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# Individual Differences in Managing Emotion and Incidental Memory

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**Abstract**

The present study investigated the differences between the participants with high level of the ability of managing and regulating emotion (MR) and those with low MR in incidental memory. Participants were presented targets on two occasions, and each time were asked to rate the pleasantness of episodes elicited by each target followed by unexpected free recall tests. Although the spacing effects were observed for both MR groups, the participants with high MR recalled the targets associated with pleasant episodes and those with unpleasant ones equally, whereas the participants with low MR recalled the targets associates with unpleasant episodes more often than those with pleasant ones. These results were interpreted as showing that MR suppress the stronger emotion associated with unpleasant episodes elicited by a targets as a cue for retrieving it.

**Key Words**：*managing and regulating emotion, spacing effect, incidental memory*

Recently a number of researches showed the phenomenon that the words elicited emotions were recalled more often than those did not emotions. This phenomenon has been explored in several studies using words (D'Argrembeau & Ver der Linden, 2004; Hamann, 2001; Kensinger, Brierley, Medford, Growdon, & Corkin, 2002; Nagae & Moscovitch, 2002), pictures (Bradley, Greenwald, Petry, & Lang, 1992) and stories (Cahill & McGaugh, 1995). Talmi, Schimmack, Paterson, and Moscovitch (2007) termed this phenomenon as emotionally enhanced memory (EEM). EEM could be interpreted as showing the importance of emotion as retrieval cues. However, the strength of emotion elicited by each word was determined by the ability of processing emotion. Such ability has not been defined precisely, but it seems to be similar to emotional intelligence (EI). Salovey and Mayer (1990) suggest that EI is "the subset of social intelligence that involves the ability to monitor one's own and others' feelings and emotions, to discriminate among them, and to use this information to guide one's thinking and actions"(p.189). Many researches have adopted this definition (e.g. Davies, Stankov, & Roberts, 1998; Mayer, Caruso, & Salovey, 2000), albeit with minor alterations (Toyota, 2008). Takšić (1998) developed the Emotional Intelligence Skills and Competence Questionnaire (ESCQ), which is based on the above definition (Salovey & Mayer, 1990).

The ESCQ has three subscales corresponding to three sub-abilities: Expressing and Labeling emotion (EL), Perceiving and Understanding emotion (PU), and Managing and Regulating emotion (MR). Toyota, Morita, and Takšić (2007) developed the Japanese version of Emotional Skills and Competence Questionnaire (J-ESCQ). Toyota (2011) regarded EI as the ability of processing emotion, and measured level of EI in each participant by using J-ESCQ. And he examined the relationship between the level of EI and memory performance. The results showed that the participants with high EI recalled target words associated with pleasant, neutral and unpleasant episodes equally. However, the participants with low EI recalled target words associated with pleasant and unpleasant episodes more than those with neutral episodes. These results were interpreted as showing that the participants with high EI use the emotion cues associated with episodes for retrieving targets effectively, even if these episodes did not elicit strong emotion as neutral episodes.

As mentioned above, EI has three components; EL, PU and MR. Toyota (2011) did not examine which is the most important ability of EI for determining memory performance. Richards and Gross (2000, 2006) showed that suppressing of emotion has negative effect

on memory. Namely the participants with a high rate of expressive suppression of emotion did not perform well on memory tasks. Toyota (2013) also showed the relationship between the size of the spacing effects (the difference of recall performance between the spaced and the massed presentation) and the level of MR. According to the encoding variability hypothesis (Martin, 1968; Madigan, 1969; Gartman & Johnson, 1972; Glenberg, 1977; Kitao, 1983), the richness of encoding determines recall performance during the repeated presentation of targets (Toyota & Kikuchi, 2004, 2005). As the participants with high MR suppress emotion expressively, it seems that emotional encoding would be not so rich. However as the participants with low MR did not suppress emotion, it seems that emotional encodings would be rich. If so, it was predicted that the size of the spacing effect would be larger in the participants with low MR. The results was consistent with the above prediction. Specifically the spacing effect observed in the participants with low MR was larger than that in those with high MR. This result could be interpreted as indicating that the participants with high MR suppress emotional cues expressively, and they could not use these cues effectively. Contrary to the participants with high MR, the participants with low MR seldom suppress the emotional cues, and they could use these cues effectively.

Although MR was a determinant of memory performance, the relationship between MR and the type of emotion, pleasant and unpleasant, was not examined. Baumeister, Bratslavsky, Finkenauer, and Vohs (2001) reviewed a number of psychological phenomenon and proposed the focusing notion like "negativity bias" where negative emotions/memories were stronger/remembered better than positive ones. Specifically, unpleasant episodes elicit stronger emotional encoding than pleasant episodes. Thus, target words associated with unpleasant episodes are processed more deeply and stronger than target words associated with pleasant episodes. It seems that the participants with high MR have tendencies to suppress emotion, especially unpleasant emotion, because it is stronger than pleasant one. If so, it is predicted that they would recall target words associated with unpleasant episodes no less than those with pleasant ones. Whereas for the participants with low MR, it seems that they suppress neither pleasant nor unpleasant emotions. If so, it is predicted that the participants with low MR would recall target words associated with unpleasant episodes more than those with pleasant ones. The purpose of the present study is to examine the above predictions.

## Method

### *Design*

A 2 × 2 × 2 design was used with the level of MR (high and low; between-subjects), the type of presentation (spaced vs. massed; within-subjects), and type of episodes (pleasant vs. unpleasant; within-subjects).

### *Participants*

Participants were 41 undergraduates (19 males and 22 females), with a mean age of 19.50 years (range: 18.20-22.50). To select the participants with high and low MR, I used MR subscale in J-ESCQ, which consisted of 8 items (e.g., "I try to keep up a good mood."). Participants were asked to rate on a 5-point scale ("never" "seldom" "occasionally" "usually" or "always") how often each of these statements applied to them. I used a criterion of the mean±1SD of MR score in all participants (M=28.68, SD=4.69) to select high and low MR groups: a high MR group consisting of 7 male and 7 females (M=34.00, SD=1.77), and a low EI group consisting of 7 male and 7 females (M=23.57, SD=2.35). The mean age of these participants was 18.80 years (range: 18.10-19.30). MR scores between high and low MR groups were assessed with analysis of variance. Mean MR score in the high MR group was higher than that of low MR group ($F(1, 26) = 163.01$, $p < .001$).

### *Materials*

The target words used in the present study were the same words used in the previous study (Toyota, 2011). These words were either positive (e.g., happi- ness) or negative (e.g., war), were selected from a normative set in a previous study (Hyodo, Takahashi, Suto, Yata, & Yasunaga, 2003). Each target word was written in a Japanese Kanji character familiar to the participants. The words were divided into two categories; 8 pleasant words and 8 unpleasant words. Two list of the orienting task were provided. In each list, 16 target words (8 pleasant and 8 unpleasant words), which were presented twice, and a buffer slide was presented in the first and the last serial positions in the orienting list. The number of interpolated words was fixed at five for the spaced presentation, but there were no interpolated words in the massed presentation. Each target word was placed on its own page in a 34-pages booklet. Each participant

was asked two orienting questions on each page. The first question was “Are there any episodes that you are reminded of by the above word?” and the second one was, “How does the episode that the word reminded you of make you feel?” The possible answers were “Yes” or “No” for the first question, and “1, 2, 3, 4, 5, or 6” for the second question a rating scale in which 1 indicates ’most unpleasant’ and 6 indicates ’most pleasant’. For each list of target words, two different orders were constructed and counter-balanced.

### *Procedure*

The procedure used in the present study was the same one used in Toyota (2011). The experiment was conducted with the group of participants under incidental memory procedure. First, all the participants in two MR groups were told that the task was a pilot test to gather information about the Japanese language. The following experimental procedures were then used for two MR groups simultaneously.

Orienting task Each participant received a booklet mentioned above, and the task was explained with an illustration of a booklet page displayed on a board at the front of the classroom. The participants were then given the following orienting instructions. “A familiar word is shown in the upper part of each page. There are two tasks on each page [pointing to the example on the white board]. The first task is to answer the question “Are there any episodes that you are reminded of by the word?” by circling’Yes’ or ’No’. Your second task is to answer the question “How does the episode that the word reminds you of make you feel?” by rating it on a 6-point scale indicating the pleasantness. Participants were given 10 seconds per page to perform the task.

Interpolated task Following the orienting task, each participant was given an interpolated task for 3 minutes. A sheet of paper with Japanese words, printed in hiragana, was given to each participant, and the participant was then required to quickly circle as many of the nouns that contained more than three letters as they could.

Free recall test Following the interpolated task, the participants were required to recall, and write down as many of the targets as possible. Five minutes were allowed for this test.

## Results

The means for all types of episodes (pleasant vs. unpleasant vs. no episodes) are shown in the upper part of Table 1. On the basis of these numbers, the percentage of target words correctly recalled was calculated. These percentages are shown in the lower part of Table 1 as a function of the type of episodes (pleasant vs. unpleasant vs. no episode) and the type of presentation (spaced vs. massed). However, percentages corresponding to no episodes were calculated for only a small number of participants, because 1-2 participants in both MR groups recalled episodes for all the targets. As the present study focused on the difference between pleasant and unpleasant episodes, the following analysis excluded data that contained no episodes.

A 2 (MR; high vs. low MR group) × 2 (type of presentation) × 2 (type of episode) analysis of variance showed that the main effect of type of presentation ($F(1,26)=6.92$, $p<.05$, $\eta 2=.08$) was significant, and that the interaction between MR and type of episode ($F(1,26)=3.71$, $p<.07$, $\eta 2=.03$) was marginally significant. Planned comparisons were performed for this interaction. Although the simple main effect of type of episode was not significant for high MR group ($F(1,26)=.53$), this effect was marginally significant for low MR group ($F(1,26)=3.97$, $p<.06$), indicating that the targets associated with unpleasant episodes were recalled more often than those with pleasant episodes for low MR group.

**Table 1 Mean Number of Episodes and Percentages of Targets Recalled Correctly in Free Recall Test**

| | | Pleasant episode | | Unpleasant episode | | No episode | |
|---|---|---|---|---|---|---|---|
| | Type of presentation | Massed | Spaced | Massed | Spaced | Massed | Spaced |
| Number of episodes | | | | | | | |
| High MR | M | 3.57 | 3.61 | 2.89 | 2.68 | 1.54 | 1.71 |
| | SD | .65 | .57 | .87 | .62 | 1.09 | .86 |
| Low MR | M | 3.68 | 3.14 | 2.50 | 2.30 | 1.86 | 2.39 |
| | SD | .59 | .85 | .67 | 1.10 | 1.17 | 1.51 |
| Recall of targets | | | | | | | |
| High MR | M | .57 | .72 | .51 | .70 | .49 | .57 |
| | SD | .23 | .19 | .25 | .26 | .43 | .38 |
| | | | | | | n=12 | n=13 |
| Low MR | M | .56 | .62 | .61 | .81 | .52 | .79 |
| | SD | .27 | .27 | .23 | .22 | .40 | .24 |
| | | | | | | n= 12 | n=13 |

## Discussion

The purpose of this study was to examine incidental memory performance as a function of MR and types of episodes. For participants with high MR, the difference of memory performance between targets associated with pleasant and unpleasant episodes. However, for participants with low MR, targets associated with unpleasant episodes were recalled more often than those with pleasant episodes. These results were consistent with the prediction and indicated that MR suppress strong emotion associated with unpleasant emotion. As the emotional cues were effective cues for retrieving corresponding targets, high level of MR diminished the emotional cues, leading to the low recall performance. As mentioned before, Richards and Gross (2000, 2006) showed that participants with a high rate of expressive suppression of emotion did not perform well on memory tasks. Toyota (2013) also showed that MR level determined the size of the spacing effects. Consistent with these previous studies, the present study also indicated the relationship between the memory performance and the level of MR. According to Baumeister et al. (2001), unpleasant episodes elicited emotion stronger than pleasant episodes. Participants with high MR had tendency to suppress such stronger emotion. Suppressed emotion would not be cues for retrieving a target associated with it. More recently, Nairne and his colleagues (Nairne, Thompson, & Pandeirada, 2007; Nairne & Pandeirada, 2008; Nairne, Pandeirada & Thompson, 2008) proposed that memory systems evolved to help us remember the information relevant to survival or fitness-relevant information. Namely memory systems contain information relevant to living a successful and happy life. Thus the informatin is recalled, because it is important to adaptation to life. According to their proposition, the results of the present study is interpreted as showing that the stronger unpleasant emotions are not adapative to life, so they would be suppressed.

Unfortunately, the relationship between MR and the size of spading effects were not observed. Namely the size of spacing effects in high MR group was not different from that in low MR group. This result was not consistent with the previous study (Toyota, 2013). The inconsistency between the two researches might be caused by the difference of orienting list. Specifically the list used in the present study contained the both pleasant and unpleasant target words, but each list used in Toyota (2013) had only pleasant or unpleasant words. According to the encoding variability hypothesis (Martin,1968; Madigan, 1969; Gartman & Johnson, 1972; Glenberg, 1977; Kitao, 1983), the spaced presentation facilitated encoding variability between the first presentation and the second presentation, whereas the massed presentation did not. The spaced presentation facilitated encoding variability for this emotional encoding between the first and second presentations. However, as individual differences in the level of MR produced differences in the activation of emotional encoding elicited by each target, participants in the high MR group had tendency to suppress these activation for the targets associated with unpleasant episodes. As mentioned before, according to a review by Baumeister et al. (2001), unpleasant episodes elicited stronger activation as compared to pleasant episodes. As participants with low EI did not activate the emotional encoding of targets associated with pleasant episodes, emotional encoding did not vary across the first and the second presentation for this group. Therefore, the spacing effect, the superiority of the spaced presentation to the massed presentation, disappeared. On the other hand, participants with high EI activated the emotional encoding of targets even those targets that elicited weaker emotions (e.g., pleasantness). This activation facilitated encoding variability across repeated presentations, leading to the spacing effect for both types of episodes.

Although the present study focused on MR, EI has another two aspects; EL and PU. Both EL and PU have a common elements that facilitate the encoding of emotion. However, MR does not facilitate emotional encoding, and in some cases, suppresses them. Previous studies (Richards & Gross, 2000, 2006) have shown that participants with a high rate of expressive suppression, which is one form of emotion regulation, do not perform well on memory tasks. These studies, along with the results of the present study, suggest that the level of EL and PU might be positive predictors of memory. However, MR might be a negative predictor, which might prevent the activation of emotional encoding to each target. Further research is necessary to determine which aspect of EI most contributes to memory performance.

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【日本語要旨】

# 情動の制御における個人差と偶発記憶

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本研究は，情動の制御と調節能力（ＭＲ）の高い参加者と低い参加者における偶発記憶の違いを検討した。大学生41名に対して，情動知能尺度（Ｊ−ＥＳＣＱ，Toyota *et al.*, 2007）を実施し，ＭＲの得点が高い参加者（ＭＲ高群）と低い参加者（ＭＲ低群）を14名（男女同数ずつ）抽出した。これらの抽出された実験参加者に対して，Toyota（2011）と同じ偶発記憶手続きを用いた集団実験が実施された。方向づけ課題では，小冊子が配布され，その各ページには，兵藤ら（2003）から選択された快語及び不快語が含まれていた。各語は２回提示されたが，連続して提示される場合（集中提示）と他の語をはさんで提示される場合（分散提示）が設けられた。参加者は提示された単語から過去のエピソードが想起されるか否かの回答を求められ，想起された場合にはその出来事に対する感情を不快から快までの６段階で評定するように求められた。ひらがな文字列から名詞を抽出する挿入課題を行った後，偶発自由再生テストが実施され，提示された単語の書記再生が求められた。本研究で用いた材料においては，分散効果（分散提示条件が集中提示条件よりも再生率が高い現象）はＭＲ高群とＭＲ低群ともに見いだされた。ただし，ＭＲ高群では，快な過去のエピソードが喚起された単語と不快なエピソードが喚起された単語の再生率が同じであったが，ＭＲ低群では，不快な過去のエピソードを喚起する単語の再生率が快な過去のエピソードを喚起する単語の再生率よりも高かったのである。Baumeister *et al.*（2001）は，一般に不快情動が快情動よりも強いと主張している。この主張にしたがうと，本研究の結果は，ＭＲが不快な過去のエピソードに結びついている強い情動を抑制するために，その情動が検索手がかりとして機能しないことによると解釈された。すなわち，ＭＲ高群は情動を抑制する力が強いので，不快な過去のエピソードの強い情報を抑制してしまい，快なエピソードから喚起される弱い情動と同じくらいの検索手がかりとしての機能しかもたなくなる。一方，ＭＲ低群では，このＭＲによって不快な過去のエピソードから喚起される強い情動が抑制されることがないので，その情動がそのまま検索手がかりとして機能したのである。