

The Effects of Choosing Method to use for Memorization on Intentional Memory of Words

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Abstract

Participants were asked to remember one word in a series of pairs in the study phase, in which the following three conditions were provided in terms of method to use for memorization: circling the to-be-remembered word and crossing out the to-be-ignored word of each pair (CC), circling the to-be-remembered word only (CN) and crossing out the to-be-ignored word only (NC). Recall performance for the words chosen to-be-remembered in CC condition was higher than that of those in CN and NC ones. The results were interpreted as showing that the integration of the chosen words into one's cognitive structure was determined by being given the choice of word which word to remember, and by the method used for memorization.

Key Words : Choosing method, memorization, intentional memory

1. Introduction

Target words chosen to remember by the participants themselves are recalled more often than the words that participants are instructed to remember by an experimenter. The superiority of the self-chosen words over the forced chosen words was termed as “self-choice effect” by Takahashi (1989). Initial research on self-choice effects was conducted by Perlmutter, Monty, and Kimble (1971). They proposed a motivational hypothesis with regard to this effect; namely, that there is higher motivation to remember self-chosen words than forced-chosen words. After the development of the motivation hypothesis, many further hypotheses were proposed, for example, metamemory hypothesis (Takahashi, 1991), multiple-cue hypothesis (Watanabe, 2001), connecting-processing hypothesis (Hirano & Ukita, 2003) and integration hypothesis (Toyota, Kobayashi & Hirano, 2007). These hypotheses cannot explain the self-choice effects in all situations, because previous research examined the self-choice effects in various contexts. Types of memory tests used is a typical example of this variation. Perlmutter et al. (1971) used a paired-associative learning paradigm, in which the stimulus item was paired with alternatives of response items. The participants were asked to select one of the alternatives and remember it. Takahashi (1991, 1993) and Watanabe (2001) used free recall and recognition tests, while Toyota *et al.*

(2007) used a free recall test only. Because the differences in the retrieval process between recall and recognition was indicated by many researchers (e.g., Hunt & Seta, 1984), the determinants of self-choice effects are dependent on the type of memory tests used.

To address the variation in previous examinations of self-choice effects, the procedure used should be limited to a specific situation to examine this mechanism. Therefore, the present study focused on the intentional free recall procedure. Takahashi (1991) and Toyota *et al.* (2007) used this procedure, which is a valid way to explain the metamemory or integration hypotheses. Recent research by Toyota (2015) also showed the self-choice effects in an intentional free recall context. Specifically, when the participants were asked to choose words that related to themselves (self-reference criterion), self-choice effects were observed, but when they were asked to choose words that were easy to remember (metamemory criterion), the effects did not appear. This result was interpreted as indicating that the criterion of choice was a critical factor for producing the self-choice effects in an intentional free recall context. According to the integration hypothesis (Toyota *et al.*, 2007), words chosen using a clear criterion are integrated into one's cognitive structure more efficiently than those chosen using an unclear criterion. The above results of Toyota (2015) support the integration hypothesis. If the metamemory hypothesis is valid, self-choice ef-

fects will be found in the context of the metamemory criterion. However this predicted result was not found and it seems that the metamemory hypothesis cannot be applied to self-choice effects in an intentional free recall situation.

In the studies mentioned above, the participants were asked to choose only the words to remember, and they were not asked to choose the words to ignore. If the criterion of choosing is critical to self-choice effects, choosing both the to-be-remembered words and the to-be-ignored words would make the criterion of choosing clearer than choosing to-be-remembered words alone. Toyota *et al.* (2007) found self-choice effects in relation to pleasant-unpleasant word pairs, although these effects were not observed for pleasant-pleasant and unpleasant-unpleasant pairs. These results were interpreted as showing that the contrast between the pleasant and unpleasant word in each pair made the criterion of choosing clearer. Even if the clear contrast does not exist, such as in pleasant-neutral pairs, circling the chosen words and crossing out the non-chosen (to-be-ignored) words (CC) will make an apparent contrast between the two words and provide a clear criterion for choosing. If this is the case, it is predicted that the CC condition will lead to better recall of the chosen words than either the condition of circling the chosen word only (CN) or the condition of crossing the non-chosen words out only (NC). The purpose of the present study is to examine this prediction.

2. Method

2.1. Participants

Thirty volunteers (6 males and 24 females) participated in the experiment. These participants were students from a nursing school. Their mean age was 20.0 years. ($SD=1.7$; range=19.2-29.0). They participated the experiment voluntarily, and were informed of the purpose of the experiment and the results of their own personal performance.

2.2. Measures

Word pairs presented to the participants were constructed using a combination of pleasant words (e.g., happiness) and neutral words (e.g., clothes). These words were selected from the pool used in a previous study (Hyodo, Takahashi, Suto, Yata, & Yasunaga, 2003), and written in Japanese Kanji characters on a separate pages in a booklet (see Fig. 1). Each study list consisted of 30 word-pairs and two buffer-pairs. Three types of choos-

ing condition were provided, comprising CC, CN and NC. Ten word pairs were assigned to each choosing condition. Three types of study lists were provided, counterbalancing the combination of the word pairs and the choosing condition. On each page of the CC condition, a word-pair was presented and below it the instructions "Circle the chosen word" and "Cross out the non-chosen word" were presented. On each page of the CN condition, a word-pair and the instruction "Circle the chosen word" were presented. On each page of NC condition, a word-pair and the instruction "Cross out the non-chosen word" were presented. Within a block of three successive pages, a page corresponding to each condition appeared once, and the serial position of conditions was randomized within a block.

2.3. Procedure

2.3.1. Study phase. The experimenter distributed one of the booklets to each participant. Participants were told that the task was to remember one word of each word-pair. Then the task was explained by showing trial three pages corresponding to the three conditions (CC, CN, and NC) at the beginning of a booklet. Each participant turned a page of the booklet according to the instruction given by the experimenter. Next, the following instructions were given to participants: "A Kanji word-pair is shown in the middle of each page and below it, are the instructions for you to follow. For a page like this [corresponding to the CC condition], according to the instructions printed below the word-pair, your task is to choose a to-be-remembered word [the chosen word] by circling it, and a to-be-ignored word [the non-chosen word] by crossing it out." After receiving this instruction, each participant circled the chosen word and crossed out the non-chosen word. Then each participant turned the page, and the following instructions were given: "For each page like this [corresponding to the CN condition], your task is to choose a to-be-remembered word [the chosen word] by circling it." After this instruction, each participant circled the chosen word. Then, each participant moved to next page, and the following instructions were given: "For each page like this [corresponding to the NC condition], your task is to choose a to-be-ignored word [the non-chosen word] by crossing it out." After receiving this instruction, each participant crossed out the non-chosen word" Subsequently, each participant moved to the next page corresponding to the start of the study phase. At every 10 sec. indication given by the experimenter, each participant turned the pages one by one, and he or she remembered

<CC>	<p>幸福 洋服</p> <p>○</p> <p>憶える単語を○で囲む 憶えない単語を×で消す</p>	<p>Happiness Clothes</p> <p>×</p> <p>Circle the chosen word Cross out the non-chosen word</p>
<CN>	<p>花嫁 改札</p> <p>○</p> <p>憶える単語を○で囲む</p>	<p>Bride Ticket gate</p> <p>○</p> <p>Circle the chosen word</p>
<NC>	<p>炊飯 満足</p> <p>×</p> <p>憶えない単語を×で消す</p>	<p>Cooked rice Satis-faction</p> <p>×</p> <p>Cross out the non-chosen word</p>

Fig. 1 An example of pages in the booklet used in the present study

one word while following the choosing instructions corresponding to each page, as mentioned above, before moving to the next page.

2.3.2. Free recall test. Following the study phase, the experimenter distributed a sheet of paper for the free recall test, and the participants were required to recall and write down as many words (including chosen and non-chosen words) as possible. Three minutes were allowed for this test.

3. Results

The numbers of words that were recalled correctly were divided into categories of chosen and non-chosen words in each condition. The mean percentages of chosen and non-chosen words correctly recalled as a function of method used for memorization (CC, CN and NC) are

shown in Table 1.

A within-factor analysis of variance was conducted on the per-centages of chosen words that were correctly recalled (shown in the upper part of Table 1). The main effect of choice of method ($F_{2,58} = 4.30, p < .05$, partial $\eta^2 = 0.13$) was significant. Multiple comparisons among the three conditions indicated that the per-centage of the chosen words correctly recalled in CC condition was higher than those in CN ($t_{58}=2.02, p<.05$) and NC ($t_{58}=2.85, p<.01$) conditions, and that the difference between the CN and NC conditions was not significant ($t_{58}=.81$).

The percentages of the non-chosen words correctly recalled are shown in the lower part of Table 1. Recall for the non-chosen words was rather low, so no further analyses were conducted on these data.

Table 1 Mean percentages in free recall as a function of method to use

Method to use (condition)		CC	CN	NC
Chosen words	<i>M</i>	.58	.49	.45
	<i>SD</i>	.18	.22	.20
Non-chosen words	<i>M</i>	.08	.06	.04
	<i>SD</i>	.12	.09	.07

4. Discussion

The present study examined the prediction that the recall performance in the CC condition would be highest. The results were consistent with this prediction. The integration hypothesis (Toyota *et al.*, 2007) proposed that a clear criterion for choosing a to-be-remembered word facilitates the integration of chosen words into one's cognitive structure (Toyota, 2015). In the present study, the CC condition had a clear contrast between the chosen and the non-chosen words, which means that the choosing criterion was clearer than in the CN and NC conditions. Toyota (2007) showed that the self-choice effects in relation to pleasant-unpleasant word pairs were larger than those in relation to pleasant-pleasant or unpleasant-unpleasant word pairs. These results were interpreted as showing that the contrast within pleasant-unpleasant word pairs gives the participants a clear criterion. As the present study used pleasant-neutral word-pairs, the contrast within each word-pair was not clear. However, the choosing activity of circling the chosen words and crossing out the non-chosen words made a clear contrast between the two. Therefore, this clear contrast facilitates the integration of the chosen word into one's cognitive structure.

Finally two further possibilities to explain the present results should be mentioned. The first is that the number of choosing activities is different between the CC condition and the CN or NC conditions. The CC condition has two choosing activities (circling and crossing), while CN and NC conditions have one choosing activity (circling or crossing out). The difference in the number of choosing activities between the conditions might have led to the difference in recall performance between CC and CN/NC conditions. However, as the present study used an intentional memory procedure, participants were strongly aware of the to-be-remembered words in all conditions. Because the increased number of choosing activities dis-

turbs the recall of the to-be-remembered words, it was predicted that the recall of the to-be-remembered words would be more disturbed in the CC condition than in CN or NC conditions. However, the results did not support this prediction.

The second explanation is that the quantity of attention paid is different between the CC condition and the CN or NC conditions. The attention paid to the chosen word in each word pair in the CC condition seems to be greater than that in the CN or NC conditions, because circling the chosen word directly facilitates attention to the chosen word and crossing out the non-chosen word, suppresses attention paid to the non-chosen word, which indirectly facilitates attention to the chosen word. If attention is paid to the non-chosen word, it would reflect better recall performance for the non-chosen words. However, the present study did not indicate a difference in recall performance for the non-chosen words among CC, CN, and NC conditions. As mentioned above, if the recall performance of non-chosen words was regarded as an index of attention, no differences among these three conditions seemed to indicate that the attention was not the determinants of recall performance. Although the present study could not analyze the data about output order position, it is possible to detect the differences among the three conditions in such data. Further researches need to analyze such data. And the other methodological problem should be mentioned. Namely the present study did not control the attribute of each word, such as frequency, concreteness and so on. The effects of such attributes might have reflected the results of the present study. Further research should control these attributes of the words.

References

- Hirano, T., & Ukita, J. (2003) Choosing words at the study phase: The self-choice effect on memory from the viewpoint of connective processing. *Japanese Psychological Research*, 45, 38-49.

- Hunt, R. R., & Seta, C. E. (1984) Category size effects in recall: the roles of relational and individual item information. *Journal of Experimental Psychology: Learning, Memory & Cognition*, 10, 454-464.
- Hyodo, M., Takahashi, M., Suto, S., Yata, Y., & Yasunaga, M. (2003) [Research on the relation between memory and emotion (4)], Poster session presented at 61th annual meeting of Japanese Congress of Psychology, Tokyo, Japan, September 13. [In Japanese, translated by the author of this article.]
- Perlmutter, L. C., Monty, R. A., & Kimble, G. A. (1971). Effect of choice on paired-associate learning. *Journal of Experimental Psychology*, 91, 41-53.
- Takahashi, M. (1989) [The self-choice effect in learning and memory.][Kyoto University Research Studies in Education], 35, 211-221. (in Japanese)
- Takahashi, M. (1991) The role of choice in memory as a function of age: Support for a metamemory interpretation of the self-choice effect. *Psychologia*, 34, 254-258.
- Takahashi, M. (1993) [The role of self-choice in recognition memory as a function of the meaningfulness of the materials. *Memoirs of Kyoto Tachibana Women's University*], 20, 130-140. (In Japanese with English abstract).
- Toyota, H. (2015) The role of word choice and criterion on intentional memory. *Perceptual & Motor Skills: Learning & Memory*, 120, 84-94.
- Toyota, H., Kobayashi, K., & Hirano, T. (2007) [Self-choice effects in incidental memory and integration hypothesis] [*Bulletin of Nara University of Education*], 56, 31-39. (In Japanese with English abstract).
- Watanabe, T. (2001) Effects of constrained choice on memory: The extension of the multiple-cue hypothesis to the self-choice effect. *Japanese Psychological Research*, 43, 98-104.

【日本語要旨】

意図記憶に及ぼす記憶の選択方法の効果

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本研究は、看護学校の学生に対して、小冊子の各ページに2つの単語を対提示し、そのいずれかを憶えるように求める意図記憶課題を与えた。その際に、憶える単語を○で囲み、憶えない単語を×で消す条件（CC）、憶える単語を○で囲むだけの条件（CN）及び憶えない単語を×で消す条件（CN）を設けた。そして、自分で憶えようとした単語（選択語）も、憶えないようにした単語（非選択語）も併せてどんな順番でも良いので思い出すように求める自由再生テストを実施した。その結果、CC条件で提示された単語の再生率が最も高く、CN及びNC条件間には差はなかった。この結果は、○と×をつけることによって、その対比から○で選択された語が認知構造に統合されやすいためと解釈された。