Verbal Satiation of Chinese Bisyllabic Words: A Semantic Locus and its Time Course

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Abstract

Verbal satiation of Chinese bisyllabic words was studied in three experiments to ascertain the phenomenon, to track its time course, and to identify its locus. Experiment 1 asked the participants to judge if an exemplar matched a category in 22 blocks of 40 trials each. Within a block, one category appeared 20 times (*repeated* trials) while each of the remaining 10 categories appeared only twice *(baseline* trials). For the first 11 trials, response times (RTs) for the repeated ones were similar to RTs for the baseline ones. For the subsequent trials, *repeated* RTs were slower (by 9 ms) than *baseline* RTs, indicating a satiation effect. Its loci could be orthographic, semantic, or both, or on the associative links between form and meaning. In Experiment 2, category names were not shown. Participants judged if two exemplars belonged to the same category. *Repeated* RTs were faster (by 6 ms) than *baseline* RTs for the first 12 trials. Then, verbal satiation emerged but was short-lived (between the 13th and the 17th trial) and was of greater magnitude (20 ms) than that observed in Experiment 1. The satiation effect must be semantic, as only meanings were repeated. Experiment 3 asked participants to judge if two category names were identical, mostly an orthographic task. *Repeated* RTs were similar to *baseline* ones across all trials, suggesting no orthographic satiation. The results indicate that semantic satiation of Chinese words can be directly semantic (categorical). Its time course conforms to the habituation model described in Rankin, et al. (2009), i.e., sensitization (semantic priming) before habituation (semantic satiation) and habituation followed by dishabituation (recovery).

Keywords: Verbal Satiation, Semantic Satiation, Repetitive Semantic Processing.

Introduction

For more than a century, the self-reports collected by psychologists (Moulin & Connor, 2006; Severance & Washburn, 1907) mention a loss of the meaning of an alphabetic word following its prolonged viewing (e.g., 3 min.) or its active repetition (oral or written, e.g., for 30 times). This experienced loss of meaning has been coined *semantic satiation*. The term *semantic satiation* emphasizes that the locus of satiation is thought to be semantic. In the present work, we will also use the term *verbal satiation* which is neutral regarding the locus of satiation. For the non-alphabetic Chinese script, according to the self-reports collected by Cheng and Wu (1994), prolonged viewing of a multi-component Chinese character (e.g. 臉, which means a face, can be decomposed at a first level into 月 + 僉) elicits an *orthographic satiation.* The original binding of the different components is disrupted and the character looks weird. Hence, the primary subjective experience is an orthographic decomposition of the character, not the loss of the character's meaning. Cheng and Lan (2009) advanced that for the Chinese script there is no genuine semantic satiation but mainly orthographic satiation. To our knowledge, no one has tried to demonstrate whether for the Chinese script a verbal satiation with a unique semantic locus exists. If it does, semantic satiation would be genuine and would not be a mere by-product of orthographic satiation or of any pre-semantic satiation. Neither were we aware of any studies that examined Chinese verbal satiation at the word level rather than the character level.

In a most recent study on verbal satiation in English, Tian and Huber (2010) designed a continuous speeded category-matching task to track the time course of verbal satiation, and to identify its locus. In their Experiment 1, subjects performed for each trial a membership task for a category name (the cue) and an exemplar (the target). Half of the 20 trials of an experimental block contained a repeated category name (e.g. VEGETABLE). In half of these trials, the repeated category name was paired with exemplars of the category, producing matching trials (VEGETABLE-CARROT). In the other half of these trials, it was paired with exemplars of non-repeated categories, producing mismatching trials (VEGETABLE-GOLF). These 10 trials constituted the *satiation trials*. The other 10 trials using 10 distinct category names constituted the non-repeated trials, or the *baseline trials*. The satiation trials and the baseline trials were mixed and ordered randomly within a block. In their Experiment 1, Tian and Huber aimed at monitoring continuously the effects of repetition of a category name. They predicted that only response times for satiation trials should slow down as the task progressed if satiation occurred and if the task did not cause fatigue. The locus of any detected satiation in this experiment could be: (a) orthographic if the word's orthographic form representing the category name is satiated, (b) semantic if the meaning of the word is satiated, (c) both orthographic and semantic, or (d) on the associative link between the orthographic and semantic units. To distinguish between these four possible loci, Tian and Huber designed two more experiments based on the same speeded category-matching task. In their Experiment 2, Tian and Huber aimed at isolating a sole semantic locus of verbal satiation. They tested whether verbal satiation of the meaning of a category name (e.g.

VEGETABLE) can be induced without repeating the category name but instead by repeating many of its exemplars (e.g., CARROT, LETTUCE, ...). In this experiment, Tian and Huber used exemplars instead of category names as the repeated words. The task for their subjects was to judge whether two exemplars are members of the same category (e.g. LION-TIGER, CAR-ROSE). Within a block, exemplars of the category to be satiated made half of the stimulus words. Trials with exemplars from 10 other categories served in the baseline trials. The prevalence of the exemplars from the non-presented category name to be satiated should elicit satiation of its meaning. In Experiment 3, Tian and Huber aimed at isolating an orthographic locus of verbal satiation. Subjects had to perform lexical decisions about whether two words were the same word (e.g., VEGETABLE-VEGETABLE, ANIMAL-VEGETABLE). Within a block, the word to be satiated was used repeatedly in half of the trials. Repetition of the same word in this task was assumed to induce a verbal satiation with a lexical locus. In their experiments 2 and 3, Tian and Huber did not observe a satiation effect, but in Experiment 1 they did. Hence, Tian and Huber concluded that verbal satiation occurs in a task only when two conditions are met: (a) a word form is repeated, (b) the meaning of the repeated word is repetitively accessed. Tian and Huber posited that repeatedly viewing a word while thinking of its meaning elicits *associative satiation*: the information-flow channel from the lexical units to the semantic units is satiated which caused the subjective experience of the loss of meaning of a satiated word.

The lack of a satiation effect in Experiments 2 and 3 of Tian and Huber's (2010) study is critical to their interpretation of the satiation effect observed in Experiment 1. Therefore, the findings need to be evaluated with rigor. On the one hand, the satiation effect of Experiment 1 could be due to the concomitant loci of satiation at the levels of form, meaning, and form-to-meaning link. On the other hand, the failure to observe a satiation effect in Experiment 2 could be the result of insufficient number of repetitions (10). In previous studies, the smallest number of repetitions for which semantic satiation effects were observed was 15 (Kounios, Kotz, & Holcomb, 2000).

Our main goal was to observe whether a verbal satiation at the meaning level could occur in Chinese, and if it did, to track its time course. To pursue this goal, we adapted Tian and Huber's (2010) three experiments by doubling the number of repeated trials within a block and by using traditional Chinese multisyllabic words as visual stimuli.

General Method

Participants

Participants were Taiwanese students from National Cheng Kung University. The participants were different for each experiment.

Apparatus

The experiments were programmed with DMDX (Forster & Forster, 2003).

Materials and Design

The materials consisted of eleven Chinese category names: 蔬菜 (VEGETABLE), 動物 (ANIMAL), 水果 (FRUIT), 疾病 (DISEASE), 親戚 (RELATIVE), 運動 (SPORT), 職業 (OCCUPATION), 國家 (COUNTRY), 城市 (CITY), 公司 (COMPANY) and 樂器 (MUSICAL INSTRUMENT). Twenty exemplars were selected for each category from a Chinese corpus and word lists. Care was taken to ensure the exemplars shared no characters with the category names.

One experimental block contained 40 trials of pair of words as shown in Table 1. We detail the pairing in Experiment 1 to exemplify its general principles. Adaptations for Experiments 2 and 3 are given in the respective Experiment section. Within a block, all the 11 categories were represented but only one category (VEGETABLES in Table 1) was to be satiated through long-term repetition. This latter category is termed the *dominant* category of the block and the 10 others the *non-dominant* categories. The 11 Chinese category names listed before and their respective 20 exemplars were used respectively as cues and targets. Within a block, the 20 *repeated trials* contained as a cue the dominant category name. Ten exemplars from the dominant category served as targets to produce the *repeated match trials*. Ten exemplars from the non-dominant categories served as targets to produce the *repeated mismatch trials*. The 10 non-dominant category names served twice as a cue to produce the 20 *baseline trials.* They were randomly assigned to one or two of the (*baseline match, baseline mismatch*) groups to prevent any informed guessing about the pairing of a second occurrence of a non-dominant category name from viewing its first occurrence in a previous trial. Ten exemplars, distinct from the ones in the *repeated mismatch trials*, from the non-dominant categories served as targets and are paired to their respective category label to produce the *baseline match trials*. The 10 remaining exemplars from the dominant category not used in the *repeated match trials* served as targets to produce the *baseline mismatch trials*. Hence in a block, all the 20 dominant exemplars occurred once. Each of the 220 exemplars was used only twice in a set. Each of the 11 category names served as the word to be satiated in one block. The eleven blocks made a set. For the experiment, participants ran 2 sets totaling 22 blocks of 40 trials.

Procedure

We describe the procedure of Experiment 1 to exemplify the general common procedure to all experiments. Adaptations for Experiments 2 and 3 are given in the respective Experiment section. Subjects faced a screen with a black background. For the first trial of a block, a fixation-cross appeared in white at the center of the screen for 200 ms. Then, a category name was presented in white at the center of the screen. After 1000 ms, an exemplar in white was presented below the cue. Within 2000 ms, subjects had to decide whether the exemplar matched the above category name. The two words remained on the screen until subjects pressed a Right or Wrong button on a gamepad. After pressing one of the buttons, the screen was cleared, and after

300 ms the next trial began with the presentation of the next cue word.

Data Analysis

Both reaction time and accuracy for each trial were recorded. The first trial of each block was suppressed from the analysis because it tended to deviate from the trend of the rest of the trials which are the primary focus of the study. We analyzed both the RTs and accuracy data as a function of the trial number ranging from 2 to 40. This approach allows the most straightforward visualization of the dynamics of verbal satiation within a block as the task progresses and also equates the baseline/repetition conditions in term of general fatigue along a block. In a first statistical analysis, the range of the 39 trial numbers was a priori and arbitrarily segmented and mapped onto four equally spaced intervals. Mean RTs were calculated separately for Yes and No responses for each subject and separately for the repeated and baseline conditions for each of the four intervals over the 22 blocks. The mean RTs were subject to the analysis of variance. We run another similar statistical analysis with both the number of intervals and their unequal length informed by the data pattern over the 39 trial numbers. As the conclusions derived from the two statistical analyses were congruent, we reported only the results of the latter which offered a finer tracking of the dynamics of verbal satiation. Because of space limitation, only data for Yes responses are presented. Data for No responses were congruent with the ones from Yes responses.

Experiment 1

In Experiment 1, we aimed at eliciting verbal satiation through 20 repetitive access to a Chinese category name's word form and meaning.

According to three accounts of satiation (associative satiation, semantic satiation, and orthographic satiation), Experiment 1 should elicit verbal satiation. Repetitive access from the same word form to the same meaning unit should satiate the associative link between orthographic and semantic units. Accessing repetitively the meaning of the category name should satiate it. Repetitive access to the same word form should elicit orthographic satiation.

Method

Forty students (female 33) participated in the experiment. The subjects ran a category-matching task as described in the General Method section.

Results and Discussion

One participant out of 40 was excluded based on a 90% accuracy criterion. Figure 1 plots the time course of the RTs for the correct Yes responses as a function of the trial number. Both baseline and repeated trials showed a slowing trend which revealed a general fatigue effect.

In Fig. 1, we drew a vertical line between trial number 11 and 12, a cutoff from which repeated RTs appeared to become globally slower than baseline RTs until the end of the block. From this cutoff, we defined two intervals: position 1 for the trials 2-11 and position 2 for trials 12-40. A repeated measures two-way ANOVA was applied with repetition (2: baseline and repeated) and position (2: position 1 and position 2) as the two within-subject factors. We found both a statistically significant main effect of repetition, $F(1, 38) = 4.13$, $p = .049$, GES = .0016 (GES being the generalized eta squared, Bakeman, 2005), a statistically significant main effect of position, $F(1, 38) = 33.65$, $p < .001$, GES = .031, and a statistically significant repetition × position interaction, $F(1, 38) = 9.67$, $p = .0035$, GES = .003. The interaction is characterized by the RTs for the repeated trials being comparable with the RTs for the baseline trials at position 1 but becoming slower at position 2. A paired t-test comparing RTs for repeated and baseline trials at Position 1 revealed no significant difference, $t(38) = -0.57$, $p = .58$. Another paired t-test at Position 2 showed that RTs for repeated trials were significantly slower (by about 9 ms) than RTs for baseline trials, $t(38) = 4.7$, $p < .001$.

Table 1. Block structure in Experiments 1, 2 and, 3.

Trial Number	Repetition Status	Match Status	Experiment 1	Experiment 2	Experiment 3
1	Repeated	Match	蔬菜 / vegetables 玉米 / corn	馬鈴薯 / potato 蘆筍 / asparagus	蔬菜 / vegetables 蔬菜 / vegetables
2	Baseline	Mismatch	疾病 / disease 南瓜 / pumpkin	台北 / Taipei 香菇 / mushroom	運動 / sport 蔬菜 / vegetables
3	Repeated	Match	蔬菜 / vegetables 茄子 / aubergine	茄子 / aubergine 洋蔥 / onion	蔬菜 / vegetables 蔬菜 / vegetables
4	Repeated	Match	蔬菜 / vegetables 牛蒡 / burdock	南瓜 / pumpkin 紅蘿蔔 / carrot	蔬菜 / vegetables 蔬菜 / vegetables
5	Baseline	Match	職業 / profession 秘書 / secretary	法國 / France 巴西 / Brazil	親戚 / relative 親戚 / relative
...	...	...	...	...	...
38	Baseline	Mismatch	城市 / city 香菇 / mushroom	足球 / football 芋頭 / taro	城市 / city 蔬菜 / vegetables
39	Baseline	Match	運動 / sport 網球 / tennis	姑姑 / aunt 姪女 / niece	動物 / animal 動物 / animal
40	Repeated	Mismatch	蔬菜 / vegetables 吉他 / guitar	黃瓜 / cucumber 網球 / tennis	蔬菜 / vegetables 國家 / country

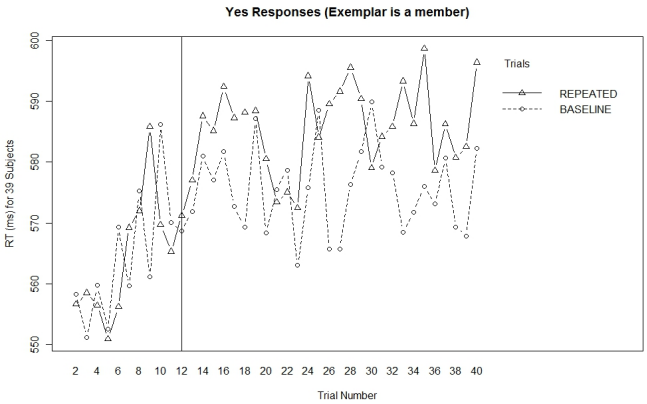

Figure 1. Experiment 1. Reaction times as a function of trial number for Yes responses.

The accuracy data were analyzed in the same way. We found a statistically significant main effect of repetition, $F(1, 38) = 12.55$, $p = .001$, GES = .049, revealing better accuracy for repeated trials. The main effect of position was not statistically significant, $F(1, 38) = 0.44$, $p = .51$, GES = .003. There was no repetition × position interaction, $F(1, 38) = 0.034$, $p = .85$, GES < .001, suggesting that the interaction effect in the RT data was not the result of a speed-accuracy tradeoff.

Experiment 1 asked the subjects to determine if an exemplar word matched a category word. In terms of YES responses, response times for the first 11 repeated trials were similar to RTs for the non-repeated baseline trials. After that, RTs for the repeated trials became slower than RTs for the baseline trials. The increased RT difference between the repeated and the baseline trials from position 1 to position 2 was about 9 ms. Not due to a speed-accuracy tradeoff, this difference represented a verbal satiation effect brought about by the repeated processing of the same category word.

Experiment 2

Experiment 2 investigated whether pure semantic satiation was possible by asking subjects to repeatedly process a category but not its name. According to the three accounts of satiation, Experiment 2 should elicit neither associative satiation nor orthographic satiation because there is no repetition of the category name. However, repetitive access to the meaning of an unshown category name should elicit satiation with a semantic locus.

Method

Forty-one students (female 26) participated in the experiment. The materials for Experiment 2 were the 220 exemplars from the 11 categories used in Experiment 1. Category labels were not shown. Within a block, the 20 exemplars of the dominant category occurred twice, once as a cue in the *repeated trials* and once as a target. Exemplars from the 10 other categories served as cues in the baseline trials. Each of the 11 category names served as the unshown word to be satiated in one block. For the procedure, the cue word was no more a category name but a changing exemplar. Hence, subjects had to decide whether two exemplars belonged to the same category.

Results and Discussion

One participant out of 41 was excluded based on a 90% accuracy criterion. Figure 2 plots the time course of the RTs for the correct Yes responses. As for Experiment 1, both baseline and repeated trials showed a slowing trend which revealed a general fatigue effect. In Fig. 2, we drew two vertical lines at trial numbers 13 and 17, two cutoff trial numbers separating the plot in three intervals: position 1 for the trials 2-12, position 2 for trials 13-17, and position 3 for trials 18-40. During position 1, repeated RTs appeared globally faster than baseline RTs which could signal a facilitatory semantic priming effect. Position 2 represents a potential verbal satiation interval during which repeated RTs became slower than baseline RTs. During position 3, the repeated RTs recovered to be as fast as baseline RTs. This qualitative interpretation of Fig. 2 was confirmed by the thereafter statistical analysis. A repeated measures two-way ANOVA on mean correct RTs was applied with repetition (2) and position (3) as the two within-subject factors. We reported the Huynh-Feldt corrections for all statistical effects involving more than one degree of freedom in the numerator. The main effect of repetition was not statistically significant, $F(1, 39) = 3.3$, $p = .077$, GES = .0016.

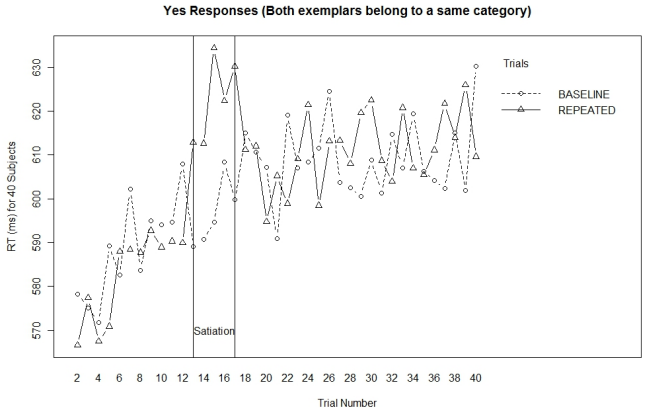

Figure 2. Experiment 2. Reaction times as a function of trial number for Yes responses.

However, we found a statistically significant main effect of position, $F(2, 78) = 31.5$, $p < .001$, GES = .026, and a statistically significant repetition × position interaction, $F(2, 78) = 11.09$, $p < .001$, GES = .007. The interaction is characterized by the RTs for the repeated trials compared to the RTs for the baseline trials being faster at position1, slower at position 2 and equally fast at position 3. A paired t-test comparing RTs for repeated and baseline trials at position 1 revealed marginally statistically significant faster reaction times (by 6 ms) for repeated trials, $t(39) = -1.88$, $p = .068$, 95% CI [-12.8, 0.48]. Repeated trials are made of exemplars of a same dominant category, therefore the observed facilitation at position 1 for repeated trials revealed the occurrence of semantic priming. Another paired t-test at Position 2 showed that RTs for repeated trials became statistically significantly slower (by 20 ms) than baseline trials, $t(39) = 4.7$, $p = .003$, 95% CI [7.5, 33.6]. Such a reversal from semantic priming at position 1 to semantic impairment at position 2 for repeated trials supported the occurrence of verbal satiation at position 2. Another paired t-test at position 3 showed that repeated RTs were no longer slower than baseline RTs, $t(39) = 0.55$, $p = .58$, 95% CI [-4.1, 7.1]. Hence, at position 3, verbal satiation vanished.

Analysis of the accuracy data showed a statistically significant main effect of repetition: $F(1, 39) = 6.27$, $p = .017$, GES = .018, a statistically significant main effect of position: $F(2, 78) = 3.3$, $p = .043$, GES = .02, and a marginally statistically significant repetition × position interaction: $F(2, 78) = 3.11$, $p = .058$, GES = .018. Of main interest to us, accuracy rates for repeated trials were

statistically significantly higher only for position 1, $t(39) = 4.05$, $p < .001$. Then, they decreased to the level of baseline trials for position 2 and 3, ($t(39) = 0$ .38, $p = .7$; $t(39) = 0.54$, p =.59). Hence, at position 2 RTs for repeated trials increased as shown previously whereas their accuracy rates decreased, indicating no speed-accuracy tradeoff. The RT and the accuracy data constituted convergent evidence towards the occurrence of verbal satiation at Position 2.

In Experiment 2, the main result was that repeated processing of exemplars of a same category increased the RTs differences between repeated trials and baseline trials. We posited that these RTs differences signaled the occurrence of verbal satiation. Verbal satiation occurred roughly at the same trial number than in Experiment 1. Unlike the verbal satiation in Experiment 1, verbal satiation in Experiment 2 was short-lived (limited to trials 13-17) and of higher magnitude (20 ms versus 9 ms). The verbal satiation in Experiment 2 must be purely semantic because the word form of the dominant category name was never shown and the cues in repeated trials had all a different word form. Hence, with Experiment 2, we identified a semantic locus to verbal satiation which could have contributed to the verbal satiation found in Experiment 1.

Experiment 3

Experiment 3 investigated whether pure orthographic satiation was possible by asking subjects to repeatedly recognize the word form of a category name. According to the three accounts of satiation, Experiment 3 should elicit neither associative satiation nor semantic satiation because there is no need to access repetitively the meaning of the category name. However, repetitive processing of a same word form name should elicit its orthographic satiation as demonstrated in (Cheng & Lan, 2009).

Method

Forty-one students (female 20) participated in the experiment. The materials for Experiment 3 were the 11 category names used in Experiment 1. Table 1 illustrates the pairing of trials. The exemplars in Experiment 1 were all replaced by category labels. Hence, within a block, the dominant category label was repeated 20 times as a cue and 20 times as a target. Non-dominant category names served twice as a target. The task became lexical rather than semantic. Subjects had to decide whether the cue and the target were a same word.

Results and Discussion

Two participants out of 41 were excluded based on a 90% accuracy criterion. Figure 3 plots the time course of the RTs for the correct Yes responses. Unexpectedly, not only no occurrence of verbal satiation could be observed around the 12-13 trials as in the two previous experiments but it also appeared that repeated RTs were globally equally fast to baseline RTs. We partitioned the 40 trials into three intervals: trials 2-30, trials 31-35 and trials 36-40. The second interval could be the seat of a weak and delayed verbal satiation. We proceeded to a statistical analysis to evaluate this possibility. For Yes responses, a repeated measures two-way ANOVA on mean correct RT was applied with repetition (2) and position (3) as the two within-subject factors. None of the main effect of repetition, the main effect of position, and the repetition × position interaction, ($F(1, 38) = 0.037$, $p = .85$, GES < .001; $F(2, 76) = 0.7$, $p = .47$, GES = .001, $F(2, 76) = 2.08$, $p = .14$, GES = .001) were statistically significant.

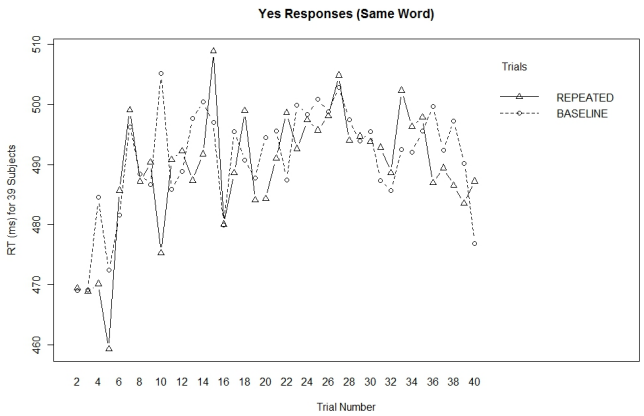

Figure 4. Experiment 3. Reaction times as a function of trial number for Yes responses.

The latter result invalidated our hypothesis of occurrence of a verbal satiation elicited by repetitive processing of a repeated word form. None of the paired t-test comparing RTs for repeated and baseline trials for each of the three positions reached statistical significance. Hence in experiment 3, speed of processing for both conditions was equal.

General Discussion

The present study explored the existence of verbal satiation in Chinese and questioned whether its nature would be semantic. In both Experiments 1 and 2, we found within 40 trials an interval for which RTs for repeated trials became slower than baseline RTs after being equally fast over the first 11 trials in Experiment 1 and after being slightly faster over the first 12 trials in Experiment 2. In Experiment 3, RTs were similar for repeated trials and baseline trials. For Experiments 1 and 2, we ruled out a speed-accuracy trade-off strategy. Instead, we posited that verbal satiation occurred in both experiments and we advanced that its nature is semantic as it can be induced by mere repetitive processing of exemplars of a category without repetition of the word form of the category label. Before defending our viewpoint, we considered a number of alternative explanations.

Did subjects strategically generate exemplars impairing semantic retrieval?

If subjects on seeing a cue category name or an exemplar retrieve strategically from semantic memory a few exemplars for further responding, these exemplars could block competing exemplars impeding semantic processing if the target words differ from the expected exemplars.

Repeated RTs for Yes responses will become increasingly slower than baseline RTs because of the repetitive impediment of blocking on the exemplars of a same category in repeated trials. This specific slowing down of repeated trials should happen from the very beginning within a block. However, our results in Experiments 1 and 2 refuted this latter prediction.

Does inhibition underlie verbal satiation?

Semantic inhibition of return (IOR) (Weger & Inhoff, 2006) refers to an attentional bias towards *semantic novelty* slowing down processing of repeated or semantically related words compared to unrelated and nonrepeated words. Weger and Inhoff (2006) found that for semantic IOR tended to not occur when repeated/related words with large item variability are mixed with a rather heterogeneous pool of nonrepeated/unrelated words. Hence, both of the designs in Experiment 1 and 2 are not propitious to semantic IOR.

A semantic habituation model of verbal satiation

In Rankin, et al. (2009), ten characteristics of behavioral habituation are listed. We described thereafter the first five characteristics and showed that data in Experiment 2 in the light of data in Experiment 1 matched realistically a semantic habituation model of verbal satiation. The first three characteristics in Rankin, et al. (2009) shaped the usual time course of habituation: sensitization before habituation and dishabituation following habituation. In Experiment 2, the three intervals of the 40 trials in Figure 2 delineated respectively first the sensitization phase with facilitatory semantic priming for repeated trials, then a habituation phase corresponding to the semantic satiation of the unshown dominant category name, and finally a dishabituation phase for which repeated RTs recovered from habituation to return to the level of baseline RTs. The fourth characteristic of habituation (Rankin, et al., 2009) can be stated as: more frequent stimulations can result in more pronounced response decrement (slowing reaction times in our case). We considered that if we count the number of distinct stimuli to the meaning of the dominant category name, it was greater in Experiment 2 than in Experiment 1, simply because in Experiment 2 many exemplars replaced the dominant category name. We thought that the higher number of external stimuli (exemplars) in Experiment 2 could be translated as a higher frequency of external stimulation to the meaning of the category name. Following the fourth characteristic of habituation, a higher magnitude of verbal satiation could be expected in Experiment 2 than in Experiment 1. The fifth characteristic of habituation can be stated as: the weaker the stimulus, the more pronounced is habituation. We considered that in Experiment 2, the exemplars replacing the dominant category name as a cue constituted weaker semantic stimuli to the meaning of the category name than the category name itself. Hence, using weaker stimuli in Experiment 2 than in Experiment 1, we could expect, according to the fifth characteristic, again a higher magnitude of verbal satiation in Experiment 2. The dynamics of our enduring verbal satiation in Experiment 1 is akin to the long-term semantic satiation obtained in a semantic generation task by Kuhl and Anderson (2011).

Conclusion

The semantic satiation account of verbal satiation (Smith & Klein, 1990) which stipulates that semantic units became habituated with repetitive access to the meaning of word was newly validated for Chinese multisyllabic words. The time course of semantic satiation follows the classic habituation model (Rankin, et al., 2009): sensitization (semantic priming) before habituation (semantic satiation) and habituation followed by dishabituation (recovery).

Semantic satiation exemplifies that conceptual processing can be habituated as early suggested by Baars (1987). Hence, the cognitive system would respond to both perceptual information redundancy (see the example of stabilized retinal images (Pritchard, Heron & Hebb, 1960)) and meaning redundancy with the same habituation mechanism.

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