# The effect of eye movement on memory and attention: A preliminary study

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JEMDRA
Japan EMDR Association





# Hypothesized Mechanism in EMDR

- Working memory
- Orienting response
- REM sleep
- Reconsolidation
- Exposure





# Two Paradigms

Paradigm #1 | Paradigm #2

Accessing imagery

Imagery + EM

Keep accessing Imagery

Imagery, Emotion Change

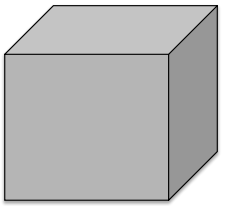




# Current Paradigm

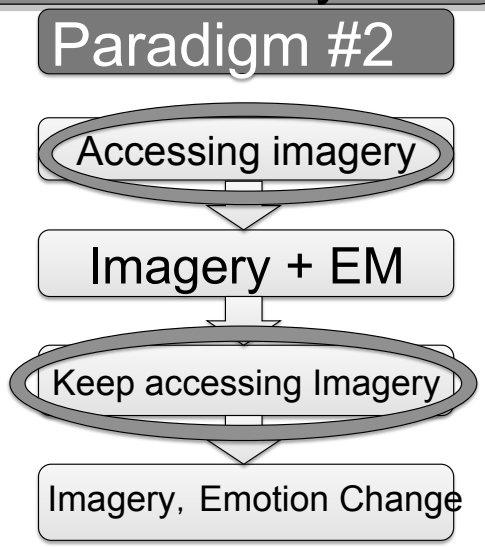
Paradigm #1

Imagery + EM



Imagery, Emotion Change

# Paradigm of this study








# Role of eye movement

1. Changing memory
2. Accessing memory





# Dual attention = Distancing?

- Lee et al.(2006)
  - EM can lead the effect of distancing from the negative imagery, which is related to therapeutic improvement.
  - Amount of re-experience is not related to the therapeutic effect.
  - Distancing response can lead the memory change.





# EM vs Instruction to keep distance

- Lee and Dorummond(2008)
  - EM vs instruction to have distance from imagery.
  - Only EM can decrease imagery vividness and stress intensity.
  - Instruction is not effective for therapeutic change
  - Whether distancing response can be guided from instruction was not clear.

# Mindfulness

- "So just give as accurate feedback as you can as to what is happening without judging whether it should be happening or not. Just let whatever happens, happen."
- Train Metaphor
- Movie Metaphor





# Cognitive Psychology Perspective (Wells & Matthews, 1994)

- EMDR is effective because it may divide attention.
- Self-focused attention is reduced in motor activity(EM in this case) by directing attention outward (Duval & Wicklund, 1973).
- Attention training, which changes attention outward leads to detached, problem focused perspectives.





# Cognitive Bias

- Attention bias
  - Avoiding negative stimuli
  - Difficulty to disengage from negative stimuli
- Memory bias
  - Emotional stimuli are memorized more than neutral ones (Hamman, 2001)





# Purpose

- How does horizontal eye movement affect processing of words that are presented as visual stimuli?
- Dependent variables: memory recall of words & reaction time to press a button according to direction.

# Hypothesis

1. Threat word vs. Neutral word (Cognitive bias)
   A. Reaction time: Threat > Neutral
   B. Amount of recall: Threat > Neutral
2. EM vs. Fixed (Task load)
   A. Reaction time: EM > Fixed
   B. Amount of recall: EM < Fixed





# Method





# Participants

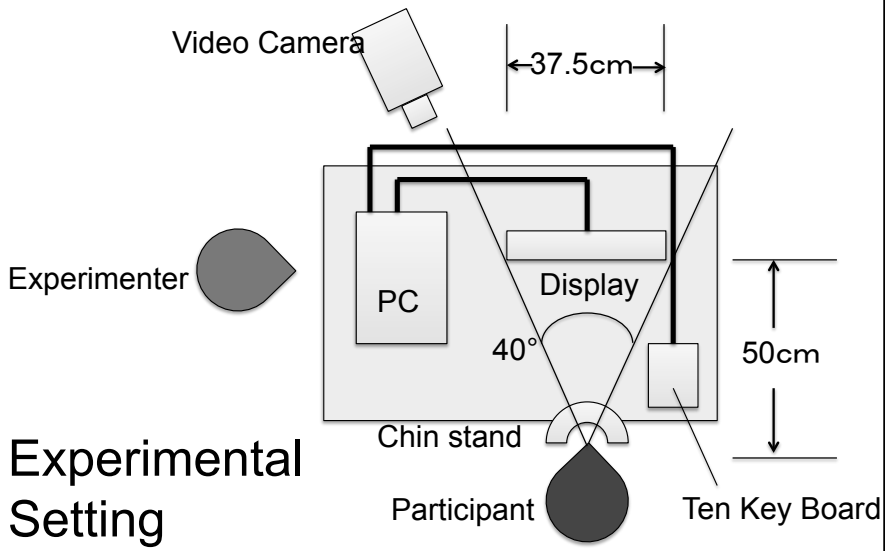
- Thirty one undergraduate or graduate students (Age19.6, SD1.17)
- Female 26, Male 5





# Material

- Before experiment, the following inventories were filled out.
  – BDI-Ⅱ
  – STAI-T
  – STAI-S
- In current study, these factors are not focused.




Experimental Setting



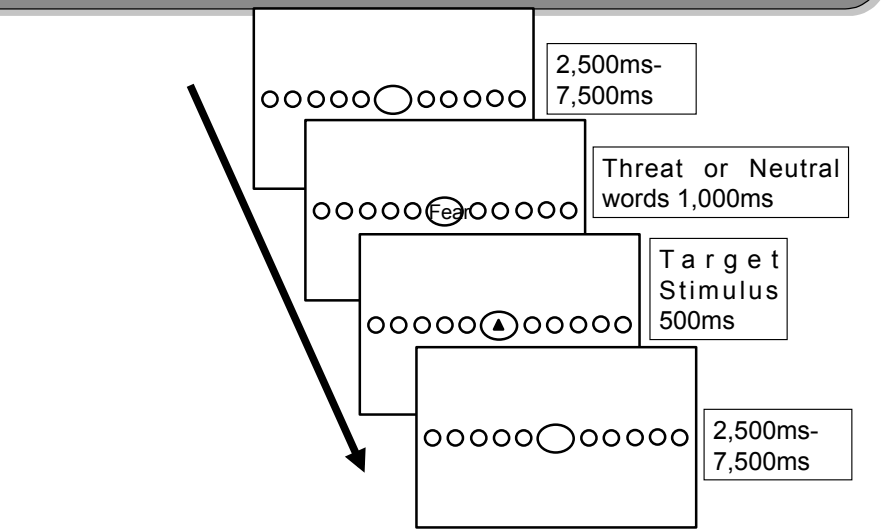


# Procedure

- All participants were tested individually in Japanese.
- Each participant experienced both eye fixation and horizontal eye movement conditions.
- Threat or neutral words were presented for 1000ms for remembering. Right after disappearing the word, ▲ or ▼ appeared. Each participant must press the ▲ or ▼ keys as accurately as possible.










# Material

| Threat Words | Neutral Words | | | | |
|---|---|---|---|---|---|
| Fear | Opinion | Universe | Music | Stair | Machine |
| Regret | Metal | Theater | Hometown | Industry | Black board |
| Robbery | Teacher | Data | Relatives | Sleep | Integer |
| Disaster | Detergent | Price | List price | Tofu | Barley tea |
| Failure | Number | Indication | Envelop | Body | Taste |
| Anxiety | Name list | Form | Cooking | Temporary | Topic |

Six threat words and thirty neutral words were randomly selected based on emotional value evaluated by Kanai (2003) .





Table 1

実験に用いた熟語群

| 脅威語 | 中立語 | | | | |
|---|---|---|---|---|---|
| 恐怖 | 意見 | 宇宙 | 音楽 | 階段 | 機械 |
| 後悔 | 金属 | 劇場 | 故郷 | 工業 | 黒板 |
| 強盗 | 師範 | 資料 | 親戚 | 睡眠 | 整数 |
| 災害 | 洗剤 | 値段 | 定価 | 豆腐 | 麦茶 |
| 失敗 | 番号 | 表示 | 封筒 | 本体 | 味覚 |
| 不安 | 名簿 | 用紙 | 料理 | 臨時 | 話題 |





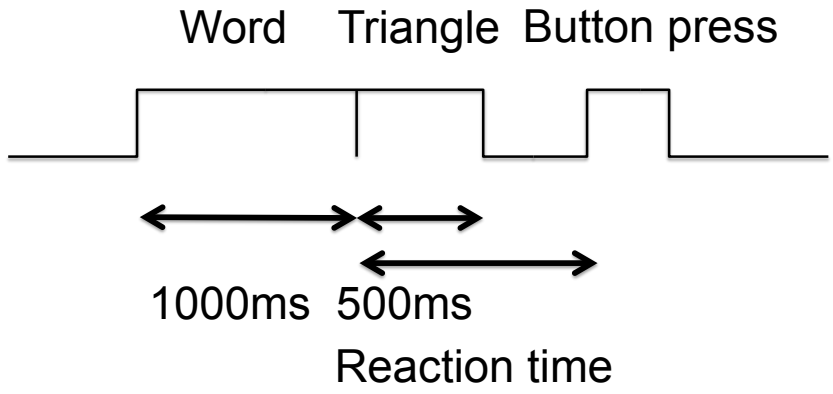
# Procedure−Instruction

- I would like you to do a task with and without your eyes moving. In a task, you can see some words in a video. Please remember as many words as possible, since I would like to ask what words were there after watching video. And also just after each word, ▲ or ▼ will appear. If you find ▲, please press key of ↑ and if you find ▼, please press key of ↓. Please do it as accurately and quickly as possible.

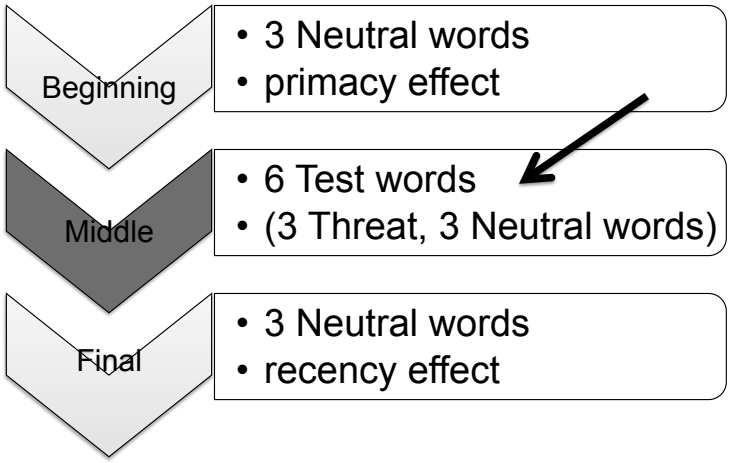




# Reaction Time



# Recall Score








# Ethical considerations

- Participants were told the following items and consented to them.
  1. The investigator does not reveal any private & confidential information
  2. Experimental data will be maintained in the place where only investigator can access.
  3. Experimental data will be analyzed in a statistical manner, in which identical data will be protected.
  4. Experimental data will be kept only until the end of analysis.
  5. Participants have the right to decline to participate at any time without any specific reason.





# Ethical considerations

6. Participants can receive result of the experiment if they want.

This study was approved by the ethical committee of Hyogo University of Teacher Education(#13) and conducted based on the guideline.





# Experimental Design

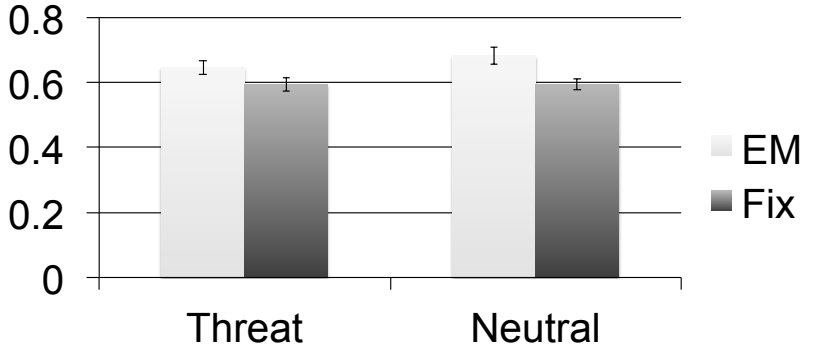
- Two within factors design
  - EM vs. Fixed (2 level)
  - Threat or Neutral words (2 level)

# Result





## Reaction Time (sec)

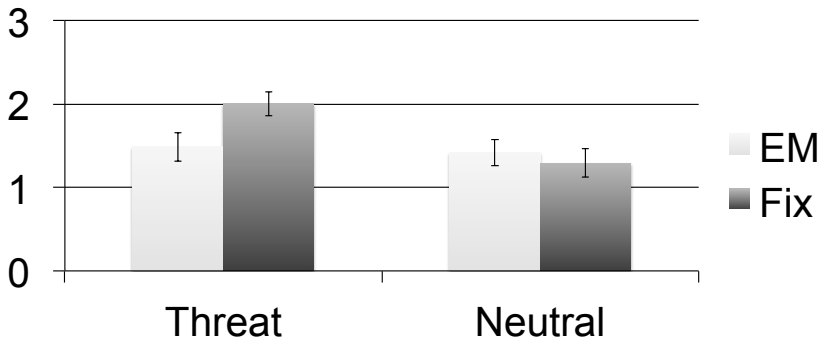



EM: F(1,30)=9.931, p<.01**





## Amount of Recall




Emotion F(1,30)=4.747 p<.05*
Emotion x EM F(1,30)=4.071, p<.1+





## Hypothesis

1. Threat word vs. Neutral word (Cognitive bias)
   A. Reaction time: Threat > Neutral ✖
   B. Amount of recall: Threat > Neutral ○ ▲
2. EM vs. Fixed (Task load)
   A. Reaction time: EM > Fixed ○
   B. Amount of recall: EM < Fixed ▲

# Discussion

- Attention bias
  - Attention bias by emotion could not be observed.
  - Shorter than 250ms→ no bias
  - Longer than 1500ms→ disengagement difficulty(Koster et al.,2005)
    - 1000ms could be middle.
  - Since instruction of memory task was announced formerly, participants may focus on memory task more.





# Discussion

- Memory bias
  - Emotional words are recalled more than neutral words.
  - Load of EM may be effective for suppressing memory bias for emotional stimuli.
  - EM could have unique characteristic different from task load.
  - In EMDR, client could keep their mind normal, although they focus on negative stimuli.





# Discussion

- Limit
  - Task could be complicated: eye movement, memory and attention could be too much.
  - Effect of attention and memory could be mixed.
  - Simple design is desired only attention or memory focus.
  - Relationship with anxiety or depression should be considered for future research.





# Contributors

Thank you for your attention.

- Kie Higuchi (Kobe City Child Growth Center)
- Sakina Inoue (Konan University)
- Yoshikazu Fukui (Konan University)

# Thank you for your attention

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