Available online at www.sciencedirect.com
SCIENCE DIRECT®
Pergamon
ADDICTIVE BEHAVIORS
Addictive Behaviors 29 (2004) 965–971

Short communication

Gender differences in self-reported anxiety, depression, and somatization among ecstasy/MDMA polydrug users, alcohol/tobacco users, and nondrug users

Raffaella M. Milani*, Andy C. Parrott, John J.D. Turner, Helen C. Fox

School of Psychology, University of East London, Romford Road, London E15 4LZ, UK

Abstract

Previous research has found gender differences in both psychological and physiological responses to drugs. The present investigation explores gender variability in patterns of drug use in relation to self-reported depression, anxiety, and somatization. The current study confirms that heavy illegal drug users are represented by a preponderance of males than females. However, within each drug group category, females generally reported higher psychopathology scores than males. This was significant for all three subscales in the alcohol/tobacco group, for depression scores in the alcohol/tobacco, cannabis/alcohol, and light Ecstasy users group, and for depression scores for the alcohol group. Interestingly, in the male sample, drug users reported higher symptom ratings than nondrug users, whereas women's scores remained constant across drug groups.
© 2004 Elsevier Ltd. All rights reserved.

Keywords: Gender; Ecstasy; MDMA; Depression; Anxiety; Somatization; Drug use

1. Introduction

Psychoactive substance use research has shown gender differences in both psychopathology and patterns of drug use (Moon, Hecht, Jackson, & Spellers, 1999; Swan, 2001). Brady, Grice, Dustan, and Randall (1993) has also indicated that gender might determine whether a psychiatric disorder precedes and contributes to the developing of drug abuse, rather than

* Corresponding author. Tel.: +44-20-8223-4556; fax: +44-20-8223-4937.
E-mail address: R.M.Milani@uel.ac.uk (R.M. Milani).

0306-4603/$ – see front matter © 2004 Elsevier Ltd. All rights reserved.
doi:10.1016/j.addbeh.2004.02.044

being a consequence. Topp, Hando, Dillon, Roche, and Solowij (1999) reported that female Ecstasy users were more likely to report physical, psychological, work, and study problems compared with males; however, they did not include nondrug or polydrug user controls. No research has investigated gender variability in relation to depression and anxiety within Ecstasy polydrug users. The aim of this investigation was to explore potential gender differences in the association between anxiety, depression, somatization and drug use, with particular emphasis on Ecstasy polydrug use.

2. Method

The sample consisted of 768 young people recruited in London, Manchester, Padua (Italy) and Rome (see Parrott, Milani, Parmar, & Turner, 2001, for recruitment procedures). Participants were categorised post hoc into six drug-use groups: nondrug users, alcohol and/or tobacco users, cannabis and/or alcohol and/or tobacco users, polydrug but not Ecstasy users, light Ecstasy polydrug users (<20 occasions), heavy Ecstasy polydrug users (>21). Table 1 shows demographic characteristics and drug use data. Structured questionnaires assessed quantity, pattern, and regimen of drug use, including Ecstasy. Derogatis, Lipman, and Covi's (1973) *SCL-90* scale was administered with the inclusion of some positive items (Parrott et al., 2001).

A priori independent group *t* tests (female vs. male) were performed for only three subscales of the SCL-90: Somatization, Depression, and Anxiety. Independent *t* tests (females vs. males) were also used for drug use and age. A series of binomial tests were performed to compare gender frequencies across groups. One-way analysis of variance (with drug group as the independent variable) was performed for females and males separately.

3. Results

See Table 1 for gender distribution across drug groups and gender difference in drug use. In relation to the SCL-90 subscales, gender differences were found to be significant for the alcohol/tobacco, cannabis/alcohol/tobacco, and light Ecstasy users groups. Specifically, in the alcohol/tobacco group females scored significantly higher than males on Somatization ($t = -2.70$, $P < .01$), Depression ($t = -2.35$, $P = .05$), and Anxiety ($t = -3.28$, $P < .001$). For the cannabis/alcohol/tobacco and the light Ecstasy polydrug user group, a significant gender difference was found for Depression only ($t = -2.15$, $P < .05$, and $t = -2.08$, $P < .05$, respectively), with females scoring higher than males.

In the male sample, there was a main effect of drug group for Somatization [$F(5,430) = 3.21$, $P < .001$] and Anxiety [$F(5,432) = 2.58$, $P < .05$]. Post hoc analysis indicated that Ecstasy polydrug users and non-Ecstasy polydrug users reported higher pathology scores than nondrug users ($P < .05$). The overall ANOVA for Depression only approached significance [$F(5,426) = 2.12$, $P = .06$]. In the female sample, there were no significant drug group effects (see Fig. 1).

Table 1
Group demographic and drug use data (means ± S.D.)

	Heavy Ecstasy users (>20 times)		Light Ecstasy users (1–20 times)		Polydrug users, no Ecstasy		Cannabis/alcohol/ tobacco		Alcohol/tobacco		Nondrug users	
	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men
n[a]	**21**	**94*****	**45**	**68***	**28**	**72*****	39	57	84	100	**89**	**60***
Age	23.6 ± 4.9	23.5 ± 4.1	23.1 ± 4.9	22.5 ± 4.4	21.8 ± 4.2	23.1 ± 6.3	22.3 ± 4.4	21.3 ± 4.4	21.5 ± 5.8	21.6 ± 5.2	18.5 ± 4.6	18.5 ± 4.9
Alcohol (weekly)	20.2 ± 19.7	31.6 ± 46.1	24.9 ± 37.3	22.5 ± 27.1	20.0 ± 27.4	21.5 ± 29.5	**12.1 ± 19.7**	**23.8 ± 27.5***	**7.1 ± 8.7**	**14.2 ± 17.5*****	0.3 ± 0.9	0.7 ± 4.0
Tobacco (weekly)	77.2 ± 108.1	65.6 ± 72.9	62.4 ± 67.8	70.0 ± 60.4	75.0 ± 65.5	85.1 ± 71.0	58.8 ± 84.9	70.3 ± 57.4	24.0 ± 44.1	28.8 ± 57.1	0.1 ± 0.4	0.2 ± 1.3
Cannabis[b]	2.9 ± 0.3	2.9 ± 0.3	2.8 ± 0.4	2.8 ± 0.4	2.6 ± 0.5	2.8 ± 0.4	2.5 ± 0.5	2.7 ± 0.5				
Amphetamine	**59.9 ± 89.4**	**138.4 ± 253.3***	14.0 ± 35.7	19.8 ± 67.6	17.1 ± 34.8	8.9 ± 36.5						
Cocaine	63.5 ± 75.2	80.8 ± 172.6	10.7 ± 19.8	32.4 ± 129.0	**5.4 ± 11.8**	**28.2 ± 91.6***						
LSD	33.3 ± 70.5	81.6 ± 257.5	4.9 ± 8.5	7.0 ± 17.7	2.0 ± 5.9	9.9 ± 59.6						
Psychotherapeutic drugs	0.4 ± 1.2	53.5 ± 286.1	23.0 ± 148.9	109.4 ± 568.9	**2.3 ± 9.5**	**66.7 ± 270.7***						
Opiates	**0.2 ± 0.4**	**134.8 ± 628.9***	119.2 ± 745.5	94.7 ± 514.8	53.7 ± 283.4	349.1 ± 1160.6						
Magic mushrooms	6.4 ± 22.2	12.9 ± 56.0	3.1 ± 15.0	1.8 ± 3.7	0.7 ± 2.1	3.1 ± 8.5						
Poppers	**4.4 ± 11.5**	**20.4 ± 48.9****	**1.1 ± 2.9**	**8.9 ± 22.7****	19.9 ± 95.4	5.7 ± 15.3						
Ketamine	**0.4 ± 1.1**	**2.1 ± 6.4***	0.02 ± 0.1	0.04 ± 0.3	0.0	0.1 ± 0.7						
Ecstasy	168.8 ± 222.7	232.0 ± 350.1	7.2 ± 5.6	7.3 ± 7.5								
Maximum[b]	**3.5 ± 1.7**	**5.3 ± 3.5*****	2.1 ± 1.7	2.1 ± 2.0								
Usual amount[c]	**1.7 ± 0.8**	**2.5 ± 1.7*****	1.2 ± 0.8	1.4 ± 1.0								
Last time of E. use	6.7 ± 11.6	10.5 ± 17.3	26.5 ± 29.0	18.9 ± 26.3								

[d]Usual amount of tablets taken in one occasion.

Bold font indicates significant mean difference calculated by independent t test (women vs. men).

[a] Binomial test.

[b] The means regarding cannabis use refer to the following classification: 1 = nonuser, 2 = moderate user, 3 = heavy user.

[c] Maximum amount of tablets taken in one occasion.

*$P < .05$.

**$P < .01$.

***$P < .000$.

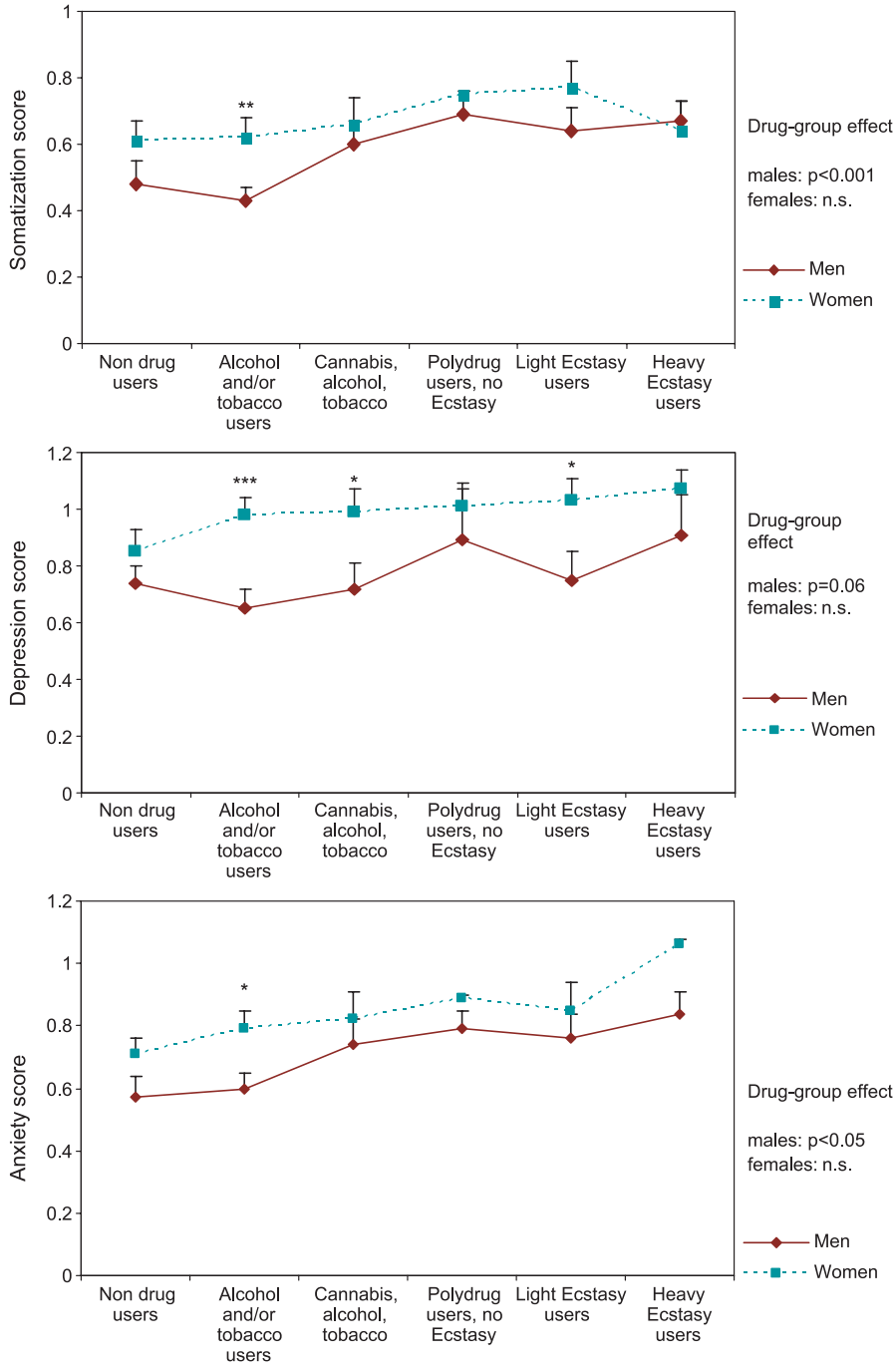

Fig. 1. SCL-90 scores for somatization, anxiety, and depression in six drug use groups.

4. Discussion

Present findings are consistent with other epidemiological data showing that more males than females take illegal drugs (Swan, 1997). However, the extent of illicit drug use was higher for males only in the heavy Ecstasy polydrug user group, and even then only in relation to certain drugs. Furthermore, there were no gender differences in lifetime consumption of Ecstasy, although males showed a greater tendency to binge compared with females (see Table 1). This gender variation in bingeing may be related to differences in sensation-seeking and risk-taking behaviour (Schifano, Di Furia, Forza, Minicuci, & Bricolo, 1998).

In the alcohol/tobacco group, females reported significantly higher scores than males in relation to depression, somatization, and anxiety. These findings are consistent with previous gender difference research in the general population (Piccinelli & Wilkinson, 2000; Silverstein, 2002). From a biological perspective, females are more vulnerable to depression and anxiety disorders, and that seems to be highly related to hormone levels (Kendler, Thornton, & Prescott, 2001; Lynch, Roth, & Carroll, 2002). However, this does not explain why the variability decreased in the illegal drug user groups. In the heavy drug groups, male's scores on depression and somatization increased compared to those of females, which remained relatively constant (see Fig. 1). These results are in line with Brady et al. (1993), where although in the general population females were more than twice as likely as males to suffer from depression, this difference disappeared among cocaine and alcohol abusers. The study reported that males, compared with females, were more likely to develop depression *after* the onset of drug use. Conversely, females were more likely to suffer from affective disorders *before* drug use. This indicates that psychiatric factors may precede and/or contribute to drug abuse in females, whereas psychiatric disorders may be more consequential to drug use in males. This hypothesis may imply that males are more sensitive to the adverse effects of certain drugs than females. Consistent with this hypothesis, previous research has indicated that insensitivity of females to cocaine may be linked to levels of luteinizing hormone (Kaufman, Levin, Maas, Kukes, & Villafuerte, 2001; King, Herning, Gorelick, & Cadet, 2000). In relation to Ecstasy, however, Liechti, Gamma, and Vollenweider (2001) showed that both acute adverse effects and perceptual alterations following MDMA consumption were more frequent in females than males. Furthermore, McCann, Ridenour, Shaham, and Ricaurte (1994) and Reneman, Booij, de Bruin, Reitsma, and de Wolf (2001) also found a significantly reduced concentration of 5-HT receptors and protein transporters, respectively, in female compared with male Ecstasy users.

From a sociocultural perspective, the empirical evidence suggests that females are much more likely to express their depression and physical symptoms than males (Kroenke & Spitcher, 1998; Moller-Leimkuhler, 2000). However, "help-seeking behaviour" theories do not explain why gender differences in self-reported problems in the current study were higher in alcohol/tobacco and cannabis/alcohol/tobacco users than in heavier illegal drug users. One possible hypothesis is that drug use heightened introspection in males (Grinspoon & Bakalar, 1986).

The current research design does not allow us to infer any causality and future research may benefit from longitudinal rather then cross-sectional designs. In addition, no biological markers were taken, and as such, caution must be taken when reporting drug use prevalence. Furthermore, there was no formal clinical assessment of the participants, and the drug users groups had taken a wider and complex range of drugs in comparison to the majority of prior research. Despite these methodological limitations, the current study highlights the possibility of gender differences in the aetiology of drug-related pathlogy, this may be important for prevention and treatment strategy.

References

Brady, K. T., Grice, D. E., Dustan, L., & Randall, C. (1993). Gender differences in substance use disorders. *American Journal of Psychiatry*, *150*, 1070–1711.

Derogatis, L. R., Lipman, R. S., & Covi, L. (1973). An outpatient psychiatric rating scale—Preliminary report. *Psychopharmacology Bulletin*, *9*, 13–28.

Grinspoon, L., & Bakalar, J. B. (1986). Can drugs be used to enhance the psychotherapeutic process? *American Journal of Psychotherapy*, *40*(3), 393–404.

Kaufman, M. J., Levin, J. M., Maas, L. C., Kukes, T. J., Villafuerte, R. A., Dostal, K., Lukas, S. E., Mendelson, J. H., Cohen, B. M., & Renshaw, P. F. (2001). Cocaine-induced cerebral vasoconstriction differs as a function of sex and menstrual cycle phase. *Biological Psychiatry*, *49*(9), 774–781.

Kendler, K. S., Thornton, L. M., & Prescott, C. A. (2001). Gender differences in the rates of exposure to stressful life events and sensitivity to their depressogenic effects. *American Journal of Psychiatry*, *158*(4), 587–593.

King, D. E., Herning, R. I., Gorelick, D. A., & Cadet, J. L. (2000). Gender differences in the EEG of abstinent cocaine abusers. *Neuropsychobiology*, *42*(2), 93–98.

Kroenke, K., & Spitzer, R. L. (1998). Gender differences in the reporting of physical and somatoform symptoms. *Psychosomatic Medicine*, *6*(2), 150–155.

Liechti, M. E., Gamma, A., & Vollenweider, F. X. (2001). Gender differences in the subjective effects of MDMA. *Psychopharmacology (Berlin)*, *154*(2), 161–168.

Lynch, W. J., Roth, M. E., & Carroll, M. E. (2002). Biological basis of sex differences in drug abuse: Preclinical and clinical studies. *Psychopharmacology*, *164*(121), 121–137.

McCann, U. D., Ridenour, A., Shaham, Y., & Ricaurte, G. A. (1994). Serotonin neurotoxicity after (+/−)3,4-methylenedioxymethamphetamine(MDMA; "Ecstasy"): A controlled study in Humans. *Neuropsychopharmacology*, *10*(2), 129–138.

Moller-Leimkuhler, A. M. (2000). Men and depression: Gender-related help-seeking behaviour. *Fortschritte der Neurologie–Psychiatrie*, *68*(11), 489–495.

Moon, D. G., Hecht, M. L., Jackson, K. M., & Spellers, R. E. (1999). Ethnic and gender differences and similarities in adolescent drug use and refusals of drug offers. *Substance Use and Misuse*, *34*(8), 1059–1083.

Parrott, A. C., Milani, R. M., Parmar, R., & Turner, J. J. D. (2001). Recreational Ecstasy/MDMA and other drug users from the UK and Italy: Psychiatric symptoms and psychobiological problems. *Psychopharmacology*, *159*(1), 77–82.

Piccinelli, M., & Wilkinson, G. (2000). Gender differences in depression. Critical review. *British Journal of Psychiatry*, *177*, 486–492.

Reneman, L., Booij, J., de Bruin, K., Reitsma, J. B., de Wolff, F. A., Gunning, W. B., den Heeten, G. J., & van den Brink, W. (2001). Effects of dose, sex and long-term abstention from use on toxic effects of MDMA (Ecstasy) on brain serotonin neurons. *Lancet*, *358*(9296), 1864–1869.

Schifano, F., Di Furia, L., Forza, G., Minicuci, N., & Bricolo, R. (1998). MDMA ('Ecstasy') consumption in the context of polydrug abuse: A report on 150 patients. *Drug and Alcohol Dependence*, *52*(1), 85–90.

Silverstein, B. (2002). Gender differences in the prevalence of somatic versus pure depression. *American Journal of Psychiatry*, *150*(6), 1051–1052.

Swan, N. (1997). Gender affects relationships between drug abuse and psychiatric disorders [Article 4]. *NIDA Notes 12.* Available at: http://www.drugabuse.gov/NIDA_Notes/NNVol12N4/gender.html. Accessed: September 20, 2002.

Topp, L., Hando, J., Dillon, P., Roche, A., & Solowij, N. (1999). Ecstasy use in Australia: Patterns of use and associated harm. *Drug and Alcohol Dependence*, *55*(1–2), 105–115.