Journal of Experimental Psychology:
Learning, Memory, and Cognition
2011, Vol. 37, No. 4, 1032–1038

0278-7393/11/$12.00 DOI: 10.1037/a0023328

COMMENTARY

Selective Attention and Distractor Frequency in Naming Performance: Comment on Dhooge and Hartsuiker (2010)

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E. Dhooge and R. J. Hartsuiker (2010) reported experiments showing that picture naming takes longer with low- than high-frequency distractor words, replicating M. Miozzo and A. Caramazza (2003). In addition, they showed that this distractor-frequency effect disappears when distractors are masked or preexposed. These findings were taken to refute models like WEAVER++ (A. Roelofs, 2003) in which words are selected by competition. However, Dhooge and Hartsuiker do not take into account that according to this model, picture-word interference taps not only into word production but also into attentional processes. Here, the authors indicate that WEAVER++ contains an attentional mechanism that accounts for the distractor-frequency effect (A. Roelofs, 2005). Moreover, the authors demonstrate that the model accounts for the influence of masking and preexposure, and does so in a simpler way than the response exclusion through self-monitoring account advanced by Dhooge and Hartsuiker.

Keywords: attention, frequency, interference, masking, naming

A hotly debated issue in the literature on spoken word production is whether word selection is a competitive process (e.g., Abdel Rahman & Melinger, 2009a, 2009b; Finkbeiner & Caramazza, 2006; La Heij, Kuipers, & Starreveld, 2006; Mahon & Caramazza, 2009). Selection by competition is assumed by several computationally implemented models (e.g., Bloem & La Heij, 2003; Howard, Nickels, Coltheart, & Cole-Virtue, 2006; Levelt, Roelofs, & Meyer, 1999; Roelofs, 1992, 2003; Starreveld & La Heij, 1996). The assumption of competition is taken to be supported by the semantic interference effect in the picture-word interference paradigm: Naming pictured objects (e.g., a picture of a cat; say “cat”) takes longer when a semantically related word (e.g., *DOG*) is presented together with the object compared with presenting an unrelated word (e.g., *HOUSE*). *Semantic relatedness* is defined here as being member of the same semantic category (e.g., cats and dogs are animals). The semantic interference effect suggests that lexical selection occurs via competition and that a semantic relation between picture name and distractor word increases the competition (e.g., Hantsch, Jescheniak, & Schriefers, 2005; Schriefers, Meyer, & Levelt, 1990). It should be noted, however, that the picture-word interference paradigm taps not only into word selection but also into attentional mechanisms. Such attentional mechanisms are an explicit part of some models of naming performance, like those proposed by Starreveld and La Heij (1996) and by Roelofs (1992, 2003).

Word selection by competition was contested by Miozzo and Caramazza (2003), who argued against lexical competition models on the basis of their observation that low-frequency distractor words yield more interference than high-frequency distractors. They reasoned that, if word frequency is reflected in resting levels of activation (McClelland & Rumelhart, 1981, but see Roelofs, 1996), high-frequency distractors should be stronger competitors and yield more interference than low-frequency distractors, exactly opposite to what they observed. Miozzo and Caramazza (2003) stated that “the distractor frequency interference effect seriously challenges a popular model of lexical access (Levelt et al., 1999)” (p. 249). Miozzo and Caramazza (2003) and Finkbeiner and Caramazza (2006) maintained that lexical selection is not by competition and that some of the effects obtained with the picture-word interference paradigm reflect the difficulty of blocking or removing the distractor word from an articulatory output buffer. This account has been referred to as the “response exclusion hypothesis” (e.g., Finkbeiner & Caramazza, 2006). The removal process is assumed to have semantic information at its disposal, and as a result, removing semantically related distractor words from the output buffer takes longer than removing unrelated distractor words, yielding the semantic interference effect. Moreover, removing a distractor is assumed to happen faster for high-frequency printed words than for low-frequency printed words, thus yielding the distractor-frequency effect.

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Preparation of this article was supported by a grant from the Netherlands Organisation for Scientific Research.

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Dhooge and Hartsuiker (2010) replicated the distractor-frequency effect of Miozzo and Caramazza (2003) and observed that it disappears when the distractors are masked or preexposed. According to Dhooge and Hartsuiker, these findings challenge existing models and support an account in terms of response exclusion.

In this comment, we argue that the rejection of lexical competition models by Dhooge and Hartsuiker on the basis of their findings is not warranted. We start by pointing out that a competition model like WEAVER++ (Levelt et al., 1999; Roelofs, 1992, 2003) already includes a selective attention mechanism that accounts for the distractor-frequency effect (Roelofs, 2005) and related findings (Protopapas, Archonti, & Skaloumbakas, 2007). Next, we report the results of new computer simulations, which demonstrate that WEAVER++ also accounts for the influence of masking and preexposure on the distractor-frequency effect, given some plausible additional assumptions. We argue that our account is simpler than the response exclusion account of Dhooge and Hartsuiker. We conclude that lexical competition models cannot be rejected on the basis of the distractor-frequency effect and its modulation by masking and preexposure, contrary to what Dhooge and Hartsuiker claim.

The Distractor-Frequency Effect

Following Miozzo and Caramazza (2003), Dhooge and Hartsuiker maintain that the distractor-frequency effect cannot be explained by lexical competition models like WEAVER++. To account for the effect, Miozzo and Caramazza (2003) proposed a new frequency-sensitive mechanism by which distractors are actively blocked. This mechanism was later developed into the response exclusion account (e.g., Finkbeiner & Caramazza, 2006). However, Roelofs (2003) and Roelofs and Hagoort (2002) already proposed a similar attentional mechanism for WEAVER++, namely a condition-action rule that blocks out distractors. Such a blocking mechanism may also be adopted by other computationally implemented competition models (e.g., Bloem & La Heij, 2003; Howard et al., 2006; Starreveld & La Heij, 1996). In naming pictures with superimposed distractor words, WEAVER++ favors processing of the picture over processing of the distractor word by reactively blocking the latter (Roelofs, 2003, 2010; Roelofs & Hagoort, 2002). Distractor blocking may involve input processing (Roelofs, 2005) as well as engage aspects of output processing, such as encoding the word form of the distractor word. For example, Protopapas et al. (2007) assumed that word-form encoding controls distractor blocking by furnishing the information that a word is available in the output, at which point the appropriateness of this information can be verified. Consequently, the speed of blocking a distractor word depends on the speed of word-form encoding. Reactive blocking implies that the attentional modulation develops after an initial processing response to both targets and distractors (cf. Duncan, 2004). The speed of blocking depends on the speed with which the distractor information becomes available.

The attentional mechanism of distractor blocking in WEAVER++ accounts for several findings in the literature on attention and naming performance (e.g., Roelofs, 2003, 2010; Roelofs & Hagoort, 2002). For example, distractors can be blocked out more quickly if their spatial position is fixed rather than variable. This accounts for the finding that spatial certainty may reduce interference (Roelofs, 2003). Moreover, the blocking mechanism accounts for the effect of reading ability on Stroop interference (Protopapas et al., 2007; Roelofs, 2003). Protopapas et al. (2007) reported the results of extensive computer simulations showing that WEAVER++ accounts for the finding that the magnitude of color-word Stroop interference is related to reading speed. The Stroop task involves naming the color in which incongruent color words are presented (e.g., the word *GREEN* printed in red; vocal response: "red") or the color in which a nonverbal control stimulus is presented (e.g., a series of Xs in red; vocal response: "red"). Naming times are typically longer in the incongruent condition than in the control condition, an effect called Stroop interference. Protopapas et al. (2007) assessed reading speed and Stroop interference in a sample of 156 Greek children. In plotting the magnitude of Stroop interference against reading speed, they observed a linear relationship: Faster reading corresponds to smaller Stroop interference. Protopapas et al. showed that WEAVER++ accounts for the linear relationship under the assumption that faster reading implies quicker distractor blocking in Stroop task performance.

Roelofs (2005) demonstrated that when one takes into account that the blocking mechanism should be sensitive to word frequency, the distractor-frequency effect obtains a natural explanation without adding new specific assumptions to WEAVER++. As Miozzo and Caramazza (2003) assumed, high-frequency words will be read more quickly than low-frequency words. Consequently, high-frequency distractor words can be blocked out faster than low-frequency distractor words. Thus, the attentional attenuation of distractor processing occurs earlier for high- than low-frequency words, and so the interference with picture naming is reduced. Computer simulations reported in Roelofs (2005) demonstrated that when the speed of distractor blocking in WEAVER++ is manipulated as a function of word frequency, the model fits the data of Miozzo and Caramazza (2003, Experiment 1). Thus, the claim by Dhooge and Hartsuiker (2010) and Miozzo and Caramazza (2003) that the distractor-frequency effect challenges competition models like WEAVER++ is incorrect. Note that WEAVER++'s account for the distractor-frequency effect (i.e., higher frequency of a distractor word means faster blocking of this distractor word) is similar to the model's account of the effect of reading speed on the size of Stroop interference (i.e., higher reading speed means faster blocking).

To summarize, Dhooge and Hartsuiker (2010) replicated the distractor-frequency effect reported by Miozzo and Caramazza (2003) and followed them in arguing that the effect refutes models like WEAVER++. This claim is not warranted because of previous demonstrations that WEAVER++ accounts for the distractor-frequency effect (Roelofs, 2005) and related findings (Protopapas et al., 2007). WEAVER++ accounts for the distractor-frequency effect by simply applying an attentional mechanism that is already part of WEAVER++ to a new empirical phenomenon, without stipulating new assumptions or mechanisms.

A Challenge to the Distractor-Blocking Account?

Miozzo and Caramazza (2003) argued against a distractor-blocking account as implemented in WEAVER++. They based their argument on additional experiments showing that factors that are known to influence the speed of word recognition, such as case mixing and repetition, do not affect the distractor-frequency effect. Moreover, they observed that semantic relatedness and distractor frequency yield additive effects on picture naming latency, whereas the effects of phonological relatedness and distractor frequency interact. In the following, we address these findings in turn.

In one experiment (Experiment 2), Miozzo and Caramazza (2003) observed that case mixing (i.e., mixing upper and lowercase letters in the distractors, such as *dOg*), did not affect the size of interference of distractor words, nor did it influence the size of the distractor-frequency effect. Thus, although it is known that case mixing influences the speed of word recognition (e.g., Mayall & Humphreys, 1996), it did not affect the distractor-frequency effect, contrary to what the distractor-blocking account seems to predict.

However, the absence of an effect of case mixing does not really challenge a distractor-blocking account. Although earlier research has shown that case mixing influences the speed of word recognition (e.g., Mayall & Humphreys, 1996), Miozzo and Caramazza (2003) did not provide evidence that case mixing in their materials was effective in influencing the speed of word recognition. Moreover, even if one assumes that case mixing affected distractor recognition during picture naming in their experiment, the data are still not conclusive. Mayall and Humphreys (1996) observed that the effects of case mixing and word frequency were additive in reading words aloud, lexical decision, and semantic categorization. They argued that case mixing disrupts early letter encoding, which may include a process of letter normalization that precedes lexical identification proper (e.g., Dehaene, 2009). However, the duration of lexical identification proper is crucial for the speed of distractor blocking in WEAVER++. Thus, the absence of an effect of case mixing on the distractor-frequency effect does not challenge a distractor-blocking account.

In two other experiments, Miozzo and Caramazza (2003) had participants first perform lexical decision (Experiment 3) and oral reading (Experiment 4) on words that were later presented as distractor words during picture naming. The words were repeated three times in the lexical decision and oral reading tasks. Picture naming times in the presence of repeated distractor words were not shorter than in the presence of new distractor words, and the distractor-frequency effect was also of the same size for repeated distractor words and new distractor words. Thus, although repetition influences the speed of word recognition, it did not affect the distractor-frequency effect, contrary to what the distractor-blocking account of WEAVER++ seems to predict.

However, the absence of an effect of word repetition on the distractor-frequency effect does not really challenge a distractor-blocking account. First, repetition of words may increase not only their recognition speed but also their input strength (i.e., the amount of activation they produce) and thereby increase their interfering power. The resulting increase in interference may cancel out the facilitatory effect of faster recognition of the distractor words. Second, presenting words as targets in one task (e.g., lexical decision or oral reading) and later using these words as distractors in a different task (e.g., picture naming) yields competition at the level of task set (e.g., Waszak, Hommel, & Allport, 2003). The increased task competition from repeated words may offset the benefit of repetition on word processing itself. To conclude, although word repetition may decrease word recognition time, it may also increase interference because of increased input strength and competition at the level of task set.

Finally, Miozzo and Caramazza (2003) observed that an orthogonal manipulation of semantic relatedness (i.e., semantically related vs. unrelated distractors) and distractor frequency (i.e., high- vs. low-frequency distractors) yields additive effects on picture naming latencies (Experiment 5), whereas an orthogonal manipulation of phonological relatedness and distractor frequency yields an interaction (Experiment 7). Whereas semantically related distractor words (e.g., *DOG* in naming a pictured cat) lead to longer picture naming latencies compared with unrelated distractors (e.g., *HOUSE*), phonologically related distractors (e.g., *CAP*) lead to shorter naming latencies. Miozzo and Caramazza observed that the distractor-frequency effect was absent for phonologically related distractors. That is, naming time did not differ between high- and low-frequency distractor words that were phonologically related, whereas phonologically unrelated distractor words yielded a distractor-frequency effect. In contrast, for semantically related distractors, the distractor-frequency effect was of the same size as for semantically unrelated distractors.

The finding that distractor frequency interacts with phonological but not with semantic relatedness does not really challenge a model like WEAVER++. In this model, the semantic interference and phonological facilitation effects arise at different planning stages, namely, during lexical selection and word-form encoding, respectively. These stages have different processing characteristics (e.g., Levelt et al., 1999), which give rise to the difference in direction of the distractor effect (i.e., interference in case of semantic relatedness and facilitation in case of phonological relatedness). As a consequence, the effect of distractor frequency may differ between semantically related and phonologically related distractors. To conclude, distractor frequency interacts with phonological but not with semantic relatedness, which is compatible with models like WEAVER++ in which semantic and phonological effects arise during different planning stages.

In summary, although case mixing and repetition may influence the speed of word recognition, these factors do not have to affect the distractor-frequency effect. This is because the influence may precede word identification proper (as with case mixing) or the influence may be counteracted by other influences, such as increased task competition (as with first presenting the words in lexical decision and oral reading). Moreover, the effect of distractor frequency may differ between semantic and phonological relatedness, because different planning stages are involved. To conclude, the absence of effects of case mixing and word repetition on the distractor-frequency effect, and the differential influence of semantic and phonological relatedness on the distractor-frequency effect, do not challenge a distractor-blocking account of lexical competition models like WEAVER++.

Simulating the Influence of Masking and Preexposure

Dhooge and Hartsuiker (2010) not only replicated the distractor-frequency effect, but they also observed that the effect disappears when the distractor words are masked (their second experiment). According to Dhooge and Hartsuiker, no response is derived and buffered for masked distractors (cf. Finkbeiner & Caramazza, 2006, 2008; but see Forster & Davis, 1991). Consequently, frequency-sensitive exclusion of a response from the buffer does not take place, and thus masked distractors yield no frequency effect.

However, the effect of masking can also be accounted for in a selection by competition model like WEAVER++ when making some plausible and independently supported assumptions. One such assumption would be that masking reduces the input strength of printed words (e.g., Dehaene et al., 2001). Alternatively, participants may strategically reduce the response selection threshold (cf. Roelofs, 2001, 2003) if distractor words are not consciously perceived. That is, if conflict is not consciously perceived, a less conservative response criterion (i.e., a reduced selection threshold) may be adopted. A third possibility is that there is a lexical competition threshold (i.e., distractor words only enter the lexical competition process when exceeding a certain activation threshold), which masked words may fail to exceed because of their reduced input strength. Input strength, selection threshold, and competition threshold are important determinants of the efficiency of selective attention in WEAVER++ (cf. Roelofs, 2003). Clearly, the three possibilities of manipulating selective attention in the model are not mutually exclusive.

We explored the effects of reduced input strength, reduced selection threshold, and an increased competition threshold on the magnitude of the distractor-frequency effect in WEAVER++ simulations. The effects of the three manipulations were assessed in separate simulations. The computational protocol was the same as in previous WEAVER++ simulations of picture naming in the picture-word interference paradigm (i.e., Roelofs, 1992, 2003, 2006, 2008a). The parameter values were fixed and identical to those in earlier simulations except that the latency of distractor blocking took on values of 125 ms for the low-frequency distractors and 100 ms for the high-frequency ones (as in Roelofs, 2005). Other parameter values in the same direction gave equivalent results. In the first simulation, the input strength of the printed distractor was reduced by half for masked distractors (the 50% reduction is an arbitrary value; other values gave equivalent results). In the second simulation, the selection threshold (i.e., the critical difference in lexical activation between target and distractor) was reduced by half for masked distractors (again, other values gave equivalent results). In a third simulation, it was assumed that masking prevented the distractor from entering the lexical competition process. All three manipulations abolished the distractor-frequency effect in the model.

To illustrate the simulation outcomes, we report the results for the input strength manipulation. The left-hand panel of Figure 1 displays the simulation results for this manipulation together with the empirical observations by Dhooge and Hartsuiker (2010). The figure shows the difference in picture naming time for low- and high-frequency distractor words as a function of visibility condition (i.e., masked vs. visible). A positive difference means longer naming time with low- than high-frequency distractor words. Dhooge and Hartsuiker observed that picture naming took longer with low- than with high-frequency distractors, but only when the distractors were visible. When the distractors were masked, the frequency effect disappeared. The figure shows that the influence of masking in WEAVER++ is similar. In the model, the effect of the difference in blocking latency between low- and high-frequency distractors disappears because of the low input strength. Thus, the effect of masking does not uniquely support the response exclusion account; rather, a model like WEAVER++ can also account for the effect.

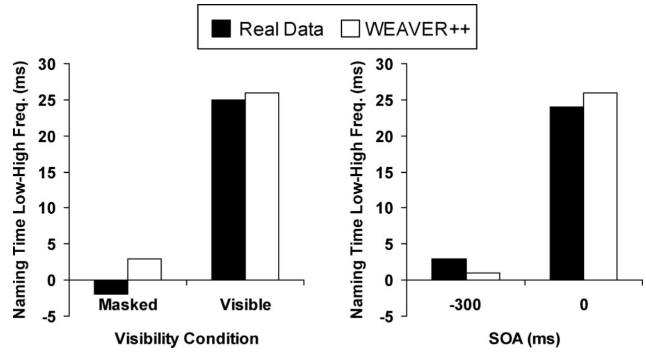

Figure 1. Difference in mean picture-naming time for low- and high-frequency distractor words as a function of visibility condition (left-hand panel) and stimulus onset asynchrony (SOA; right-hand panel): Real data from Dhooge and Hartsuiker (2010) and WEAVER++ simulation results. Freq. = frequency.

In their masking experiment (Experiment 2), Dhooge and Hartsuiker (2010) replicated the observation by Finkbeiner and Caramazza (2006) that masked distractor words yield semantic facilitation (i.e., naming is faster with semantically related than unrelated distractor words), whereas the effect is one of semantic interference when the distractors are visible (the standard effect). Dhooge and Hartsuiker followed Finkbeiner and Caramazza (2006) in arguing that this finding refutes lexical competition models like WEAVER++, under the assumption that these models predict semantic interference regardless of whether distractors are masked or visible. However, Roelofs (1992, 1993, 2006, 2008a) showed by computer simulations that semantic interference or facilitation may occur in WEAVER++ depending on the circumstances (see Abdel Rahman & Melinger, 2009b, for related discussion). For example, if lexical competition only occurs when distractor activation exceeds a competition threshold, the finding of facilitation with masking is readily explained. When distractors do not enter the process of lexical competition, semantically related distractors yield semantic facilitation because they activate the target response through conceptual connections (e.g., Roelofs, 1992, 1993, 2006, 2008a). Masked distractors would also yield semantic facilitation if they receive a smaller weight in the competition process in the model (e.g., Roelofs, 1992, 2008b). Thus, contrary to what Dhooge and Hartsuiker and Finkbeiner and Caramazza (2006) claim, semantic facilitation from masked distractors does not challenge models like WEAVER++. Whereas the simulation results shown in Figure 1 support our claim about the effect of masking on the distractor-frequency effect, simulation results reported elsewhere (i.e., Roelofs, 1992, 1993, 2006, 2008a, 2008b) support our claim about the effect of masking on the semantic effect.

The distractor-frequency effect disappears not only when distractors are masked but also when they are visible and presented well before picture onset, as Dhooge and Hartsuiker showed in their third experiment. Dhooge and Hartsuiker manipulated the stimulus onset asynchrony (SOA) between word and picture. They observed that the distractor-frequency effect was clearly reduced at a distractor preexposure SOA of −100 ms (compared with an SOA of 0 ms), even further reduced at −200 ms, and virtually absent at −300 ms (the minus sign indicates distractor preexposure). Elsewhere (e.g., Roelofs, 1992, 2003, 2006), it has been shown that WEAVER++ accounts for effects of SOA in the picture-word interference paradigm. The model assumes that pictures and words activate corresponding information in an associative network. Because of distractor blocking and spontaneous decay of activation, there is little activation from preexposed words in the network around the time of picture onset. Because word activation in the network is maximal when the word is presented around picture onset, semantic interference is maximal at short SOAs in the model, an empirically supported observation (e.g., Damian & Martin, 1999; Glaser & Düngelhoff, 1984; Schriefers et al., 1990). At a distractor-preexposure SOA of −300 ms, semantic interference is absent in the model (Roelofs, 1992, 2003), which corresponds to what is empirically observed (e.g., Glaser & Düngelhoff, 1984).

Extrapolating these findings about the SOA dependency of semantic interference to the effect of distractor frequency, the latter should be present around an SOA of 0 ms, but not at long distractor-preexposure SOAs. To assess whether this is indeed the case, we again performed WEAVER++ simulations, with the same parameter values as those in the simulations reported above except that SOA was now varied. The right-hand panel of Figure 1 displays the simulation results together with the empirical observations by Dhooge and Hartsuiker (2010). The figure shows the difference in naming time for low- and high-frequency distractors as a function of SOA, −300 ms versus 0 ms. Dhooge and Hartsuiker observed that picture naming took longer with low- than with high-frequency distractors, but this effect diminished much at preexposure SOAs of −100 and −200 ms and disappeared at the preexposure SOA of −300 ms. The figure shows that the influence of SOA in WEAVER++ is similar. In the model, the distractor-frequency effect is present at an SOA of 0 ms, but it diminishes or disappears at distractor preexposure SOAs. Thus, the effect of preexposure does not uniquely support the response exclusion account; rather, a model like WEAVER++ can also account for the effect.

To conclude, according to Dhooge and Hartsuiker (2010), the effects of masking and preexposure support the response exclusion account. However, computer simulations using WEAVER++ show that the model can also account for these findings.

Comparing the Theoretical Accounts

Whereas the effect of distractor preexposure occurs in WEAVER++ because of the attentional mechanism of distractor blocking and a spontaneous decay of activation (e.g., Roelofs, 2003, 2010), Dhooge and Hartsuiker (2010) propose an account in terms of exclusion of the distractor as a potential response from an output buffer through self-monitoring. This account (just as the original response exclusion hypothesis; e.g., Finkbeiner & Caramazza, 2006) assumes that the response to the picture has to be buffered before it can be produced. However, there is, to our knowledge, no independent empirical evidence for the assumption that an output buffer is involved in immediate, speeded naming.

Moreover, Dhooge and Hartsuiker (2010) do not specify how responses are excluded from the buffer by self-monitoring (see La Heij et al., 2006, for a discussion of other problems with the response exclusion account). Still, whereas Miozzo and Caramazza (2003) simply postulate a process of response exclusion, Dhooge and Hartsuiker make this rather underspecified proposal more explicit by linking it to a cognitive machinery that is independently motivated, namely, the self-monitoring system that checks our speech for errors. Nevertheless, the response exclusion through self-monitoring account of Dhooge and Hartsuiker in its present form cannot be evaluated through computer simulations, as has been done for the account provided by WEAVER++. Distractor blocking in WEAVER++ is achieved by a simple condition-action rule, which is a computationally explicit mechanism. As indicated earlier, such a blocking mechanism may also be adopted by other competition models (e.g., Bloem & La Heij, 2003; Howard et al., 2006; Starreveld & La Heij, 1996). The assumption that attentional influences are mediated by rules is grounded in a long tradition in the cognitive neurosciences, and it is receiving increasing support not only from behavioral studies but also from single-cell recordings and neuroimaging (see Sakai, 2008, for a review).

Independent evidence that distractor blocking occurs in an early processing stage (i.e., during lexical access, as maintained by the competition account) rather than in a late processing stage (i.e., during an articulatory buffering stage, as maintained by the response exclusion account) comes from a recent electroencephalographic study by Aristei, Melinger, and Abdel Rahman (2010). They examined semantic context effects in naming performance with event-related brain potentials (ERPs) during overt picture naming. Aristei et al. combined the picture-word interference paradigm (e.g., Glaser & Düngelhoff, 1984) and a semantic blocking paradigm (e.g., Damian, Vigliocco, & Levelt, 2001). Pictured objects were named in blocks of trials consisting of semantically related objects and blocks consisting of unrelated objects. In each blocking condition, semantically related and unrelated distractor words were presented. Aristei et al. (2010) found that the factors blocking and distractor interacted and yielded ERP effects in overlapping time windows. Distractor-word effects (i.e., from semantically related vs. unrelated distractors) started at 200 ms after picture onset and blocking effects (i.e., from trial blocks with semantically related objects vs. semantically unrelated objects) began at 250 ms. This time course is in line with the estimated time window of around 150–250 ms for lexical selection in picture naming (Indefrey & Levelt, 2004). In contrast, if the semantic interference effect arose during an articulatory buffering stage, as the response exclusion account maintains, the onset of the semantic context effects in the ERPs should have been at 500–600 ms after picture onset (Indefrey & Levelt, 2004), contrary to what Aristei et al. (2010) observed. Thus, ERP evidence on the time course of distractor effects in overt picture naming suggests that semantic interference arises during lexical selection, as assumed by the lexical competition account.

To conclude, the assumption of response buffering in speeded naming lacks independent motivation and the mechanisms underlying response exclusion through self-monitoring are not specified. In contrast, the attentional mechanism of distractor blocking through rule application of WEAVER++ is computationally explicit and empirically motivated, and has been evaluated by computer simulation. Moreover, the model's assumption that semantic interference arises during lexical selection receives support from a recent ERP study. Therefore, the WEAVER++ model presently offers a more satisfactory account of the data than the response exclusion through self-monitoring account advanced by Dhooge and Hartsuiker (2010).

Summary and Conclusion

In summary, Dhooge and Hartsuiker (2010) replicated the distractor-frequency effect originally reported by Miozzo and Caramazza (2003) and showed that the effect disappears when distractors are masked or sufficiently preexposed. These findings were taken to refute models like WEAVER++ in which words are selected by competition. We referred to previous demonstrations that WEAVER++ accounts for the distractor-frequency effect. Moreover, we demonstrated that the model accounts for the influence of masking and preexposure. Furthermore, the model does so in a simpler way than the response exclusion through self-monitoring account advanced by Dhooge and Hartsuiker. WEAVER++ accounts for the findings by applying an attentional mechanism that is already part of the model to new empirical phenomena. To conclude, lexical competition models like WEAVER++ should not be rejected on the basis of the distractor-frequency effect and its modulation by masking and preexposure, contrary to what Dhooge and Hartsuiker claim.

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Received February 15, 2010
Revision received November 22, 2010
Accepted December 21, 2010 ■