal strategy are relatively invulnerable to disruption by changing-state sound (Beaman & Jones, 1997). That the acoustic character of the irrelevant sound is important is further underscored by a raft of findings showing that neither the mere presence of lexical-semantic content within the irrelevant sound, nor the similarity between the semantic content of the speech and that in the TBR list, has any bearing on the level of disruption of serial recall (Buchner, Irmen, & Erdfelder, 1996; Jones, Miles, & Page, 1990; LeCompte, Neely, & Wilson, 1997, but see Buchner, Rothermund, Wentura, & Mehl, 2004).

The weight of evidence suggests that the irrelevant sound effect is dictated by the acoustic attributes, not postcategorical content, of the sound and that the mechanism of disruption is interference-by-process. However, a few studies, using tasks other than serial recall, have found that the semantic content of irrelevant speech can indeed have a disruptive effect on memory and that interference-by-content may, after all, play some role in disruption from irrelevant sound (Beaman, 2004; Jones et al., 1990; Martin, Wogalter, & Forlano, 1988; Neely & LeCompte, 1999; Oswald, Tremblay, & Jones, 2000). For example, in a *category-exemplar recall* task, in which a list of, say, 16 semantically rich items (nouns) taken from a single semantic category are presented for free recall, the semantic similarity between the TBR and to-be-ignored (TBI) items impairs performance (Beaman, 2004; Neely & LeCompte, 1999): The free recall of relatively low-dominance category-exemplars (e.g., “avocado”) is disrupted (as reflected in reduced recall) more by semantically related, high-dominance, irrelevant category-items (that are not included in the TBR list; e.g., “apple”) than by high-dominance, categorically unrelated, irrelevant items (e.g., “hammer”). These results would seem more readily accommodated within an interference-by-content approach: Semantic representations of TBR items are degraded in working memory as a simple function of their semantic similarity to the irrelevant items (Oberauer, Lange, & Engle, 2004).

The impetus for the present research is the observation that the category-exemplar recall task is one which—unlike serial recall—is likely to be underpinned not only by the mere activation of semantic representations but by dynamic semantic-based processes that act upon and organize those representations in the service of efficient retrieval (e.g., Bousfield, 1953; Nairne, Riegler, & Serra, 1991). It seems plausible to suggest therefore that disruption by sound in this context may represent an entirely distinct class from that found in serial recall. Indeed, one indication that this may be the case is that the presence of related, high-dominance, irrelevant category-items also results in a greater probability of those items being included in participants’ responses (i.e., intrusions) compared with a quiet or an ‘unrelated’ condition. Such extra-list intrusions are extremely rare in the serial recall setting (Surprenant, Neath, & Brown, 2006). Thus, in the present study, we examine the generality of these semantic distraction effects and also consider how they might be reconciled with the dynamic, process-oriented, view developed for auditory distraction within the more standard serial recall setting.

Experiment 1

The effect of the semanticity of irrelevant sound in the category-exemplar recall task may be simply addi-

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