

# Impaired Consolidation Processes Underlying Ecstasy-Group Deficits in Verbal Memory

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## INTRODUCTION

The study aimed to examine the cognitive mechanisms underlying ecstasy consumer's impaired performance on verbal list learning tasks [1-5]. This was achieved by comparing levels of forgetting across a related and a non-related word list. Forgetting a word that was previously recalled once indicated forgetting at level one, forgetting a word that had been recalled twice is forgetting at level 2, and so on. Thus, a higher frequency of low level forgetting indicates slower memory consolidation, whereas higher levels of forgetting indicate failure to retrieve learnt information [1].

## METHOD

Participants were regular consumers of ecstasy only ( $n = 15$ ), cannabis only ( $n = 17$ ) regular consumers of both ecstasy and cannabis ( $n = 20$ ) and drug naïve participants ( $n = 17$ ). Participants were presented with a non-related list of words, at the end of which they were asked to recall all the words they could remember. This procedure was repeated across five learning trials. A related list was also administered, where each word belonged to one of five categories.

## RESULTS

To compare the number of words recalled for each group across the unrelated and related word lists, a 2(Cannabis: present, absent) x 2 (Ecstasy: present, absent) x 2 (List: related, unrelated) repeated measures ANOVA was performed. All groups recalled significantly more words on the related compared to the non-related word list  $F(1, 69) = 108.22, p < .001$ . The effect of Ecstasy was significant  $F(1, 69) = 17.13, p < .001$ , indicating that the Ecstasy group recalled fewer words compared to the Cannabis, Ecstasy + Cannabis and Drug Naïve groups for both list types.

For the measures of forgetting, a 2 (Cannabis: present, absent) x 2 (Ecstasy: present, absent) x 2 (List: related, unrelated) x 4 (Level 1, 2, 3, 4) was calculated. There was a main effect for List,  $F(1, 69) = 185, p < .001$ , with participants forgetting fewer words for the related compared

to the non-related word list. The effect of Level was significant, as was the Level x Ecstasy interaction,  $F(1, 69) = 5.98, p < .01$ . Follow up ANOVAs showed the Ecstasy group forgot significantly more words at levels 1,  $F(1, 71) = 13.83, p < .001$  and 2,  $F(1, 71) = 8.99, p < .01$ , compared to the other groups, however, this effect ceased once a word had been previously recalled on four occasions.

## DISCUSSION

Although all groups recalled more words on the related word list, indicating that they benefitted from the provision of a categorical list, the ecstasy group forgot more words at levels 1 and 2 across both lists. This suggests that although memory consolidation was assisted with categorical cues, the ecstasy group's speed of consolidation was still significantly slower than that of the other groups.

## CONCLUSION

The reported deficit in ecstasy user's explicit verbal memory is consistent with previous research [1, 6]. These deficits may be attributed to consolidation rather than retrieval deficits, and implicate the role of serotonin in memory processes associated with the hippocampus [7, 8].

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