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Abstract

Semantic satiation research indicates that weakly-related semantic information is more satiated than highly-related information (Balota & Black, 1997). In the current studies, we used biased ambiguous words to investigate possible differences in satiation and the duration of satiation. Participants read ambiguous cues 3 or 30 times and either immediately or after a delay made a CUE—TARGET relatedness judgment. Targets were consistent with the dominant or subordinate meaning or unrelated to either. Experiments 1 and 2 satiatied noun-noun homographs (e.g., calf). Experiment 2 included a delayed relatedness judgment and indicated that satiation becomes extinct after no more than one minute (contrary to, e.g., Kuhl & Anderson, 2011). Experiment 3 also satiated noun-verb homographs (e.g., duck). Evidence of satiation was found among the immediate response tasks. Experiment 3 supported the theory that greater semantic distance exists between alternative meanings of noun-verb ambiguous words compared with noun-noun ambiguous words (Mirman et al., 2010).

Semantic Satiation among Lexically-Ambiguous Words

Historically, semantic satiation has referred to the subjective loss of meaning with prolonged exposure to a word (Severance & Washburn, 1907; Bassett, Warne, Titchener, & Weld 1919). However, this definition has produced oftentimes contradictory and inconclusive results, with the bulk of these problems in the literature from 1907 through 1970 collected and summarized by Esposito and Pelton (1971). Since this review, however, semantic satiation has been generally defined in the literature as an inhibitory effect on response times as a function of 'over-priming'—that is, the shift in priming from a facilitative to an inhibitory effect as the number of presentations of the prime increase (Collins & Loftus, 1975).

Adopting this definition, Cohene, Smith and Klein (1978) proposed what has become a relatively successful paradigm in which a written cue is repeatedly shown. Following this, a target (associated word, unrelated word, or non-word) was presented and participants responded whether the target is a word or non-word. Notably, however, no evidence was found across three experiments for any significant effect of satiation. Indeed, the authors noted, and we here emphasize, that these findings were consistent with Neely's (1977a) results that indicated the absence of any satiation following a lexical decision task: convergent findings that suggest satiation cannot be reduced to the repetition alone of a word. That is to say, simply repeating a word and then making a lexical decision on another word are unrelated cognitive processes insofar as the effect of satiation is concerned. Indeed, given the prevalence of this measure throughout much of the unsuccessful literature, the early conflicts in the field should not be met with much surprise.

Earlier experiments had attempted to quantify the causes of satiation through lexical decision tasks, as above, exemplar commonality (Smith & Raygor, 1956), number of produced associated (Kanungo & Lambert, 1963), etc. However, little research attempting to quantify the effect had measured speeded reaction times in a relatedness judgment task. Thus, Smith (1984) and later Smith and Klein (1990) used a speeded membership decision task. Although procedurally

similar to Cohene, Smith, and Klein's (1978) original experiment, these experiments, instead of presenting participants with a lexical decision task, showed both the repeated cue and a novel target (related or unrelated to the cue) and asked participants to respond whether the two words were related in meaning.

Smith (1984) again found no significant effects for repetition across three experiments; however, did note trends towards slowing among related CUE—TARGET pairs as a function of repetition. (Note, though, that the experiments had 16, 32, and 32 participants, respectively and may have been underpowered to sufficiently measure the effect.) Smith and Klein (1990), rather, satiated a category cue (e.g., FRUIT) on 3 or 30 repetitions and then gave participants a relatedness judgment with two novel words. For those target pairs in a member-match condition (i.e., two targets that are related to one another and both a member of the satiated category, such as APPLE—PLUM with FRUIT as a cue), there was a significant slowing in relatedness judgments from 3 to 30 repetitions.

Clearly, the measurement of semantic satiation, and the determination of whether and when it exists at all, is difficult and has created conflicting results in the literature since the first studies to examine it. However, in the modern literature, there are two primary theories that try to explain its emergence: Esposito and Pelton (1971) proposed that the repeated access of the lexical representation of a word causes that representation to become ineffective and that this change in processing correspondingly results in satiation (a theory termed lexical fatigue). Alternately, a theory of meaning satiation has been proposed (Jakobovits & Lambert, 1962; Neely, 1977b; Smith & Klein, 1990) in which the repeated presentation of a single word causes fatigue or adaptation among the neural networks that underlie the processing of this meaning and thereby slow subsequent processing.

Tian and Huber (2010) then offered a formal test of these two theories and advanced their own theory of associative satiation: that it is the repeated access of a lexical ascription (that is, the

series of letters that we know as a word) paired with the associated meaning that results ultimately in slowed processing and response times. Indeed, giving participants a relatedness judgment following a period of either lexical satiation (in which the target and repeated cue were identical) or meaning satiation (in which a category cue was repeated and both target pairmates were novel words and members of the repeated category), Tian and Huber found no significant slowing in response times. However, in a test of associative satiation (in which a cue was repeated and then participants made a relatedness judgment between the cue and a pairmate), there was a significant slowing as a function of repetitions of the cue. These results suggest, and a review of the successes in the literature (e.g., Balota & Black, 1997; Black, 2001; Smith & Klein, 1990) may support, that a measure of associative fatigue more reliably produces effects expected of semantic satiation than a lexical or meaning fatigue paradigm individually.

On this understanding of semantic satiation, recent research has sought to examine the effects of meaning relatedness and cue ambiguity: Balota and Black (1997) examined satiation manipulating the strength of pairmate association to the repeated cue. Here, participants saw a repeated cue (e.g., ROYALTY) an average of 2, 12, or 22 times and made a relatedness judgment between the cue and a high-strength associate (e.g., QUEEN), a low-strength associate (e.g., DUKE) or an unrelated word. Results indicated a significant relatedness by repetition interaction among their young adult population, although not their elderly population with either slowing or no change in response time for related items as a function of repetition and a marginal speeding in response times for unrelated items with repetition. They also observed a significant main effect for strength of association with response times to high-strength associates significantly faster than to low-strength associates (with low-strength associate response times nearly identical to response times on unrelated pairmates).

In a related experiment, earlier research by Balota and Duchek (1991) using homographs (although unrelated to semantic satiation) was later revisited by Black (2001) who used a test of

meaning satiation in which one of a homograph's two meanings (e.g., HEART) was repeated and participants then made a relatedness judgment between the homograph itself (e.g., ORGAN) and (1) a new word (e.g., KIDNEY) related to its satiated meaning, (2) a new word (e.g., PIANO) related to its unsatiated meaning, or (3) an unrelated word. Results of this experiment gave a marginally significant slowing with increased cue repetitions among discordant homograph pairmates (PIANO). Moreover, Black found overall slower response times for the discordant meaning than the concordant meaning.

Indeed, these results suggest that in a context-free environment, the strength of association between a word and a given meaning play an important role in the emergence of semantic satiation and the degree of inhibition that may be observed. Given this, the current study attempted to further control for meaning bias (i.e., how much more often an individual will produce one meaning of an ambiguous word than another meaning) by employing an associative satiation paradigm using biased homographs. In part motivated by Black (2003) and Balota and Duchek (1991), this study explicitly used only biased homographs that have two distinct noun meanings and, unlike the previous studies, satiated the homograph in a context-free environment and then presented the cue with a dominant, subordinate, or unrelated pairmate for a relatedness judgment.

Moreover, exceedingly little research has investigated the duration of the satiation effect. The only such study to do so (Kuhl & Anderson, 2011), using a non-standard stem completion task in which participants had to complete a partial word pair (e.g., WOOL—S____ where SHEEP is the expected stem completion), found preliminary evidence that the effects of satiation may continue for multiple minutes (up to 15 minutes in their second experiment). However, in addition to using a non-standard testing methodology, these results were based on the proportion of correctly-generated words in the stem completion task and not on any response time or response latency measure. Given this, our second experiment used the same word list as our first experiment; however, tested using a delayed relatedness judgment. In this way, participants provided a

relatedness judgment between approximately 1.5 and 6 minutes after initially satiating the homograph cue. With this methodology, we hoped to either provide evidence for a very short duration of the effect (less than one minute) or to map its gradual extinction.

Finally, semantic distance research (Mirman, Strauss, Dixon, & Magnuson, 2010) has indicated that among balanced noun-verb and noun-noun homonyms (e.g., BARK), significant differences existed in response times for relatedness judgments between the homonym in a context-free environment. Specifically, results indicated slower response times for noun-noun homonyms than for noun-verb homonyms with both being significantly slower than unambiguous words. Given this, we concluded with a third experiment that used both noun-noun and noun-verb homographs using an immediate relatedness judgment following satiation to investigate possible differences in satiation when potential meanings of a cue cross grammatical classes.

Experiment 1

Method

Participants. Sixty-two undergraduate students at John Carroll University were recruited for this study from introductory psychology courses. Participants all received partial course credit for participation in the research.

Materials. The word list consisted of stimuli (all homographs) taken from the University of South Florida Free Association Norms (Nelson, McEvoy, & Schreiber, 2004). Dominant and subordinate meanings were determined by the relative frequencies with which associates to a given meaning of each homograph were produced in the norms. (E.g., the dominant target for GAS was CAR, with the most frequently produced free association responses being CAR, MONEY, OIL, etc.) A meaning was considered dominant if it was produced at least 75% of the time in the association norms and subordinate if it appeared in fewer than 25% of responses.

For each dominant and subordinate target a corresponding unrelated target was generated, matched to the related target on the log of the related target's SUBTLEX frequency (Brysbaert &

New, 2009), length, and part of speech. (E.g., for the related pair PEN—PENCIL, the unrelated pair would be PEN—SPIDER with PENCIL and SPIDER matched on the above criteria.) All SUBTLEX frequencies were taken from the English Lexicon Project (Balota et al., 2007).

A total of 72 homographs were used in this experiment. All homographs had two distinct noun meanings. An additional 60 filler cues and targets—all unambiguous words thematically unrelated to the homographs and their targets—were presented during testing to participants. The order of the complete word list was randomized for each trial.

Procedure. Subjects were presented with two words in each trial: a to-be-satiated cue and a target pairmate. The cue was presented in the center of an LCD monitor in black 36-point Arial font on a white background and repeated either 3 or 30 times. For each repetition, the cue was presented on the screen for 600ms with a 300ms interstimulus interval between each repetition during which the screen remained blank. Following the final repetition of the cue, the screen was cleared for 300ms. Participants were then presented with the cue and a pairmate (displayed in the center of the screen as CUE—PAIRMATE). Participants pressed the 'M' key with the index finger of their right hand to indicate that the cue and target were thematically related or the 'C' key with the index finger of their left hand to indicate that the two were unrelated. A 300ms intertrial interval followed the participant's relatedness judgment.

Participants were seated approximately 50cm away from the LCD screen with the center of the screen being at approximately eye level. During the experiment, the researcher remained in the testing room with the participant. Before starting, participants were encouraged to answer as quickly and accurately as possible.

Design. The design was a 2 (bias: dominant vs. subordinate) X 2 (relatedness: related vs. unrelated) X 2 (repetition: 3 vs. 30 repetitions) within-factors design. There were 9 observations per subject per cell.

Results and Discussion

For each condition, each participant's mean response time was calculated. Prior to this calculation, individual responses were identified as outliers and dropped if: (a) the response time for an individual item was fewer than 200ms[1] or (b) the response time for the item was more than 3 standard deviations from the participant's average response time. The mean response time for each participant was calculated for only the correct responses remaining in each condition.

Response times. A 2x2x2 within-factors ANOVA revealed a marginally significant[2] main effect for homograph bias, $F(1,59) = 3.530$; $p = 0.0652$; SS = 3,716,061, a significant main effect for relatedness, $F(1,59) = 11.722$; $p = 0.0011$; SS = 41,210,059, and a significant main effect for repetitions, $F(1,61) = 10.053$; $p = 0.0024$; SS = 15,859,130.

This analysis also revealed a significant bias by relatedness interaction, $F(1,62) = 4.495$; $p = 0.0380$; SS = 3,962,134, with response times to dominant related items (M = 1628.26ms; SD = 1285.83ms) significantly faster, $t = -2.223$; $p = 0.0261$, than subordinate related (M = 1749.93ms; SD = 1224.22ms) items. Dominant related items had significantly faster, t = -4.546; $p < 0.001$, response times than dominant unrelated (M = 1867.75ms; SD = 1227.16ms) as did subordinate related, $t = -2.348$; $p = 0.0190$, with respect to subordinate unrelated (M = 1878.76ms; SD = 1194.99ms) items. There was no significant difference between dominant unrelated and subordinate unrelated items, $t = -0.1953$; $p = 0.8451$.

A significant interaction between relatedness and repetitions was also observed, $F(1,64) = 4.037$; $p = 0.0487$; SS = 5,311,433, with response times for satiated related words (M = 1780.8; SD = 1351.4) significantly longer, $t = -3.372$; $p < 0.001$, than for primed related (M = 1586.08; SD = 1154.56). Related primed words had response times significantly shorter, $t = -5.007$; $p < 0.001$, than unrelated primed words (M = 1845.45; SD = 1204.89). Related satiated words had response times

[1] The majority of these were 0ms response times. An error in the program used caused participants to skip the decision screen if the 'C' or 'M' key were pressed accidentally during the satiation phase (resulting in a null response time).

[2] Indeed, if we trim data more than 1.5 times beyond the interquartile range for each participant, this measure easily achieves a level of statistical significance.

significantly shorter, t = -2.205; p = 0.0276, than unrelated satiated words (M = 1900.71; SD = 1216.82). There was no significant difference between unrelated primed words and satiated words, t = 1.064; p = 0.2876.

The results to this were straightforward: specifically, this experiment revealed that both dominant and subordinate meanings of noun-noun homographs are satiated. That is, we see that for both dominant and subordinate meanings, with increased repetitions we see a significant slowing of response times in relatedness judgments. Moreover, we see that dominant and subordinate meanings are differentially satiated: at 3 repetitions, we see that both dominant and subordinate meanings see the benefit of a priming effect, but that dominant items receive more of a benefit than do subordinate. (That is, we may say that the dominant meaning of a homograph is more activated by the ambiguous prime than is the subordinate.) However, at 30 repetitions, both related dominant and subordinate meanings are equally satiated, showing no significant difference in mean response time. Moreover, we can conclude that this slowing was not simply the effect of general fatigue with repetition as we saw no significant difference between unrelated words at 3 and 30 repetitions.

Experiment 2

Motivation

Given the positive results of Experiment 1, Experiment 2 sought to extend this by conceptually replicating the results of Kuhl and Anderson (2011). This prior research used a stem-completion task to assess the effect of satiation at a time delay, finding significant decrements at up to a 15-minute delay. However, this method measured satiation by percentage of correct stem completions, and not by response latency—essentially a wholly unique methodology in the semantic satiation literature. For this reason, Experiment 2 sought to use a common measure of satiation (response latency in a relatedness judgment) in an attempt to replicate prior results using an established paradigm.

Method

Participants. Sixty undergraduate students at John Carroll University who had not previously participated in Experiment 1 were recruited for this study from introductory psychology courses. Participants all received partial course credit for participation in this research.

Materials. The word list was generated using the same method as in Experiment 1. Given no significant differences in participant response times for unrelated items across each condition, unrelated items were selected to match the rounded average of the length of the dominant and subordinate target for each cue and the rounded average log of the SUBTLEX frequencies of the dominant and subordinate cues.

A total of 72 homographs were used in this experiment. All homographs had two distinct noun meanings. An additional 60 filler cues and targets—all unambiguous words thematically unrelated to the homographs and their targets—were presented during testing to participants. The order of the complete word list was randomized for each trial. Refer to Appendix II for the complete material list.

Procedure. This experiment was broken into four study and four test phases. In each study phase, participants were presented with a series of 24 cues, each repeated either 3 or 30 times in the center of an LCD monitor in black 36-point Arial font on a white background. For each repetition, the cue was presented on the screen for 600ms with a 300ms interstimulus interval during which the screen remained blank. Following the final repetition of the cue, the screen was cleared for 300ms before the next cue was presented.

After a 300ms intertrial interval, participants entered the test phase. Here, participants were then presented randomly with either one of the studied cues and its pairmate or one of 12 previously-unseen cues and its pairmate (displayed in the center of the screen as CUE—PAIRMATE). Participants pressed the ‘M’ key with the index finger of their right hand to indicate that the cue and target were thematically related or the ‘C’ key with the index finger of their left

hand to indicate that the two were unrelated. A 300ms intertrial interval followed the participant's relatedness judgment.

This process repeated until participants had made a relatedness judgment for all 36 CUE—TARGET pairs. Time elapsed from the study of a cue to its testing ranged from approximately 1.5 to 6 minutes. The study and test phases repeated sequentially three more times each until all 72 homographs and 60 fillers had been tested.

Design. The design was a 3 (bias: dominant vs. subordinate vs. unrelated) X 3 (repetitions: 0 vs. 3 vs. 30 repetitions) within-factors design.

Results and Discussion

For each condition, each participant's mean response time was calculated. Prior to this calculation, individual responses were identified as outliers and dropped if: (a) the response time for an individual item was fewer than 200ms or (b) the response time for the item was more than 3 standard deviations from the participant's average response time. The mean response time for each participant was calculated for only the correct responses remaining in each condition. Five participants were excluded from analyses due to overall accuracy below 75%.

Response times. A 3x3 within-factors ANOVA revealed a significant main effect for word bias, $F(2,104) = 95.431$; $p < 0.001$; SS = 233,266,878. No significant main effect for repetitions was found, $F(2,106) = 0.295$; $p = 0.745$; SS = 318,845. Follow-up tests revealed that response times for dominant items (M = 1265.44ms; SD = 689.08ms) were significantly faster, $t = -5.722$; < 0.001, than for subordinate items (M = 1443.32ms; SD = 811.77ms). Both dominant items, $t = -17.399$; $p < 0.001$, and subordinate items, $t = -11.092$; $p < 0.001$, were faster than unrelated items (M = 1859.70ms; SD = 977.70ms).

This experiment was meant to (1) replicate the results of Kuhl and Anderson (2011) using a standard relatedness judgment paradigm and (2) assess the duration of the effect of semantic satiation in the event that it became extinct at some point along the delay (1 to 6 minutes)

measured. The results, however, fail to support Kuhl and Anderson's findings, although perhaps not unexpectedly: namely, their research used a non-standard stem completion task and measured not reaction latency in any task (as does the remainder of the modern semantic satiation literature), but rather percent accuracy in completing the task with the desired word. Further, their paper explicitly noted that it would be incredibly unusual to see a prolonged effect of satiation given general physiological knowledge of cellular fatigue and that such an observation would be a unique anomaly. In this way, it is hardly surprising that we saw, even at response delays of 1 to 2 minutes, no persistent effect of satiation.

Moreover, as a function of elapsed time since satiation, we actually see that participants' mean response latencies significantly slowed. That is, the farther into a testing session a participant was—and the farther apart an item in the test session was from its time of study—the slower a participant was in making a relatedness judgment, irrespective of meaning dominance or repetition condition. One possible account of this may be general fatigue: those items for which we see significant slowing—where 5 to 6 minutes have elapsed since study—correspond to those items which were studied at the very beginning of a study phase and tested at the very end of the following test phase. Given the change in design from Experiment 1 (where every studied item was directly proceeded by a corresponding relatedness judgment), the study phase for Experiment 2 required far less participant interaction and active participation and the test phases were longer and, presumably, more monotonous. In short, there was more a possibility for participants' to lose focus than was present in our first experiment. Nevertheless, it is important to note that, even excluding the test items with a longer time delay, we fail to see any significant evidence for satiation, contrary to the novel findings of Kuhl and Anderson.

Experiment 3

Motivation

Given the null results of Experiment 2, Experiment 3 returned to the methodology used by

E1 utilizing an immediate relatedness judgment. This experiment, however, included both homographs with two noun meanings and homographs with one distinct noun and one distinct verb meaning. Specifically, this experiment sought to examine whether issues of semantic distance would impact the degree of satiation of dominant and subordinate meanings. Namely, this theory would predict that the activation of a homograph meaning of one part of speech would not—or would to only a minimal extent—activate other meanings of the homograph that are in different parts of speech (Mirman, Strauss, Dixon, & Magnusson, 2010). In this way, it would be expected that satiated dominant meanings of noun-verb homographs would behave similarly to dominant satiated meanings of noun-noun homographs. However, it is questionable whether any satiation at all would be observed among the subordinate meanings (i.e., if the subordinate meaning in a separate part of speech is not or is minimally activated, it would not be expected for either priming or satiation to occur).

Method

Participants. Eighty-four undergraduate students at John Carroll University were recruited for this study from introductory psychology courses. Participants all received partial course credit for participation in this research. Participation was not available to students who had completed Experiment 1 or 2 previously.

Materials. The word list was generated using the same method as in Experiment 1.

A total of 96 homographs were used in this experiment. Half of the homographs had one distinct noun and one distinct verb meaning; half had two distinct noun meanings. These were presented with an additional 60 filler CUE—TARGET pairs—all unambiguous nouns thematically unrelated to any homograph cue or target. The order in which the homographs and fillers were presented was randomized for each trial.

Procedure. The procedure was identical to that of Experiment 1.

Design. The design was a 3 (bias: dominant vs. subordinate vs. unrelated) X 2 (repetitions:

3 vs. 30 repetitions) X 2 (homograph: noun-noun vs. noun-verb homograph) within-factors design.

Results and Discussion

For each condition, each participant's mean response time was calculated. Prior to this calculation, individual responses were identified as outliers and dropped if: (a) the response time for an individual item was fewer than 200ms or (b) the response time for the item was more than 3 standard deviations from the participant's average response time. The mean response time for each participant was calculated for only the correct responses remaining in each condition. Twelve participants were excluded from analyses due to overall accuracy below 75%.

Response times. A 3x2x2 within-factors ANOVA revealed a significant main effect of item bias, $F(2,138) = 25.990$; $p < 0.001$; SS = 27062337.36, a marginally significant main effect of repetitions, $F(1,69) = 3.611$; $p = 0.062$; SS = 1963863.86, and a marginally significant main effect of homograph type, $F(1,69) = 3.298$; $p = 0.074$; SS = 975818.79. There was also a marginally significant homograph type by bias interaction, $F(2,138) = 2.957$; $p = 0.055$; SS = 2419393.51.

A follow-up test revealed significant differences between dominant and subordinate meanings, $t(69) = 2.5$; $p = 0.015$, dominant and unrelated meanings, $t(69) = 5.95$; $p < 0.001$, and subordinate and unrelated meanings, $t(69) = 2.451$; $p = 0.017$, among noun-noun homographs. Among noun-verb homographs, there was similarly a significant difference between dominant and subordinate meanings, $t(69) = 4.998$; $p < 0.001$, and dominant and unrelated meanings, $t(69) = 6.334$; $p < 0.001$. There was no significant difference between subordinate and unrelated noun-verb meanings, $t(69) = 0.386$; $p = 0.701$.

Finally, there were no significant differences between noun-noun and noun-verb dominant meanings, $t(69) = 0.210$; $p = 0.835$, or unrelated meanings, $t(69) = 0.329$; $p = 0.743$. There was a significant difference between noun-noun and noun-verb subordinate meanings, $t(69) = 2.276$; $p = 0.026$.

These results indicate that among dominant meanings, there are no differences in processing between ambiguous words whose meanings are located within a single part of speech and those spanning multiple parts of speech (Appendix II). However, when considering subordinate meanings, it appears that, regardless of repetition condition, among noun-verb homographs it is only the dominant meaning that is accessed (and thus satiated; cf. Appendix III). Indeed, this would be predicted by theories of semantic distance (cf. Mirman, Strauss, Dixon, & Magnusson, 2010) and further supported looking at participant accuracies: incorrect responses for noun-verb subordinate items (accounting for 39% of all responses for those items) occur nearly 1.5 times as frequently as for noun-verb and -noun dominant items and 1.25 times as frequently as for noun-noun subordinate items. That is, the subordinate meaning of the word is so little activated that participants, nearly 40% of the time, incorrectly perceive it to be unrelated to the homograph, compared to an approximately 7% error rate for dominant items.

General Discussion

The results of the present research indicate that the effect of semantic satiation, as with, for example, sensory adaptation, is relatively short-lived, becoming extinct within the first one to two minutes following initial satiation. Although in contrast to Kuhl and Anderson's (2010) findings, this may not be unexpected given the noted differences in methodology between Kuhl and Anderson and much of the otherwise successful semantic satiation research. Notably, however, the present research did use a delayed response task with multiple satiation sessions sequentially without any participant interaction between the end of one and the onset of the next. In this way, it is possible that participants failed to pay adequate attention to the full set of stimuli presented and thus had little if anything satiated. Indeed, this may be reinforced given that a significant slowing in response times was observed with longer delays between study and test. (That is, for items that had more recently been seen at either repetition condition, response times were faster than for those studied less recently, possibly indicating that participants were benefitting from some small

priming effect from having been presented with the items recently and having not paid attention enough to become satiated on them.)

Regardless, with an immediate relatedness judgment task, participants consistently showed significant slowing in response times as a function of repetition among noun-noun homographs. However, among noun-verb homographs, only the dominant meaning showed significant slowing. Indeed, as above, this effect may be predicted by theories of semantic distance (e.g., Mirman, Dixon, Strauss, & Magnusson, 2010) which hold that semantic stores for different parts of speech are fundamentally separate (that is, one's semantic store for DUCK, for instance, as a verb is poorly connected to the semantic store for DUCK as a noun). Research (cf. Gottlob, Goldinger, Stone, & Van Orden, 1999) has even indicated that processing homographs inherently introduces decrements to response times when given in an acontextual environment, particularly for subordinate meanings of words. Given this, it would be expected that among homographs whose meanings span multiple parts of speech, only the semantic store for the dominant meaning would become activated by the presentation of the ambiguous word in a context-free environment (that is, that the activation of the dominant meaning, via theories of spreading activation—cf. Collins & Loftus, 1975—, would not indirectly cause the subordinate meaning of a different part of speech to be primed. In contrast, when both meanings share a part of speech, spreading activation predicts that the activation of one meaning will cause the activation of other, related meanings, and in this way both dominant and subordinate meaning may be activated, if to differing extents. Importantly, the present research has shown itself consistent with the predictions of each of these theories and evidences contexts in which spreading activation fails to produce a cognitive benefit, either through satiation or lack of activation across semantic stores.

Moreover, prior research (Balota & Black, 1997; etc.) has predicted that there may exist differential satiation as a function of meaning relatedness, although little to date has found statistical significance in support of the theory. In this respect, the present results have confirmed

what prior research has speculated, albeit broadly categorizing homograph meanings as dominant or subordinate.

The present results add to the growing findings supporting a broad account of semantic satiation. When an ambiguous word is satiated, all meanings within a part of speech satiate to differing degrees; however, no similar effect is observed among meanings from alternate parts of speech. Further, as with other forms of sensory habituation, the effects of satiation appear to be fairly short-lived; however, further research may seek to replicate and confirm this result.

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Appendix I

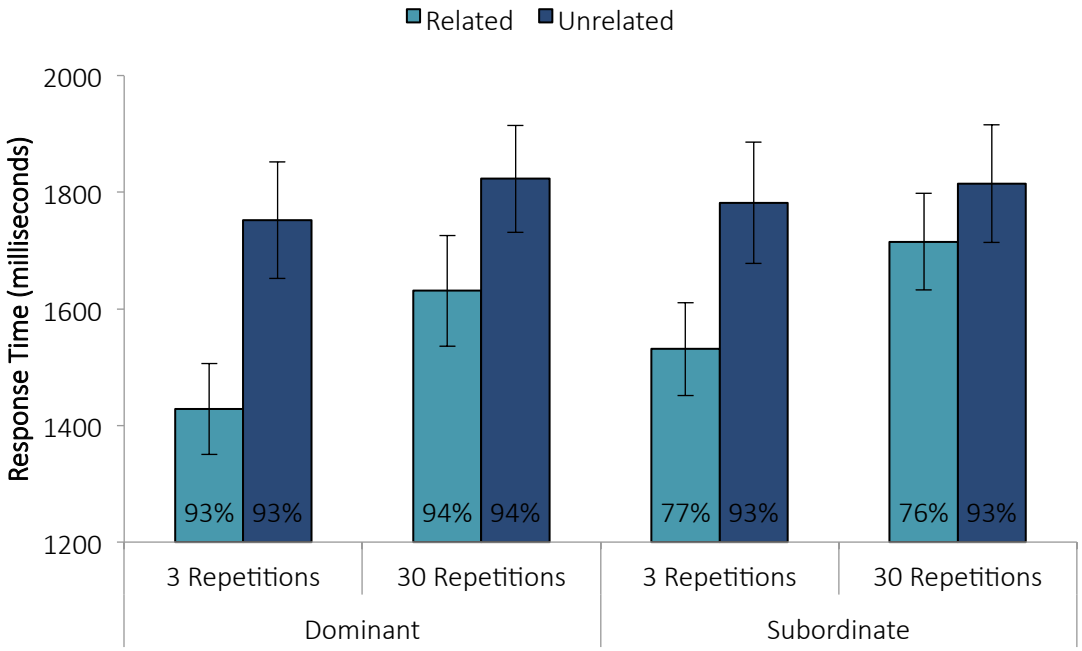

Figure 1. Response times by repetitions and meaning bias for related and unrelated homograph pairs. Satiation is observed from 3 to 30 repetitions for both dominant and subordinate meanings. Percent accuracy is represented inside each bar.

Appendix II

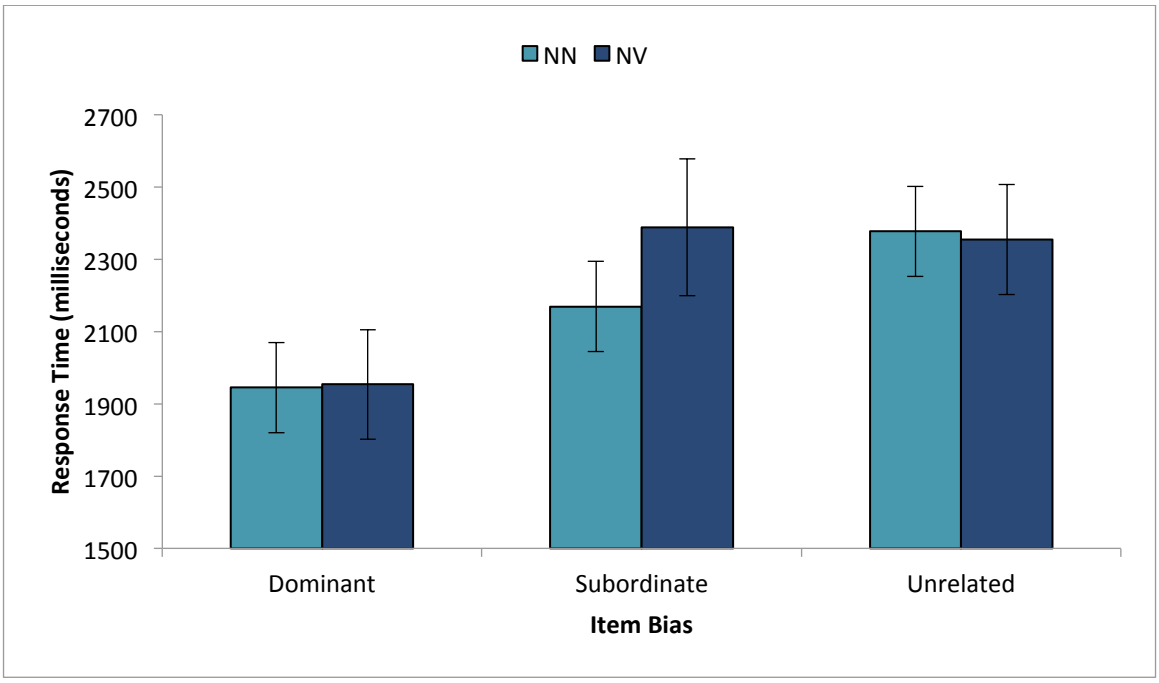

Figure 2. Response times by item bias for noun-noun and noun-verb homographs. Participant mean response times collapsed across repetition condition.

Appendix III

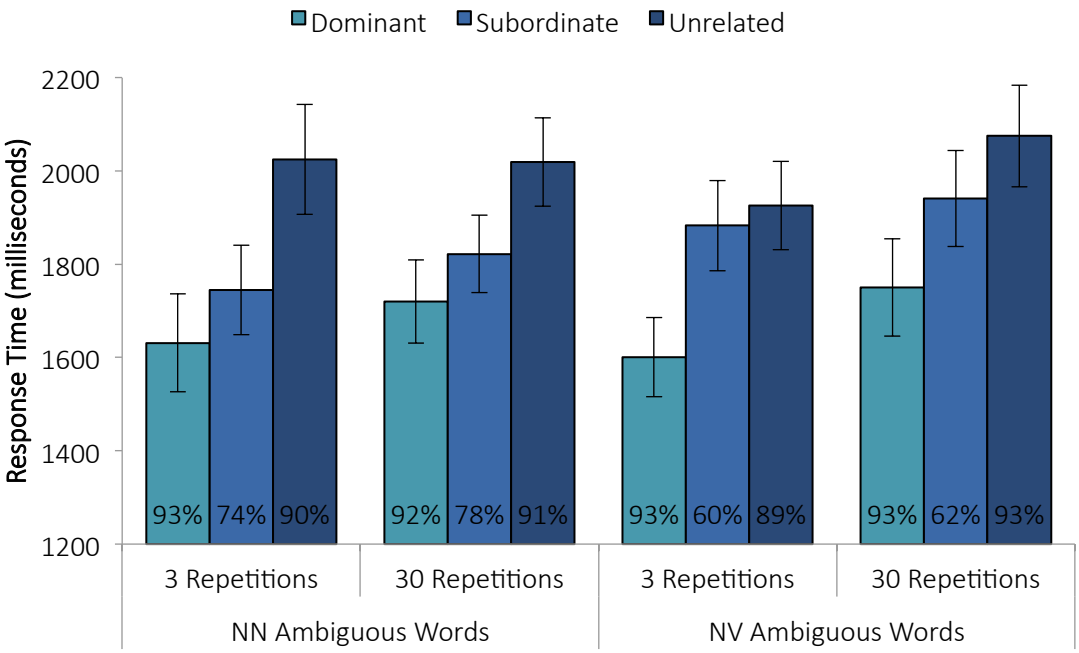

Figure 3. Response times by repetitions and dominance for noun-noun and noun-verb homographs. No satiation is observed for the subordinate meanings of noun-verb ambiguous words. Percent accuracy is represented inside each bar.