Addiction (1998) 93(5), 745–748

RESEARCH REPORT

An association between the regular use of 3,4 methylenedioxy-methamphetamine (Ecstasy) and excessive wear of the teeth

P. J. REDFEARN, N. AGRAWAL & L. H. MAIR

Department of Clinical Sciences, University of Liverpool, UK

Abstract

Aims. *This study was established to determine if users of ecstasy had greater tooth wear than a comparison group of non-users.* **Design**. *The study involved a direct comparison between two groups of young people gathered by a peer information network and divided by the response to the question "Do you take ecstasy?"* **Setting**. *The information network was established at the Maryland Centre in Liverpool (UK). Besides offering advice on drug and sex-related problems this centre distributes free condoms and is therefore visited by many young people who would not consider themselves to have these problems.* **Participants**. *There were 30 users and 28 non-users with no significant difference in the gender ratio. Age was not recorded to maintain absolute confidentiality, but all the participants appeared to be of student age.* **Measurements**. *Tooth wear was measured using the index of Smith & Knight. The social and drug-taking profile of the two groups was ascertained by questionnaire.* **Findings**. *It was found that the mean ($\pm$STD) tooth wear score for the back teeth was 0.96 ± 0.16 in the users compared with 0.12 ± 0.08 for the comparison group. These values were significantly different ($p < 0.001$). The values for the front teeth were not significantly different. Many users were aware of clenching their teeth 12 or even 24 hours after taking the drug.* **Conclusion**. *Taking ecstasy results in an increased likelihood of tooth wear on the back teeth. This is likely to result from clenching the teeth in the acidic environment caused by carbonated (fizzy) drinks.*

Introduction

Grinding and clenching of the teeth is a recognized side effect of the use of 3,4 MDMA (Greer & Tolbert, 1986; Solowij, Hall & Lee, 1992). Fizzy drinks, taken by users to relieve thirst, can potentiate tooth wear as they are acidic and weaken the surface molecules of teeth, allowing them to be worn away more easily (Mair *et al.*, 1996). Because of these interacting factors Duxbury postulated that the use of ecstasy may be associated with increased tooth wear (Duxbury, 1993). This investigation was established to test this hypothesis by comparing tooth wear in a group of ecstasy users with a comparison group of similarly aged subjects. A questionnaire on drug usage, social and dietary habits revealed some interesting information about the use of the drug.

Methodology

The experimental and comparison groups were

Correspondence to: L. H. Mair, Senior Lecturer, Department of Clinical Dental Sciences, University of Liverpool, PO Box 147, Liverpool, L69 3BX, UK. Tel: +44 (0) 151 706 5207; fax: +44 (0) 151 706 5845; e-mail: L.H.Mair@liv.ac.uk

Submitted 21st February 1997; initial review completed 11th July 1997; final version accepted 17th October 1997.

0965–2140/98/0500745–04 $9.50

Carfax Publishing Limited

established by a snowball peer information network starting with "visitors" to the Maryland Centre, Liverpool, UK. This is a facility which provides medical advice and treatment for drug- and sex-related problems. However, as it provides free condoms, it is also visited by many young people who would not consider themselves to have these problems. All "visitors" to the centre were given an information sheet explaining the nature of the study stressing that both users and non-users of ecstasy were needed and that nobody (including the investigators) would be able to identify users. Volunteers were asked to tell their friends about the study and ask them to call into the centre if they were willing to take part. This peer network provided an experimental group of 30 subjects with a comparison group of 28.

All volunteers completed a questionnaire about their social life, drug usage and dietary habits. The questionnaire was placed in a sealed envelope identified only by a code number. After completing the questionnaire the volunteers had their front teeth examined for signs of tooth wear, then the subjects were asked to bite into a thick layer of soft wax supported on a disposable tongue spatula. The wax impressions were placed in disposable plastic bags and disinfected chemically. They were used to make models of the back teeth. The clinical records and models were labelled with identification codes. They were not matched to the questionnaires for at least 5 days to prevent the examiners remembering which volunteers had indicated the use of ecstasy on the questionnaire. Tooth wear was assessed using an index first described by Smith & Knight (1984). Only the biting (contacting) surfaces were scored by the criteria shown in Table 1.

The protocol was approved by the Local Research Ethics Committee.

Table 1. *Scoring criteria for tooth wear*

Score	Criteria
0	No loss of enamel characteristics
1	Loss of enamel characteristics
2	Loss of enamel exposing dentine for less than 1/3 of the surface
3	Loss of enamel exposing dentine for greater than 1/3 of the surface
4	Complete loss of enamel, or exposure the pulp space, or exposing secondary dentine

Enamel forms the outer surface of the teeth. Dentine is approximately 2 mm under the enamel. The pulp or secondary dentine is about 4 mm under the surface.

Results

Groups

Age was not recorded on the questionnaire as some volunteers may have they felt that they could be recognized by this statistic if they were slightly older or younger than other people visiting the centre. However, it was noted that all the volunteers appeared to be of student age. There was no significant difference in the gender ratio (Fisher's Exact Test $p = 0.148$).

Use of ecstasy and other drugs

The reported use of drugs by the two groups is given in Table 2. All the users stated that they had taken ecstasy within the last 6 months with the average reported use being four times a month. The mean number of tablets taken on each occasion was 1.5 (range 0.25–5). All the users reported taking the drug in a club environment, 60% stated that they took ecstasy at private parties, while 35% also used it at home. The mean duration of the ecstasy-induced trip was reported as being 7 hours (range 4–11). Alcohol was used more frequently by individuals in the comparison group (Fig. 1).

Effects of ecstasy in relation to tooth clenching

In the questionnaire 93% of the users reported experiencing a dry mouth during a trip, while 89% were aware that they were clenching their teeth. Of the latter, 100% experienced this effect during or soon after the trip, 72% reported that they could remember clenching their teeth the next morning, while 35% claimed that they were

Table 2. *Use of drugs*

	Users	Comparison
Ecstasy	100	0
Other amphetamines	82	18
Cannabis	100	43
LSD	32	9
Magic mushrooms	4	7
Cocaine	14	0
Ketamine	11	0

Number = Percentage usage by the group.

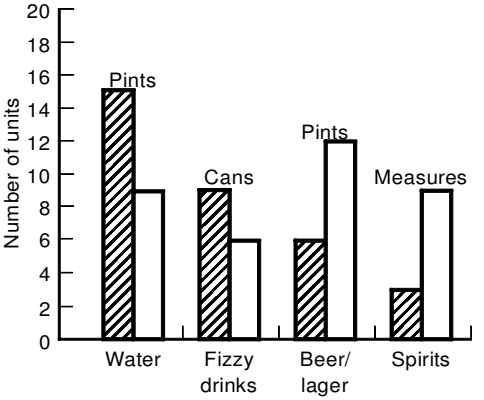

Figure 1. *Weekly drinks consumption by the two groups.* ▨, *User's;* □, *comparison.*

still aware of this activity the afternoon or evening after taking the drug.

To counteract the dry mouth all the users reported that they used chewing gum. In addition to chewing gum large volumes of fluid were consumed during a trip. Carbonated drinks were consumed by 93% of the users with a mean consumption of three cans per trip. Water was also reported to be consumed in large quantities (4 pints per trip). The estimated volumes of drinks consumed per week by the two groups are shown in Fig. 1.

Tooth wear

Figure 2 shows the mean tooth wear present for both groups in the front and back teeth. The tooth wear present in the ecstasy users was seen predominantly on the top (chewing) surfaces of the back teeth. For these teeth there was a significant difference between the values for the two groups ($p < 0.001$).

Discussion

In this study ecstasy users had greater tooth wear than a comparison group. It is important to note that some of the comparison group admitted using other amphetamines. An important finding was that the excessive wear occurred mainly on the back teeth. It has been postulated that the daytime grinding of teeth is an overexpression of an effect called thegosis, a term derived from the Greek word "to sharpen" (Every & Kuhne, 1971). This theory states that we are genetically conditioned to sharpen our front teeth by sliding them together during times of stress. This process tends to manifest as wear of the front teeth. The reason for the wear on the back teeth of ecstasy users may be explained because the action is predominantly one of clenching rather than grinding (Greer & Tolbert, 1986). There is no additional sliding of the front teeth during clenching, which explains why the values for the front teeth were similar.

To some extent, the finding that there was greater tooth wear in the user group is not surprising because the condition of clenching within a corrosive environment (carbonated drinks) is ideal to promote wear. In addition, many subjects reported feeling a dry mouth, which would promote wear because of the decreased lubrication effects of saliva. It is interesting to note that tooth clenching was reported to occur many hours after the mental effects of the drug had worn off, indicating that wear may continue for many hours. From our study it was not possible to determine whether clenching was caused because of a drug-induced change in the psyche or whether it is a direct neuromuscular effect.

Obviously, excessive tooth wear is a mild problem compared with other potential effects of ecstasy. There are other causes of excessive tooth wear in the young, such as vomiting and bulimia (Milosevic & Slade, 1989). However, if the use of the drug continues into middle age then an extrapolation of our data would suggest that many users will experience severe tooth wear at

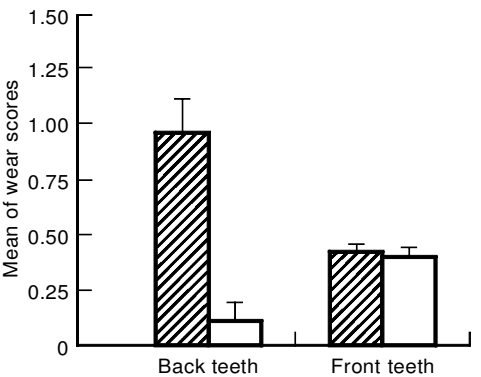

Figure 2. *Tooth wear in the two groups.* ▨, *User's;* □, *comparison.*

this time. This treatment of such a condition is difficult, time consuming and potentially very expensive.

Conclusion

The use of ecstasy results in greater tooth wear mainly on the back teeth. This is likely to result from the tooth clenching which takes places both during and for some time after the use of the drug. It may be exacerbated by the use of carbonated drinks taken to relieve dry mouth and dehydration.

Acknowledgements

We are indebted to Dr S. Ruben (consultant psychiatrist, Liverpool Drug Dependency Clinic) for her advice and especially to Sister Helen Davies (community liaison education nurse specialist) without whose help and support this study could not have taken place. We are also grateful to Dr A. Milosevic for his advice on tooth wear. This project was a part of a final year elective programme.

References

Duxbury, A. (1993) Ecstasy—dental implications, *British Dental Journal*, 175, 38.

Every, R. G. & Kuhne, K. A. (1971) Bimodal wear of mammalian teeth, in: Kermack, D. M. & Kermack, K. A. (Eds) *Early Mammals*, pp. 23–27 (London, Academic Press).

Greer, G. & Tolbert, R. (1986) Subjective reports of the effects of 3, 4-methylenedioxymethamphetamine in a clinical setting, *Journal of Psychoactive Drugs*, 18, 319–327.

Mair, L. H., Stolarski, T. A., Vowles, R. W. & Lloyd, C. H. (1996) Wear: mechanisms, manifestations and measurement, *Journal of Dentistry*, 24, 141–148.

Milosevic, A. & Slade, P. D. (1989) The orodental status of anorexics and bulimics, *British Dental Journal*, 167, 66–70.

Smith, B. G. N. & Knight, J. K. (1984) A comparison of patterns of tooth wear, *British Dental Journal*, 157, 16–19.

Solowij, N., Hall, W. & Lee, N. (1992) Recreational MDMA use in Sydney: a profile of 'Ecstasy' users and their experience with the drug. *British Journal of Addiction*, 87, 1161–1172.