Measuring Shared Knowledge with Group False Memory

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1. INTRODUCTION

False memory is recall or recognition of phenomena that did not occur. Based on Deese's (1959) study, which showed that people sometimes recall words that were not present but associated with wordlists, Roediger and McDermott (1995) suggested that the spreading activation of a meaning network produces false memories. The robustness of the Deese-Roediger-McDermott (DRM) experimental paradigm depends on the stability of shared knowledge structure. A basic assumption of the present study is that false memory in a group can be an index of shared cognition because it appears only if all group members fail to detect an error. The purpose of this research was to investigate, using the DRM paradigm, the conditions under which collaborative groups produce false memories.

1.1 Group False Memory

Groups are expected to detect false alarm more accurately than individual, because they have large information pools, opportunities to correct errors, and decision-making efficiency (Hinsz, 1990). However, in using this capacity, which is known as collaborative inhibition (Weldon, Blair, & Huebsch, 2000), groups have not been shown superior in processing large information pools. Nevertheless, there has been plenty of evidence for group superiority in accuracy. Clark, Hori, Putnam, and Martin (2000) showed that two people cooperating were able to recognize more words than were two people working separately. In Clark's study, group interaction facilitated the recognition of targets (presented words) but not the recognition of distractors (non-presented words). From the perspective of group information studies, groups are expected to produce fewer false memories than individuals.

On the other hand, several studies have found collaborative groups produced more false memory than individuals (B. H. Basden, Basden, Thomas & Souphasith, 1998; Peker & Tekcan, 2009). If groups share meta-level cognition, collaborative inhibition would decrease as hypothesized in transactive memory (Wegner, 1995), but at the same time, groups would lose their ability to detect false memory. On the basis of this argument, Arima (2013) found that collaborative groups produced more false memory when they remembered wordlists consistent with categorical cues. The present study explores the relationship between group false memory and shared knowledge in a group using consistent and randomized wordlists without categorical cues.

2. METHOD

2.1 Participants and Procedure

One hundred nineteen university students (83 males and 36 females; mean age = 19.87) participated in this experiment. Ten words of each wordlist were shown to participants sequentially for two seconds each on a screen set in front of the experimental room. After the ten words were presented, the participants were given 90 seconds to recall and write down the words. This procedure was repeated six times for six wordlists, three of which were category-consistent wordlists and three

randomized wordlists (developed by Yukihiro, Fujita & Kawakami 2001). Subsequently, the participants were asked to complete a recognition test (pre-test) consisting of 48 words including six false targets, 18 correct targets, and 24 distractors. After the first recognition test, the participants were divided into three- or four-person groups. There were 31 groups in total. Groups were instructed that there were six prototypical words for six categorical wordlists, and asked to choose the six prototypical words from the recognition test page. After all groups finished discussion, the participants took the second recognition test (post-test) that had added questions to evaluate all the words with 5-point scale (1: not at all pleasant to 5: very pleasant). In the second recognition test, participants were asked to answer individually whatever their group decision was, to confirm private acceptance but not public obedience.

2.2 Independent and dependent variables.

A 2 × 2 mixed design ANOVA with a random effect (groups) was used; the within-subject condition was wordlist (consistent or randomized) and the within-subject condition was collaboration (pre or post). Participants were randomly assigned to set (a) or (b) conditions. Both of the wordlist conditions and the set (a or b) conditions were counterbalanced. The dependent variable was the proportion of false recognition for the critical non-presented words. The proportion data were transferred using inverse sine transformation. To investigate knowledge structure, the evaluation score for each word was analyzed using ALSCAL, an alternating least-squares algorithm to perform multidimensional scaling (MDS), and INDSCAL, an individual differences (weighted) Euclidean distance model.

3. RESULTS

To test the effects of the conditions on false detection, 2 (wordlist: consistent or randomized) × 2 (time: pre or post) × 2 (set: a or b) mixed design ANOVA was conducted using a random effect (groups). It revealed the main effect of wordlist, $F(1, 351) = 21.09$, $p < .001$, $r = .24$, and time $F(1, 351) = 22.83$, $p < .001$, $r = .25$, and interaction effects between wordlist and set $F(1,351) = 6.92$, $p = .009$, $r = .14$. The difference between set (a) and (b) was found for consistent wordlists, $F(1,193.64) = 8.03$, $p = .005$, $r = .20$, but not for randomized wordlists $F(1,193.64) = .08$, $p = .78$, $r = .02$. Figure 1 depicts the results. False detection for randomized wordlists as well as for consistent wordlists increased as a result of collaboration.

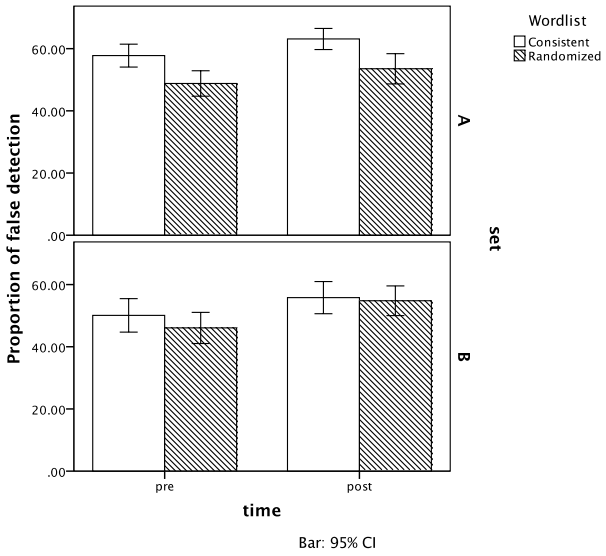

Fig. 1 False memory increased by collaboration

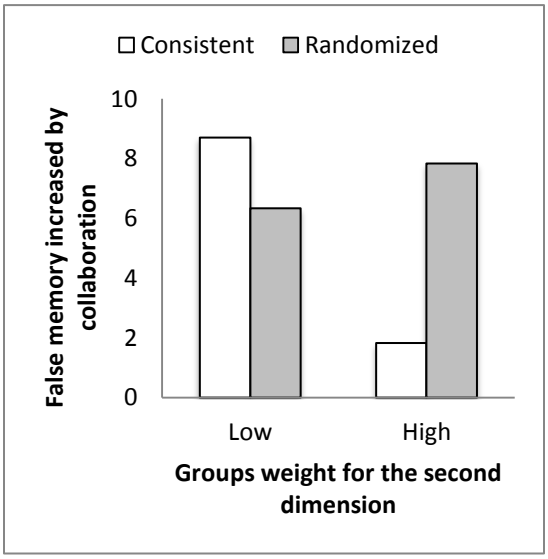

Fig. 3 Effect of Group's weight on false memory

3.1 Knowledge structure for wordlists

ALSCAL was conducted for set (a) and set (b) conditions respectively. ALSCAL yielded a two dimension matrix for the (a) groups, Kruskal's stress = .13, squared correlation (RSQ) = .94, and also for the set (b) condition, Stress = .17, RSQ = .91. Figure 2 shows the results. The first dimension distinguished 'happy' versus 'painful.' The second dimension distinguished 'rest' versus 'read,' which seems to mean leisure versus study for Japanese students. For the first dimension, the words were in almost the same position whether in a consistent or randomized list. For the second dimension, there were differences of position between set (a) and set (b). For example, while the word 'memory' was associated with 'study' in set (a), it appeared at the opposite position associated with 'leisure' in set (b), perhaps because 'memory' appeared with 'holiday' in the randomized wordlist of set (b). This result suggested that participants created a different knowledge structure for the set (a) and set (b) wordlists.

3.2 Shared knowledge structure and Group false memory

Based on the ALSCAL for all data (stress = .13, squared RSQ = .94), INDSCAL gave each group weights for the first and second dimension (groupD1, groupD2). The influence of a group's weights on false memory was investigated. Using group level data (n = 30), ANCOVA was conducted; (wordlist: consistent or randomized) × 2 (time: pre or post) × 2 (set: a or b) with covariate of groupD1, groupD2. It yielded an interaction effect between word and time, $F(1,26) = 4.96$, $p = .035$, partial η^2=.16, and three-way interactions among wordlist × time × groupD2, $F(1, 26) = 12.74$, $p = .001$, partial $\eta^2 = .33$, and wordlist × time × set(a or b), $F(1,26) = 6.12$, $p = .02$, partial $\eta^2 = .19$. Groups weighted on the second dimension could detect false alarm for consistent wordlists but not for randomized wordlists (Figure 3).

4. CONCLUSION

(1) False memory was increased by group collaboration to find prototypical words in wordlists.
(2) Although consistent wordlists produced more false memory for individuals, wordlist consistency did not affect the increment of false memory with group collaboration.
(3) The groups weighted on the second dimension could restrain false memories from consistent wordlists but not from randomized wordlists.
(4) These results suggested that collaborative groups could restructure their shared knowledge and use it for detecting false memory.

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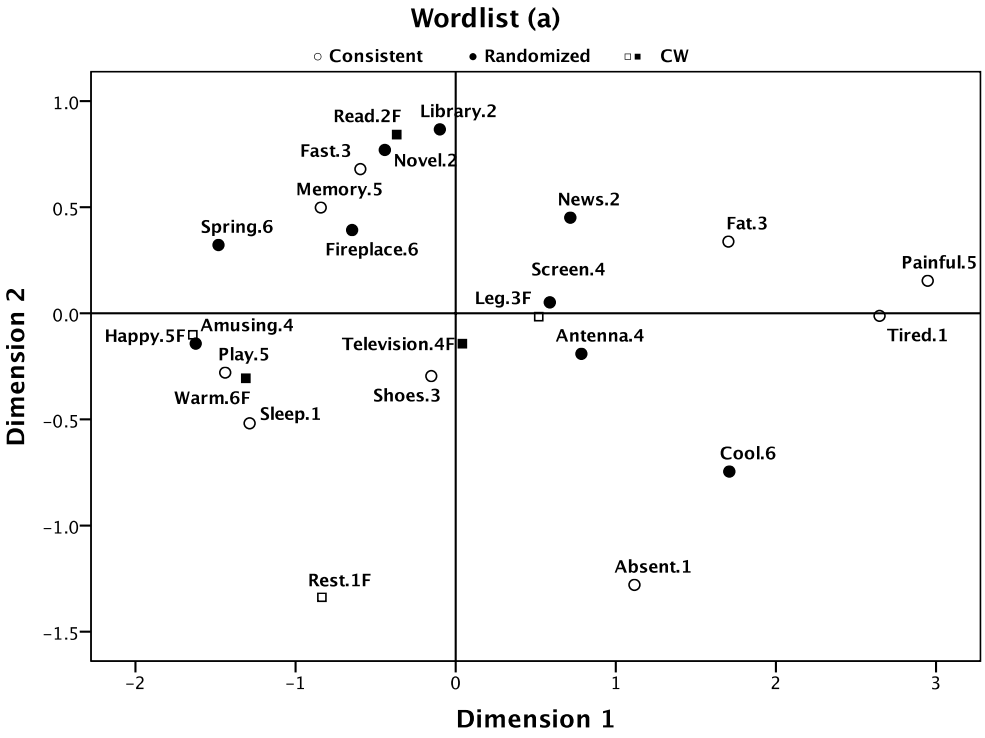

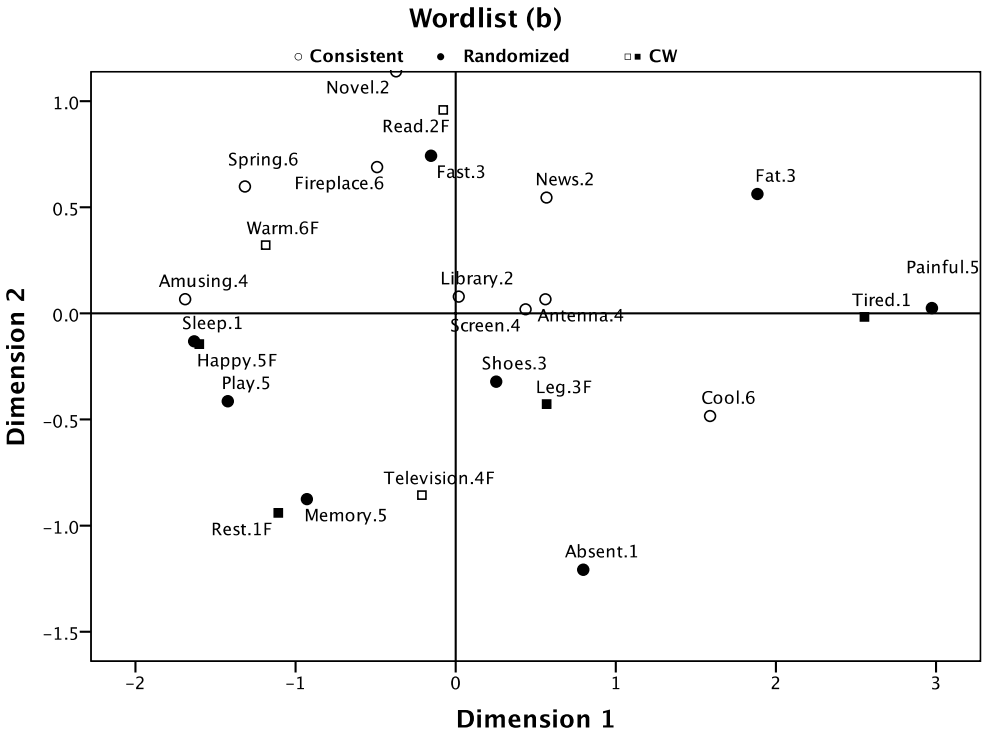

Fig. 2 Knowledge structure for wordlists yielded by ALSCAL.