Letters to the Editor

CANNABIS, ECSTASY/MDMA AND MEMORY: A COMMENTARY ON SIMON & MATTICK'S RECENT STUDY

Sir—The aims of a recent study published in *Addiction* were: 'to assess memory impairment in a group of regular users of ecstasy compared with a group of regular users of cannabis' (Simon & Mattick 2002, p. 1523). The authors reported significantly lower Weschler Adult Intelligence Scale (WAIS) vocabulary scores for the ecstasy user group, who also showed borderline trends towards impairment on two WAIS memory tasks: immediate and delayed auditory memory. Regression analysis showed that cannabis predicted performance on the visual immediate memory task. However, on the majority of the memory tasks, there were no significant effects for either cannabis or ecstasy. The regression analyses showed that WAIS vocabulary, 'an estimate of verbal intelligence was found to be the most predictive of most memory indices'. These findings allowed the authors to conclude that there were no effects of past ecstasy/MDMA use on memory, and that cannabis use was a probable confound in this area of research.

However, there is a crucial design issue that we would like to raise, namely that in contrast to the stated aims, this study did not compare ecstasy users with cannabis users. Instead, the two groups contained users of both cannabis and ecstasy! Thus, 25 of the 39 participants in the ecstasy group were cannabis users, and their overall group mean consumption was even slightly higher than that of the cannabis group (ecstasy mean 67.9 joints/month; cannabis group mean 62.6 joints/month; Table 1). Thus, the ecstasy group must have contained some of the heaviest cannabis users in the whole study. Turning to the use of ecstasy/MDMA, the entry criteria for the control group noted that: 'a small amount of ecstasy use was allowed (life-time exposure of up to five tablets)' (Simon & Mattick 2002, p. 1525). The number of ecstasy users in the cannabis group was not reported, but the crucial point is that both groups comprised a mixture of cannabis and ecstasy users. This means that the *t*-tests performed between the two groups were not a real test of drug effects, possibly helping to explain why there were so few significant findings on any of the memory tasks.

The other statistical procedure employed to assess drug effects was regression analysis. But in order to assess drug effects with optimum sensitivity high variance is needed, so that one needs to test a full range of non-users through to heavy users. With cannabis there seems to have been a preponderance of moderate or heavy users. In contrast with ecstasy/MDMA, the majority were light or moderate users. Although the overall mean life-time consumption for the ecstasy/MDMA group was quite high at 258 tablets, this value was boosted by a single individual who had taken 3583 tablets. Without this case, the mean consumption for the group was 89 tablets (Simon & Mattick 2002, p. 1527). This may also help explain why life-time ecstasy usage was never a significant predictor; a larger number of heavy ecstasy users would probably have been needed to adequately test this hypothesis. For instance, Fox *et al.* (2001) found significant effects of life-time consumption on cognitive functioning, but they contrasted three separate groups of low (<100 tablets/life-time), moderate (100–499 tablets/life-time), and high (>500 tablets/life-time) ecstasy users.

Therefore, we believe that the characteristics of the two groups in Simon & Mattick (2002) mitigated against demonstrating any drug effects. More clearly defined and separated drug user groups would have allowed the effects of both cannabis and ecstasy to have been assessed more effectively. Non-user controls would also have been extremely useful, for both the between-group comparisons and the regression analyses. There is an extensive empirical literature on memory impairment in cannabis and ecstasy users, but these studies have all employed clearly differentiated groups. For instance, Gouzoulis-Meyfrank *et al.* (2000) compared three carefully matched groups, and found a range of significant cognitive/memory impairments in the ecstasy/MDMA users compared to both cannabis user controls and non-user controls; furthermore, heavy cannabis use was significantly linked to some areas of cognitive dysfunction. Several further studies have demonstrated cognitive deficits in ecstasy users compared to cannabis users, but again they each employed well-defined groups (Morgan 1999; Rodgers 2000; Fox *et al.* 2001; Rodgers *et al.* 2001; Morgan *et al.* 2002; see Table 1 in Parrott 2001).

In conclusion, the deleterious neurocognitive effects of cannabis and MDMA are best conceptualized in additive terms, rather than being seen as alternatives (Parrott 2003). This is illustrated by a recent Internet study

involving 490 participants, of whom 192 were cannabis users and 155 had taken ecstasy/MDMA (Rodgers *et al.* 2001). Each drug was found to be significantly associated with a different type of self-rated memory impairment. Rodgers *et al.* (2001, p. 623) concluded: 'cannabis was associated with reports of here and now cognitive problems in short-term and internally cued prospective memory . . . in contrast, ecstasy was associated with reports of long-term memory problems, which were more related to storage and retrieval difficulties'.

Those who had used both drugs reported impairments in all these areas. Thus, we believe that many of the participants in Simon & Mattick's drug user groups may well have been memory impaired, but their design did not allow this to be revealed.

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