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知覺脈絡對負向促發效果的影響(2/2)

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執行單位：國立臺灣大學心理學系暨研究所

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行政院國家科學委員會專題研究計畫成果報告

知覺脈絡對負向促發效果的影響 II

The Effect of Perceptual Context on The Negative Priming Effect

計畫編號：NSC92-2413-H-002-025

執行期限：92 年 8 月 1 日至 93 年 7 月 31 日

主持人：葉怡玉　國立台灣大學心理學系

一、 中文摘要

本研究計畫探討知覺脈絡對負向促發效果的影響，總共分為二部份。就第一部份而言，我們以位置負向促發效果探討物體知覺屬性如何影響位置的負向促發效果。實驗結果顯示：物體知覺屬性與位置屬性必須都在高激發，且物體知覺屬性必須能引發記憶提取的歷程，位置負向促發效果才會展現。就第二部份而言，我們以比對作業探討促發項與偵測項知覺相似性對負向促發效果的影響。實驗結果顯示：色彩與形狀的整合表徵必須是高激發，且促發項與偵測項的知覺相似性高，比對作業的負向促發效果才會展現。整體而言，本研究的結果顯示物體的整合表徵必須是高激發，使干擾刺激在選擇目標時產生高競爭，抑制機制才會啟動。抑制機制只抑制與目標行為有關的特徵屬性，而被抑制的表徵必須依賴記憶提取才能展現負向促發效果。

關鍵詞：負向促發、選擇注意力

Abstract

The present study investigated the influence of perceptual context in negative priming. The first series of the experiments examined the roles of integrated representations in location negative priming. The results showed that location negative priming manifests only when both the object features and the location feature were highly activated such that the integrated representations of the distractors were competitive in selecting a target. The second series of experiments examined via a matching task the effect of perceptual similarity between the primes and probes on the negative priming effect. The results showed that distractors must be competitive in selection via the integration of color and shape and also prime-probe couplets were similar in color composition. The results from the present project suggested that integrated representations must be in high activation so that distractors impose high competition in target selection. The inhibition operates on the goal-derived feature and the inhibited representations rely on memory retrieval to reveal negative priming.

Keywords: Selective attention, negative priming

二、 緣由與目的

The fate of ignored stimuli is germane to the understanding of selective attention. Unattended stimuli can be filtered out completely before reaching perceptual

identification (e.g., Broadbent, 1958) or processed to the semantic level before being blocked from response selection (e.g., Deutsch & Deutsch, 1963). The phenomenon of negative priming (Tipper, 1985) sheds lights on the fate of ignored stimuli. When an ignored prime stimulus becomes the target in the subsequent probe trial (i.e., the ignored repetition (IR) condition), people tend to respond at a slower speed than to a target that is unrelated to prime stimuli (i.e., the control condition). Negative priming manifests even when an ignored prime distractor (e.g., a picture of a cat) and the subsequent probe target (e.g., the word “dog”) are in different formats but share a semantic relationship (Tipper & Driver, 1988). The results suggest that the ignored stimuli are processed to the semantic level. The slower response is understood to reflect the working of inhibitory mechanisms in selective attention (Tipper & Cranston, 1985).

One important characteristic of negative priming is its dependency on the use of repeated stimuli, which has been well documented in the domain of identity negative priming. In a series of experiments, Strayer and his colleagues (Grison & Strayer, 2001; Malley & Strayer, 1995; Strayer & Grison, 1999) demonstrated that identity negative priming is contingent upon repeated stimuli. When non-repeated stimuli are used as test items, negative priming is often absent or instead positive priming is observed. Dark and Schmidt (2000) found that a single episode of semantic priming is insufficient for the manifestation of negative priming. In a recent study, Kramer and Strayer (2001) also demonstrated the contingency of identity negative priming on repeated stimuli with both young and old adults as participants. It appears that identity negative priming is difficult to manifest when novel stimuli are used.

While there is empirical evidence supporting the contingency of stimulus repetition in identity negative priming, no empirical study has been conducted to investigate this contingency in location negative priming. The first part of the present research project investigated the contingency of stimulus repetition that embody integrated representations in location negative priming.

According to the integrated competition hypothesis (Duncan, 1996, 2001), stimulus competition is integrated between cortical regions in such a way that features that gain a competitive advantage in one region will tend to cause features in other regions to also have an advantage when they are from the same object. Extending this hypothesis to the phenomenon of negative priming, an interesting question arises, i.e., which level of competition is critical to invoke the operation of inhibitory mechanisms and hence the manifestation of negative priming. That is, whether negative priming occurs as long as the goal-derived feature is highly activated or negative priming depends on the repetition of integrated representations.

Addressing a similar question, we adopted a matching task in the second part of the project to investigate whether repetition of integrated representations is critical in the manifestation of negative priming. The results converge from

these two parts should further our understanding of negative priming, and hence the operation of selective attention.

三、 研究方法

The first part of the project consisted of seven experiments. In the first four experiments (Chao & Yeh, in press), we used a stimulus identification task to investigate whether location negative priming relies on location repetition. The subjects' task was to name the red target word and ignore the green distractor on each trial. The method used in each experiment is summarized as bellows.

Experiment 1. This experiment involved a Couplet Type (IR/control) × Stimulus Type (non-repeated/repeated location) design. If location negative priming is contingent on location repetition, negative priming should be found only in the repeated condition, and not in the non-repeated condition.

Experiment 2. The purpose of this experiment was to investigate the impact of the target-to-distractor distance on negative priming. A Couplet Type (IR/control) × Distance Type (short/long) design was used in Experiment 2A with non-repeated locations. The same design was used with repeated location in Experiment 2B. We expected to find location negative priming only in Experiment 2B when the target-to-distractor distance was relatively long.

Experiment 3. The objective of this experiment was to demonstrate the transition in priming effects as distractor locations accumulate activation through repetition, as shown in Strayer and Grison's (1999) Experiment 2 on identity negative priming. Each block had its own unique set of four locations. Moreover, each block was divided into four quartiles, resulting in a Couplet Type (IR/control) × Quartile (1/2/3/4) design.

Experiment 4. This experiment was conducted to test the effect of inhibition of return (Posner & Cohen, 1984) in the paradigm of location negative priming, and also to test the impact of location repetition on inhibition of return (IOR). This experiment followed Christie and Klein's (2001) design. Seven types of prime-probe location repetition were used (Type of Repetition): the D-to-T condition, the T-to-D condition, the Switch condition, the T-to-T condition, the D-to-D condition, the Intact condition, and the Control condition.

We used a location negative paradigm in the other three experiments (Yeh & Chao, 2004). The method used in each experiment is summarized as bellows.

Experiment 1. We used a small set of stimuli in this experiment, which also followed Christie and Klein's (2001) design with seven types of prime-probe location mapping relations. The subjects' task was to respond to the location of a yellow target and ignore the green distractor. We expected to find the typical location negative priming effect.

Experiment 2. We used a large set of stimuli in this experiment. If it is the competition at the level of integrated representations is critical for the manifestation of location negative priming,

we predicted null results.

Experiment 3. We once again used a small set of stimuli in this experiment. On the basis of the memory retrieval hypothesis (e.g., Neill, Valdes, Terry, & Gorfein, 1992), we also predicted null results. Moreover, we predicted that identity effects should still occur if inhibition is selective on the goal-derived feature (e.g., Tipper, Weaver, & Houghton, 1994).

In the second part of the project, we tried in vain many experiments to investigate the influence of perceptual context in multiple levels of representation and also to examine the influence of background context in negative priming as originally designed in the grant proposal.

In the last two experiments, we adopted a perceptual matching task to verify the integrated competition hypothesis. The subjects' task was to match whether the second and the fourth stimuli in a row of five were identical. Through the manipulation of the correlation between colors and shapes in stimuli, two perceptual contexts were designed. In the first context (correlated), the color-shape mapping was consistent such that a shape was always in one particular color. In the second context (uncorrelated), the color-shape mapping was inconsistent so that a shape could be in two colors.

If the competition occurs on the level of integrated representations, we predicted the manifestation only in the correlated context. The rationale is the follows. Each integrated color-shape representation was repeated more frequently in the correlated context than in the uncorrelated context. For example, a diamond was always in red in the correlated context and hence each occurrence activated the representation of a red diamond. In the uncorrelated context, a diamond could be in red or black. The representation of a red diamond was repeated one half of the frequency as in the correlated context. In addition to the influence of perceptual context, we examined whether segmentation and the similarity of color composition in a prime-probe couplet play critical roles in the negative priming effect revealed through the use of a matching task.

Experiment 1. In this experiment, the correlated context was adopted. In the *homogenous* condition, all the stimuli were in one color (red or black) for both the prime and probe trials. Thus, segmentation was more difficult. In the *heterogeneous* condition, the target stimuli were in one color while the distractor stimuli (1^{st}, 3^{rd}, 5^{th}) were in another color for both the prime and probe trials. Thus, segmentation was relatively easy. In the *mixed* condition, stimuli were in one color for either the prime or the probe trial, while stimuli were in two colors in the other counterpart of the prime-probe couplet. Segmentation should be difficult in either the prime or the probe trial.

Among the three conditions, the color composition and also the order that colors appeared were identical in the homogenous condition, because color remained the same in a prime-probe couplet. In the heterogeneous condition, the color composition was the same in the prime-probe couplet although the exact

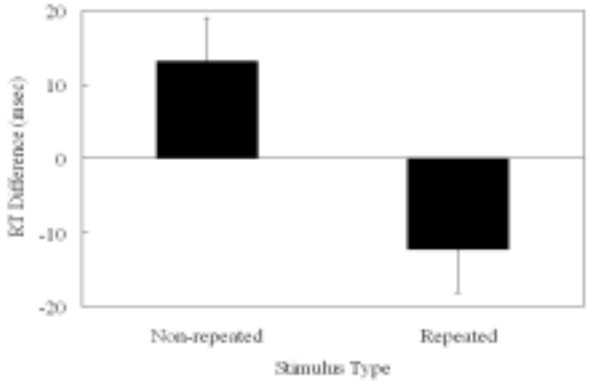
order may be different. When the color composition was black-red-black-red-black in the prime trial, the color composition in the probe trial would be red-black-red-black-red. In the mixed condition, the color composition was different in each prime-probe couplet. If the similarity of color composition plays a role, we predicted null results in the mixed condition because dissimilarity does not encourage memory retrieval.

Experiment 2. The uncorrelated context was used in this experiment. The only difference from Experiment 1 was that the color-shape mapping was varied.

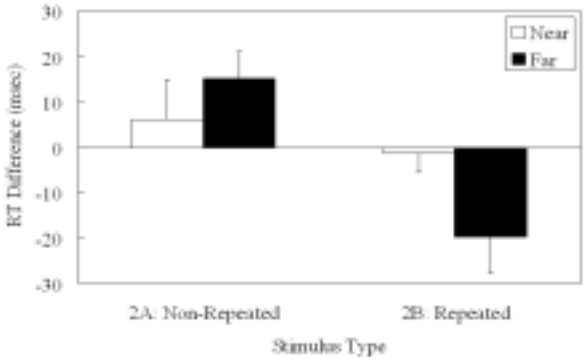
四、 結果與討論

The results from the first four experiments showed that location negative priming in an identification task relies on location repetition. Location negative priming manifested only when a small set of locations was used in the experiment. Moreover, location selection in a large space occurs only when the target-to-distractor distance was relatively long.

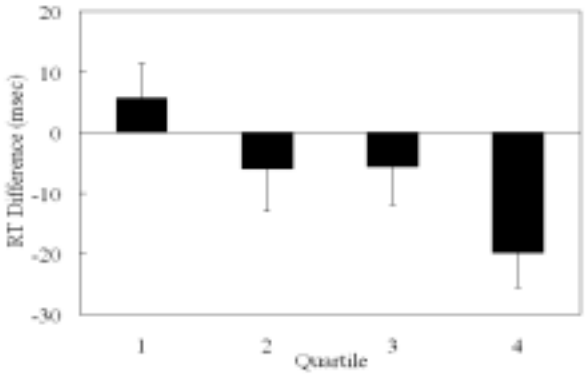
Experiment 1



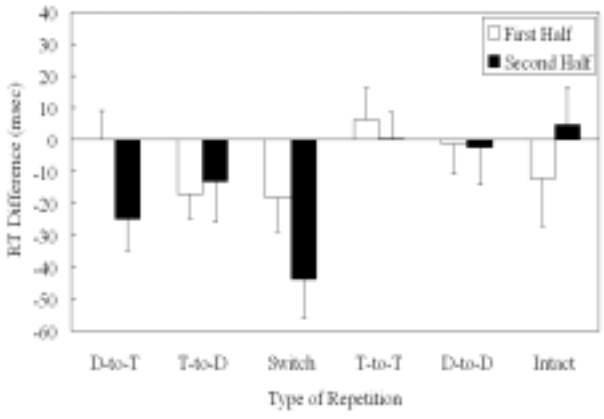
Experiment 2



Experiment 3

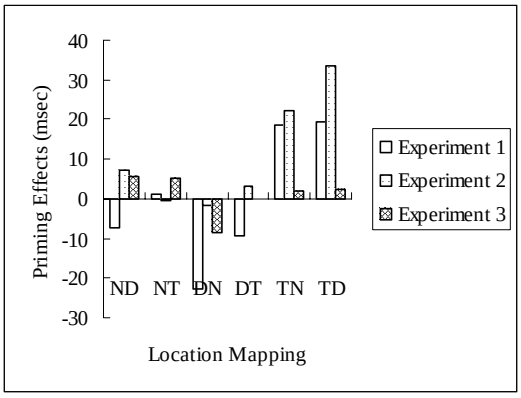


Experiment 4



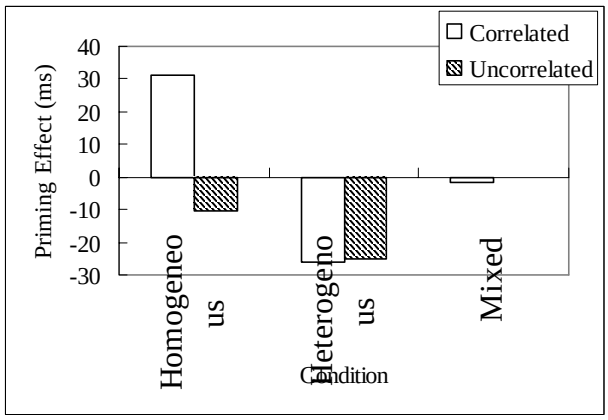
The results from the three experiments on location negative priming showed that location negative priming occurred only when a small

set of Chinese words was used. When a large set of stimulus words were used, location negative priming did not occur. Moreover, memory retrieval plays a critical role because location negative priming did not occur in Experiment 3. Identity effects were observed in both Experiments and 3, supporting that inhibition operated on the goal-derived feature, i.e., location in this series of experiments.



Taken together, the results from these series of experiments showed that competition must be in integrated representations to invoke the operation of the inhibitory mechanisms in selective attention. The inhibition appears to operate only on the goal-derived feature such that the irrelevant feature of the distractors remains intact to produce priming effects. To bring forth the inhibited representations, the selection feature (i.e., color in the location priming experiments) must repeat from the prime to the probe trial to instigate the memory retrieval process.

The results from the matching experiment showed significant negative priming in the homogenous condition only when color-shape mapping was correlated. Significant positive priming was found in the heterogeneous condition in both the correlated and uncorrelated context. In the mixed condition, no effect was observed.



Among the three conditions, segmentation was required in the homogeneous condition because all the stimuli were in one color. Thus, the results are consistent with the suggestion that segmentation plays a role in a matching task (Loula, Kourtzi, & Shiffrar, 2000). Moreover, the correlated context allowed higher competition among integrated representations in contrast to the uncorrelated context. As a result, negative priming occurred only in the correlated context.

The null results in the mixed condition were of particular interest because segmentation was required in either the prime or the probe trial. Yet, no priming effect was observed. Because the color composition was different in each prime-probe couplet, we suspected that the dissimilarity of color composition did not instigate the memory retrieval process. Because negative priming requires the operation of both the inhibitory and memory retrieval mechanisms (Tipper, 2001), negative priming did not occur.

Taken together of all the results, we

suggested that negative priming relies on the high competition among integrated representations in selective attention and also on the memory retrieval to bring forth the inhibited representation.

五、 計畫成果自評

前四個實驗已經投稿，並被接受(Chao & Yeh, in press)。第二部份的三個實驗正在撰稿中。第二年的計畫書裡原來的重心放在第三部份，所提的實驗大多失敗，在許多實驗裡，負向促發的效果均不顯著。回顧這些實驗，我評估是實驗的脈絡過於複雜，操控的因子過多，使得不同因子牽動不同機制的涉入以及互動。針對這方面的問題，我評估要重新回到負向促發的基本面，系統性的操控抑制機制以及記憶提取機制的引發與運作。所以，我們回到抑制機制運作的基本條件：目標與干擾刺激的高激發造成選擇注意力運作時的高競爭。將重點改為競爭運作的層次是在與目標有關的知覺屬性或是所有屬性整合表徵的競爭。在此架構下，我們設計了比對作業，也做了二個實驗。雖然計畫已經結束，我們仍將繼續比對作業的實驗，希望能將這部份做個更清楚的整理。

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