

Effects of Congruity between Criterion of choosing and Word Pair Type on Intentional Memory

Hiroshi Toyota¹

¹Otemon Gakuin University

May 10, 2022

Abstract

This study examined the relationship between the recall of chosen words and congruity between the selection criterion and type of pairs in intentional memory. Participants were asked to select a more pleasant or unpleasant word from two types of pairs, pleasant–neutral and unpleasant–neutral, and to remember the chosen word presented in the learning phase, followed by the free recall phase. Although the pleasant words selected from the pleasant–neutral pairs were equally recalled as in the unpleasant–neutral pairs, the chosen unpleasant words from unpleasant–neutral pairs were recalled more often than those in the pleasant–neutral pairs. These results suggest that the recall of the chosen words was determined by the congruity between the criteria of choosing and the type of paired words and the negativity bias in memory.

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Summary. This study examined the relationship between the recall of chosen words and congruity between the selection criterion and type of pairs in intentional memory. Participants were asked to select a more pleasant or unpleasant word from two types of pairs, pleasant–neutral and unpleasant–neutral, and to remember the chosen word presented in the learning phase, followed by the free recall phase. Although the pleasant words selected from the pleasant–neutral pairs were equally recalled as in the unpleasant–neutral pairs, the chosen unpleasant words from unpleasant–neutral pairs were recalled more often than those in the pleasant–neutral pairs. These results suggest that the recall of the chosen words was determined by the congruity between the criteria of choosing and the type of paired words and the negativity bias in memory.

Target items to be remembered among alternative items chosen by participants in the self-choice condition were recalled more often than those chosen by the experimenter in the forced-choice condition). This is called the self-choice effect (Takahashi, 1989), and many hypotheses are proposed to explain this effect. The early research on self-choice effects were conducted by Perlmutter, Monty, and colleagues (Monty et al., 1973, 1979; Perlmutter & Monty, 1982). They proposed the motivation hypothesis (Perlmutter & Eads, 1998). According to this hypothesis, choosing a word leads to higher motivation among the participants, leading to a higher memory performance level, and explains the self-choice effect. However, this hypothesis had a critical problem; the motivation index was not clarified. Hence, an increased motivation level to facilitate memory performance in the self-chosen condition could not be demonstrated. According to Toyota (2013), since the motivation hypothesis, others have been proposed, including the metamemory hypothesis proposed by Takahashi (1991), the multiple-cue hypothesis by Watanabe (2001), and connective processing by Hirano & Ukita (2003). However, these did not sufficiently explain the self-choice effect because rebutting evidence was observed on them.

In contrast, Toyota et al. (2007) proposed the integration hypothesis. In their study, participants were asked to choose one word they liked more in each word pair in a self-choice condition, whereas one of the paired words was underlined to signify that it was favored by another participant in a forced-choice condition. Participants were required to indicate whether their judgment differed from the other participants. Both a self-choice and forced-choice conditions were followed by unexpected free recall tests. The self-choice effect (the superiority of self-choice to forced-choice conditions) was apparent only for the pleasant–unpleasant pair. In the pleasant–unpleasant pair, a contrast between words in each pair was apparent; hence, participants could choose a word by referring to the contrast between the two words in each pair. However, in the pleasant–pleasant and unpleasant–unpleasant combination, there was no apparent contrast between the two words in each pair. These results were interpreted as follows. The pleasant–unpleasant pairs gave the participants an apparent criterion for selecting one of each pair because the pair had an opposite value; they could easily choose the word they liked more. Chosen words were integrated into participants’ cognitive structure and heightened precisely and would be recalled more. In contrast, the criterion for choosing was not apparent for the pleasant–pleasant and unpleasant–unpleasant pairs because each word in a pair had a similar value. Participants could not easily choose one word based on likableness (pleasantness) or dislikeableness (unpleasantness). Thus, Toyota et al. (2007) considered that an apparent criterion would support the participant to integrate each chosen word into a cognitive structure to facilitate their recall. Toyota and Kobayashi (2009), using an intentional memory procedure, also found a self-choice effect only in pleasant–unpleasant pairs. This finding also supports the integration hypothesis. Initially, the word “integration” in memory was used by Craik and Tulving (1975). They found that the words in the congruous contexts were recalled or recognized more often than those in incongruous contexts; the superiority of congruous contexts is called the “congruity effect” and has been observed in several studies (Goldman & Pellegrino, 1977; Hall & Geis, 1980; Toyota, 1996). According to Craik and Tulving (1975), words in the congruous contexts were integrated into the cognitive structure, but words in incongruous contexts were not. The difference in integration led to a difference in recall performance between congruous and incongruous contexts (Toyota, 2013).

Toyota et al. (2007) considered the self-choice effect using this concept of integration and suggested it is caused by the degree of integration when a word is chosen based on the participant’s criterion. For example, in a pleasant–unpleasant pair, the chosen words can easily integrate into a cognitive structure because the participants could quickly choose a word based on the contrast between each word in a pair. However, in the pleasant–pleasant and the unpleasant–unpleasant pairs, the chosen words could not easily integrate into the cognitive structure because the participants could not easily choose a word based on the contrast between each word in a pair. The selection criterion would be critical if the integration function explained the self-choice effect. Namely, the clear instruction about the criterion for choosing a word may lead to the self-choice effect in the pleasant–pleasant and unpleasant–unpleasant pairs, wherein there is no contrast between each word in a pair. Toyota (2013) used specific instruction about the selection criterion and found the self-choice effects in both types of pairs (pleasant–pleasant and unpleasant–unpleasant). Although the self-choice effects were observed in both types of pairs, the significance of its effect differed: when the participants were asked to choose the more liked word, the self-choice effect was more significant in pleasant–pleasant pairs than in unpleasant–unpleasant pairs, whereas when asked to choose the more disliked word, it was more significant in unpleasant–unpleasant pairs than in pleasant–pleasant pairs. Thus, the self-choice effects in the congruous contexts were more significant than in incongruous contexts. This suggests that the congruity between the criterion of choosing (e.g., pleasantness) the word from the alternatives and types of paired words (e.g., pleasant–pleasant pairs) is critical. However, in Toyota’s (2013) study, the participants chose words with a similar value of pleasantness or unpleasantness, making it difficult for each participant to choose the more pleasant or unpleasant words. According to Toyota (1997), many studies have indicated the effectiveness of encoding difficulty on memory performance (Auble & Franks, 1978; Einstein, 1976; Ellis, Thomas & Rodriguez, 1984; Jacoby, 1978; Kitao & Kaneko, 1981; Krinsky & Nelson, 1981). Toyota (1997) indicated that difficulty in choosing a word to memorize in each word pair facilitated the retention of chosen and non-chosen words, called the encoding difficulty effect. Although some hypotheses explained this effect, including mental effort (Tyler, Hertel, McCallum & Ellis, 1979), elaboration (Craik & Tulving,

1975), and distinctiveness (Jacoby, Craik & Begg, 1979), Kitao and Kaneko (1981) explained that such difficulty led to increased effort in elaborating the word, leading to cues for retrieving the chosen words for elaboration and distinctiveness (Toyota, 1997). This study used the two types of word pairs, pleasant-neutral and unpleasant-neutral pairs, including neutral words, to examine the effect of congruity on retention eliminating the encoding difficulty effect.

The first hypothesis of this study is as follows. Suppose the congruity between the criterion and the word type determined the recall performance of the chosen word, then: if participants were asked to choose the more pleasant word, the chosen words in pleasant-neutral pairs would be recalled more often than those in unpleasant-neutral pairs. In contrast, if asked to choose the more unpleasant word, the chosen words in unpleasant-neutral pairs would be recalled more often than those in pleasant-neutral pairs.

Baumeister et al. (2001) reviewed several psychological phenomena and proposed the focusing notion of “negativity bias,” wherein negative emotions or memories were recalled better than positive ones. Specifically, unpleasant episodes elicited more robust emotional encoding than pleasant episodes. Thus, target words associated with an unpleasant mood are processed more deeply and intensely than those associated with a pleasant mood. Toyota (2014) examined negativity bias using an incidental free recall procedure, and participants with a low ability to manage and regulate emotions recalled targets associated with unpleasant episodes more often than those with pleasant episodes. Although only for low ability participants, a negativity bias was observed in incidental memory in Toyota’s (2014) study. If the negativity bias was robust, the chosen unpleasant words in unpleasant-neutral pairs were predicted to be recalled more often than the chosen pleasant words in pleasant-neutral pairs. The second aim of this study is to examine this hypothesis.

METHODS

Design

A two $\times$ two $\times$ three design was used, wherein the first factor was the type of choice condition (self-choice or forced-choice), the second was the type of criterion (pleasantness or unpleasantness), and the third was the type of word pair (pleasant-neutral or unpleasant-neutral).

Participants

A total of 29 volunteers (12 men and 17 women) participated in the experiment, with a mean age of 20.8 years ($SD = 1.69$; range=19.8–22.7), and were undergraduate university students.

Materials

This study used two lists of items reconstructed from previous studies (Toyota et al., 2007; 2013). Each list included 16 word pairs and 2 buffer pairs. These word pairs were constructed using two combinations of pleasant (e.g., happiness) and neutral words (e.g., dress) and unpleasant (e.g., war) and neutral words. These words were selected from items tested in a previous study (Hyodo et al., 2003). Two types of choice conditions were provided: self-choice and force-choice. In each choice condition, two types of word pairs were provided: pleasant-neutral (e.g., happiness-dress) and unpleasant-neutral (e.g., war-air) pairs. Each target was familiar and written in Japanese *Kanji* characters on a separate booklet page. Examples of each page corresponding to each condition as a function of the type of choice, type of word pair, and type of criterion are shown in Figure 1.

On each self-choice condition page, a word pair and a question corresponding to each type of choice and criterion were presented. However, on each page of the forced-choice condition, a word pair was presented, and one word in a pair was underlined, which was to be recalled. Assignment to the underlined word in each pleasant-neutral pair was fixed to a pleasant word in the pleasantness criterion and a neutral word in the unpleasantness criterion. This was since pleasant words may be chosen in the self-choice condition if the participants were asked to choose more pleasant words (words they like better) in each pleasant-neutral pair. In contrast, in each unpleasant-neutral word pair, the underlined word was fixed to an unpleasant word in the unpleasantness criterion and a neutral word in the pleasantness criterion because the unpleasant words

may be chosen in the self-choice condition if the participants were asked to choose a more unpleasant word (the word that they dislike more) in each unpleasant-neutral pair.

Procedure

The following experimental procedures were conducted separately for two groups of 15 and 14 participants, and the second experiment was conducted two weeks after the first experiment.

Study phase. Each participant was given a booklet and explained that the task was to remember one word from each word pair. Subsequently, the task was explained by showing a slide corresponding to each choice condition. The following instructions were provided to each participant.

A familiar Kanji word pair was shown in the middle of each page. For pages corresponding to the self-choice condition, below the word pairs, a question was presented: “Which (of words) do you like better?” in the pleasant criterion, or “Which (of words) do you dislike more?” in unpleasant criterion. For each page like this (corresponding to the self-choice condition), their task was to select one word more pleasant (the word you like better) or unpleasant (the word you dislike more) and to remember it for each pair. For the pages corresponding to the forced-choice condition, a word was underlined, and a question concerning it was presented; “Do you like this word?” in the pleasantness criterion, or “Do you dislike this word?” in the unpleasantness criterion.

Examples of these pages are shown in Figure 1. Each participant was also instructed as follows: “As I said before, for each page like this (corresponding to the self-choice condition), your task is to select one word by circling it that is more pleasant or unpleasant and to remember it for each pair. For each slide like this (corresponding to the forced-choice condition), your task is to remember the underlined word while answering the presented question about underlined word by circling “Yes” or “No.” Later, each participant was provided five seconds to remember one word on each page. The experimenter sent a signal “Next page” every five seconds before moving to the next page. Following the signal, the participants turned the page and remembered the chosen or underlined words.

Free recall test. Following the learning phase, the participants were required to recall and write as many words as possible (the chosen or not chosen in the self-choice condition and the underlined or not underlined words in the forced-choice condition). Three minutes were allowed for this test.

Self-choice Condition

Pleasant–Neutral Pairs

Pleasantness Criterion

Unpleasantness Criterion

幸福 洋服 yori好kinanoha?	“Happiness” “Dress” ”Which do you like better?”	旅行 椅子 yori嫌inanoha? “Travel” “W
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Unpleasant–Neutral Pairs

Pleasantness Criterion

Unpleasantness Criterion

束 美 yori好kinanoha?	“Shackles” “Art” ”Which do you like better?”	地 yori嫌inanoha? “Surveillance” “Plain” “W
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Forced-choice Condition

Pleasant–Neutral Pairs

Pleasantness Criterion

Unpleasantness Criterion

足 炊 好kidesuka?	“Satisfaction” “Cooking” ” Do you like ?”	切 嫌kidesuka? “Kindness” “Watch” “Do you dislike?”
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Figure 1. An example of a booklet page corresponding to each condition as a function of types of choice condition (self-choice or forced-choice), word pairs (pleasant-neutral or unpleasant-neutral), and criterion (pleasantness or unpleasantness).

Words recalled correctly were counted based on the categories of chosen and non-chosen words for each choice condition. The mean percentages of chosen and non-chosen words correctly recalled by the type of choice (self-choice and forced-choice), type of word pair (pleasant-neutral and unpleasant-neutral), and type of criterion (pleasantness and unpleasantness) are shown in Table 1.

Non-chosen word recall. The same analysis of variance was conducted for the percentage of non-chosen words correctly recalled, as shown in the lower part of Table 1. This analysis showed that only the main effect of type of choice (F 1, 27 = 22.12; p < .001, η^2 = .10) was significant. Non-chosen words in the self-choice condition were recalled more often than those in the forced-choice condition.

Table 1

Type of Word-pair	Pleasant–Neutral	Pleasant–Neutral	Unpleasant–Neutral	Unpleasant–Neutral
Type of Choice	Self	Forced	Self	Forced
	.47 .35 .36 .29	.52 .31 .43 .34	.31 .31 .45 .40	.24 .31 .48 .38
	.48 .38 .24 .28	.17 .27 .05 .15	.19 .28 .12 .21	.00 .00 .10 .20

To examine the effect of congruity eliminating the encoding difficulty, this study first examined if the chosen word by the pleasantness criterion is recalled more often than those selected by the unpleasantness criterion in pleasant-neutral pairs and those chosen by the unpleasantness criterion are recalled more often than those chosen by the pleasantness criterion in unpleasant-neutral pairs. The words chosen following the pleasantness criterion were recalled as much as those chosen by the unpleasantness criterion in pleasant-neutral pairs; however, those chosen by the unpleasantness criterion were recalled more often than those

chosen by the pleasantness criterion in unpleasant–neutral pairs. This result confirmed the hypothesis of the unpleasantness criterion and indicated that the congruity between the criterion of choosing and the type of word pair was critical for the self-choice effects on memory.

According to the integration hypothesis (Toyota et al., 2007), chosen words in the congruous contexts were more effectively integrated into a cognitive structure than those in incongruous contexts. In this study, the words chosen by the unpleasantness criterion were more congruous with unpleasant–neutral pairs than those chosen by the pleasantness criterion. In other words, the words chosen by the pleasantness criterion were incongruous to unpleasant–neutral pairs. The congruity between the chosen word and the context (the word pair in this study) facilitated the integration of the chosen word into one’s cognitive structure. As mentioned above, previous studies (Toyota et al., 2007; Toyota & Kobayashi, 2009; Toyota, 2013) have indicated that an apparent criterion of choice is the determinant of self-choice effects. According to these studies, congruity makes the criterion apparent to facilitate the integration of chosen words into participants’ cognitive structure. Previous studies (Toyota et al., 2007; Toyota & Kobayashi, 2012) have indicated robust self-choice effects and the superiority of the self-choice condition to the forced-choice condition; however, this effect was not observed in this study. The inconsistency between the studies may be because of some differences in the procedure. Specifically, the number of word pairs in a list may be critical. In this study, the number of word pairs assigned to each condition (e.g., pleasant–neutral pairs in the pleasantness criterion in the self-choice condition) was only two, whereas, in previous studies, the number was four. The smaller the number of word pairs, the harder to discriminate the differences between the conditions.

Second, this study examined the hypothesis regarding the negativity bias; the chosen unpleasant words in unpleasant–neutral pairs would be recalled more often than the chosen pleasant words in pleasant–neutral pairs. This hypothesis was confirmed; the words chosen by the unpleasant criterion in unpleasant–neutral pairs were recalled more often than those chosen by the pleasant criterion in pleasant–neutral pairs. Toyota (2014), using the incidental memory procedure, indicated the “negativity bias” in participants with a low ability to manage and regulate emotions. This study also showed the bias in the self-choice effect procedure. However, the difference in the strength of emotion between pleasant and unpleasant words used in this study must be noted. There is a possibility that unpleasant words elicited stronger emotions than pleasant ones. As it is difficult to discriminate the quality and the strength between pleasant and unpleasant emotions, further research is required to control the above possibility.

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