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A behavioural economic analysis of alcohol, amphetamine, cocaine and ecstasy purchases by polysubstance misusers

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Abstract

Behavioural economic models of substance choice describe the relationship between changes in unit price and consumption. As the majority of UK non-dependent substance misusers are polysubstance misusers, we investigated the influence of price upon hypothetical purchases of alcohol, amphetamine, cocaine and ecstasy. Forty-three current polysubstance misusers (25 males, 18 females; mean age 21.3 ± 2.8) were recruited into the study. As the price of alcohol rose, demand was inelastic. Amphetamine was a substitute for alcohol, cocaine was a compliment drug and ecstasy was independent. Demand for amphetamine was elastic as its price rose, but only alcohol was identified as a substitute drug and other drug purchases were independent of amphetamine price. As the price of cocaine increased, demand was elastic. Alcohol and ecstasy were substitute drugs but amphetamine purchase was independent, indicating asymmetrical substitution of alcohol and cocaine. Finally, demand for ecstasy was also elastic, but only cocaine substituted as ecstasy price rose. These results extend previous findings in substance dependent populations using behavioural economic models and support the opinion that purchasing substances is a complex process, involving both socio-economic and psychopharmacological factors. Whilst subjects expressed a preference for ecstasy, these behavioural findings indicated that alcohol was their drug of choice when economic considerations were brought into play. Self-reported drug preference, although facilitating between subjects experimental design, may therefore not accurately represent real world polysubstance misuse.

Keywords: Polysubstance misuse; Alcohol; Amphetamine; Cocaine; Ecstasy; Behavioural economics

1. Introduction

In the UK, the social normalisation of controlled drug use has lead to a 'pick and mix' attitude in young users, whereby different drugs are selected for particular purposes and effects (Measham et al., 2001). For example, the most common substances used at dance music events are alcohol, amphetamine and ecstasy, closely followed by cocaine and LSD (Bean et al., 1997;Forsyth, 1996;Riley et al., 2001). Studies reporting the extent and variety of substance misuse show a clear tendency towards concomitant polysubstance misuse (e.g. Gervin et al., 2001;Golub et al., 2001;Morgan et al., 2002;Parry et al., 2002;Siliquini et al., 2001;Staines et al., 2001;Sumnall et al., 2004). For drug information and prevention strategies to be successful it is important that the prevalence of polysubstance misuse and the complex reasons for drug choice are investigated (Boys and Marsden, 2003).

Behavioural economics applies consumer demand theory to the study of human behaviour and several concepts derived from behavioural economics may describe the relationship between consumption and the price of controlled drugs (Petry, 2001). *Own-price elasticity* quantifies the relationship between price and consumption of a particular product with changes in price making demand either elastic or inelastic. Elastic demand occurs when changes in prices markedly alter consumption and inelastic demand occurs when changes in price hardly alter consumption. *Cross-price elasticity* quantifies how the price of one commodity affects the consumption of another. Substitution occurs, when an increase in the price of one commodity and subsequent reduction in consumption is followed by an increase in consumption of another (related) commodity. One commodity

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may complement another, so that when the price of that commodity increases the consumption of the complement decreases, even though its price has not changed. Independent commodities have no relationship with each other's consumption (Petry, 2000, 2001;Petry and Bickel, 1998).

Previous research with substance dependent populations have demonstrated that changing the price of controlled drugs will alter their drug purchases. Heroin abusers bought cocaine as a complement to heroin when heroin was relatively cheap and cocaine became a substitute as the price of heroin rose. Similarly, diazepam substituted for heroin but heroin purchases were independent of diazepam prices (Petry and Bickel, 1998). In alcohol abusers, cocaine was a complement to alcohol but alcohol was a substitute for cocaine, indicating an asymmetrical relationship between the two (Petry, 2001). In both studies, these choices were both reliable and supported by urinalysis.

These economic relationships may be useful in describing the decision making processes of polysubstance misusers. For example, as there is a strong association between substance use parameters in non-dependent subjects (Sumnall et al., 2004), if the price of cocaine decreases its consumption may increase with a concomitant decrease in ecstasy (i.e. substitution) and an increase in alcohol use (i.e. alcohol as a complement to cocaine use). This may provide a more meaningful behavioural measure of drug preference and intention to use rather than relying upon self-report measures alone.

2. Method

2.1. Participants

Forty-three polysubstance misusers were recruited by using the 'snowball technique', a recruitment procedure widely used in studies of this nature. In this procedure, participants recruit their peer group into the study, affording the possibility of testing participants, who engage in a similar lifestyle. Pilot studies indicated that non-illicit drug users would not purchase controlled drugs other than alcohol so they were excluded from the study.

2.2. Scales

A questionnaire was constructed to ascertain the extent of controlled drug use with questions about the frequency and amount of those drugs used by the participants. Questions relating to the previous month were used as indicators of current controlled drug use (and thus, drugs they were likely to purchase). Whether particular controlled drugs had been used once in their lifetime was included to give a measure of the range of drugs sampled by this population. Naloxone was included in order to control for false reporting. Further questions, ascertained the price of subject usually paid for drugs and the amount of money usually spent on a night out when they would use controlled drugs.

The Symptom Checklist 90 revised (SCL-90-R; Derogatis, 1994) was used as a screening tool for current psychopathological symptomatology. It consists of nine subscales measuring; depression, anxiety, somatic symptoms, obsessive-compulsive behaviour, interpersonal sensitivity, hostility, phobic anxiety, psychoticism, paranoid ideation and additional items, such as difficulty in sleeping and loss of appetite. Each question is rated on a 4-point scale and the response indicated depended on to what extent the participant has experienced the feeling or complaint in the past week. Raw scores on the SCL-90-R were converted into a *t*-score and compared to the adult non-patient norms (Derogatis, 1994). Participants who scored in the clinical range on any of the subscales would have been removed from the study but none were detected (data not shown).

2.3. Behavioural economics measures

The general methodology followed procedures described by Petry (2000). In a single experimental session (which lasted about 45 min), the participants were asked to make hypothetical purchases of alcohol and fake controlled drugs based on a presented price list with imitation money provided by the researcher (£40). The fake controlled drugs were: amphetamine sulphate powder (0.25 g of strawberry Nesquik in a plastic bag), cocaine hydrochloride powder (0.25 g of glucose powder in a plastic bag) and ecstasy tablets (Trebor Mighty Mints). These substitutions were chosen on the basis of recommendations by a forensic science expert (Ramsey, personal communication). Additionally, 330 ml bottles of beer were used for simulations of alcohol purchases. Cannabis was excluded from this study because of the difficulty in deciding which type of preparation to use for the fake drug. Despite cannabis being considered a single drug there are multiple different preparations with differing strengths and prices which would have overly complicated this study. It would also be unlikely, in contrast to the other drugs, that a typical purchase of cannabis (e.g. 1/8th oz) would be consumed by an individual on a single night out. Further studies will be needed to determine the effect, including cannabis preparations, in the choice of drugs to be purchased.

The participants were instructed that the study was a series of questions designed to assess drug choice across changes in price and that the information was entirely for research purposes. It was explicitly stated that the controlled drugs were not real (in order to avoid prosecution under the Misuse of Drugs Act (1971)). Subjects were then read the following passage: "First, think back to a typical night when you were going out. Now we are going to use a price list and some Monopoly money to play a sort of game. Please answer the questions honestly and thoughtfully. Assume that you have access to £40 which you can use to buy drugs for your night out (the participant was handed the appropriate amount of imitation money). The drugs that are available to you are listed on this sheet (the participant was handed a

price list). You may buy any drugs that you like with this money. So, assume that this is a study that has been approved by the police and all other organisations. Also, assume that the only money that you can spend on drugs for the entire night is the allotted £40. You have no other drugs available to you. You cannot purchase any more drugs or any other drugs than those on the price list. The drugs which you purchase are solely for your own use and cannot be given away or sold on. With this £40, please purchase the drugs which you would like from the selection in front of you (the different types and amounts of fake drug were presented to the participant)". This paragraph was then repeated for each of the price conditions (see below).

The prices of the drugs (based on the street prices when the study was designed) were altered to assess both own-price and cross-price elasticity. The price of alcohol was presented as £1, £2 and £5 per drink with the price of amphetamine (£10), cocaine (£10) and ecstasy (£10) held constant. The price of amphetamine was presented as: £5, £10 and £15 per 0.25 g bag with the price of alcohol (£2), cocaine (£10) and ecstasy (£10) held constant. The price of cocaine was presented as: £5, £10 and £15 per 0.25 g bag with the price of alcohol (£2), amphetamine (£10) and ecstasy (£10) held constant. The price of ecstasy was presented as: £5, £10 and £15 per tablet with the price of alcohol (£2), amphetamine (£10) and cocaine (£10) held constant. These prices were presented as lists on cards (e.g. alcohol—£2 per drink, amphetamine—£10 per 0.25 g, cocaine—£10 per 0.25 g and ecstasy—£10 per tablet). These cards were presented in a random order so that there was no effect of presentation order on the choices made.

2.4. Statistical analyses

The behavioural economics data were analysed according to the method of Petry and colleagues (Petry, 2000;Petry and Bickel, 1998). Price and consumption (mean units purchased) data were plotted on log–log co-ordinates. Linear regression was used to calculate the slope of best fit for drugs across changes in test drug price. The slope of the test drug plot determined own-price elasticity (E_{own}), whilst slopes for those drugs kept at constant price within the condition indicated cross-price elasticity (E_{cross}). E_{own} values <-1 indicated that demand for the drug was elastic (i.e. drug purchases decreased at rates proportionally greater than price increases). E_{own} values between -1 and 0 indicated that demand was inelastic (i.e. drug purchases decreased at rates proportionally less than price increases). Those drugs producing statistically significant E_{cross} values of ≥ 0.2, ≤ 0.2 and (independent of significance) between ≥ 0.2 and ≤ 0.2, were defined as substitute, complement and independent drugs, respectively. As data were normally distributed significant changes in grouped mean drug purchases across test drug price conditions were analysed by repeated measures ANOVA with planned contrasts. All analyses were performed using SPSS (v12.0).

3. Results

3.1. Demographics and drug use

The study group was a mean 21.3 ± 2.8 years old (range 19–36) and comprised 25 males and 18 females. Subjects spent a mean of £32.8 ± 9.8 on substances on an 'average' night out, which corresponded well to the total amount of money provided in the simulation. Drug use characteristics are presented in Table 1. The study population was experienced in a wide variety of substances for a period of 12.8 ± 23.7 (LSD) to 93.1 ± 38.2 (alcohol) months. All subjects reported lifetime use of alcohol, amyl nitrate 'poppers' and ecstasy. Examining current drug consumption, cigarettes, cannabis and ecstasy were the most frequently used substances, with a mean of 16.5 ± 10.6 units, 9.2 ± 10.0 units

Table 1
Drug use characteristics

	% Reporting ≥1 use in lifetime	Self-reported episodes in previous month (range)	Self-reported lifetime units (range)	Months of use (range)	Units used in typical episode in previous year[a] (wraps, tablets, joints, etc.)
Alcohol	100	18.6 ± 6.6 (5–31)	–	93.1 ± 38.2 (0–264)	15.4 ± 6.5 (5–30)
Amphetamine	87.5	0.4 ± 0.8 (0–4)	21.0 ± 39.5 (0–200)	29.8 ± 39.3 (0–216)	1.2 ± 0.4 (1–2)
Cannabis	97.5	20.3 ± 10.6 (0–31)	–	69.5 ± 36.7 (12–228)	9.2 ± 10.0 (1–50)
Cigarettes	97.5	21.2 ± 12.8 (0–31)	–	67.2 ± 47.6 (0–240)	16.5 ± 10.6 (1–40)
Cocaine	95	2.2 ± 2.9 (0–14)	31.8 ± 65.5 (0–300)	30.5 ± 20.0 (0–84)	1.1 ± 0.2 (1–2)
Ecstasy	100	3.8 ± 2.4 (0–10)	292 ± 239 (0–950)	42.1 ± 28.5 (0–168)	3.7 ± 1.7 (1–10)
LSD	37.5	0.2 ± 0.4 (0–2)	6.0 ± 12.9 (0–60)	12.8 ± 23.7 (0–80)	1.6 ± 0.5 (1–2)
Mushrooms	60	0.3 ± 0.6 (0–3)	137.4 ± 235.6 (0–980)	17.4 ± 22.8 (0–72)	41.7 ± 27.2 (15–80)
Poppers	100	2.7 ± 4.0 (0–20)	244.9 ± 396.8 (0–2000)	36.2 ± 43.1 (0–240)	11.8 ± 11.9 (2–60)

All values are mean and standard deviations unless specified. Drug use variables too infrequently reported for meaningful analysis omitted. Unsurprisingly, subjects had great difficulty reporting lifetime exposures to alcohol, cannabis and cigarettes. In addition to the target drugs subjects also reported use of GHB, glue, herbal highs, ketamine, LSD, mushrooms. No subjects reported use of the false drug naloxone.

[a] In those individuals reporting use, cannabis and cigarettes are daily use.

Table 2
Price usually paid per unit of drug

	Mean ± S.D.	Range (£)
Alcohol (drink)	2.1 ± 0.4	1.50 ± 3.50
Amphetamine (0.25 g wrap)	3.4 ± 1.9	1.00 ± 10.00
Cannabis (1/8th oz)	14.2 ± 5.3	2.50 ± 20.00
Cocaine (0.25 g wrap)	10.9 ± 2.4	7.00 ± 20.00
Ecstasy (1 tablet)	3.4 ± 0.8	2.00 ± 5.00

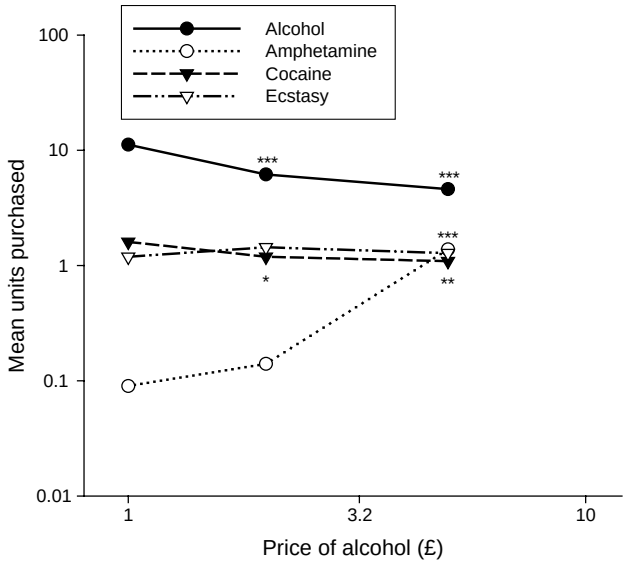

Fig. 1. Mean units of alcohol, cocaine, ecstasy and amphetamine purchased as the price of an alcoholic drink increased from £1 to £5. Data are plotted on log–log co-ordinates and the plot slopes equal E_{own} and E_{cross} detailed in Table 3. ⋆ $P < 0.05$; ⋆⋆ $P < 0.01$; ⋆⋆⋆ $P < 0.001$, number of purchases differs significantly from the £1 alcohol condition.

and 3.7 ± 1.7 units per episode, respectively. Prices usually paid for drugs are detailed in Table 2. Whilst the price of alcohol and cocaine equated to the constant drug prices in the experiment, ecstasy and amphetamine were much cheaper.

3.2. Elasticities of demand (see Table 3)

3.2.1. Alcohol (Fig. 1)

Alcohol purchases decreased, significantly as its own-price rose ($F_{2,42} = 18.263$, $P < 0.001$) with £2 ($P < 0.001$) and £5 ($P < 0.001$) price conditions resulting in significantly fewer purchases than the £1 condition. However, $E_{own} = -0.54$, indicating that demand was inelastic (i.e. drug purchases decreased at rates proportionally less than price increases). Changes in the price of alcohol significantly influenced purchases of amphetamine ($E_{cross} = 1.74$; $F_{2,42} = 18.147$, $P < 0.001$; purchases increased at £5 compared to £1 ($P < 0.001$)) and cocaine ($E_{cross} = -0.23$; $F_{2,42} = 4.354$, $P < 0.05$; purchases decreased at £2 ($P < 0.05$) and £5 ($P < 0.01$)). Purchases of ecstasy were independent of alcohol ($E_{cross} = 0.04$; $F_{2,42} = 1.656$, $P = 0.197$). These results indicated that amphetamine was a substitute for alcohol, whilst cocaine was a complement (see Table 3).

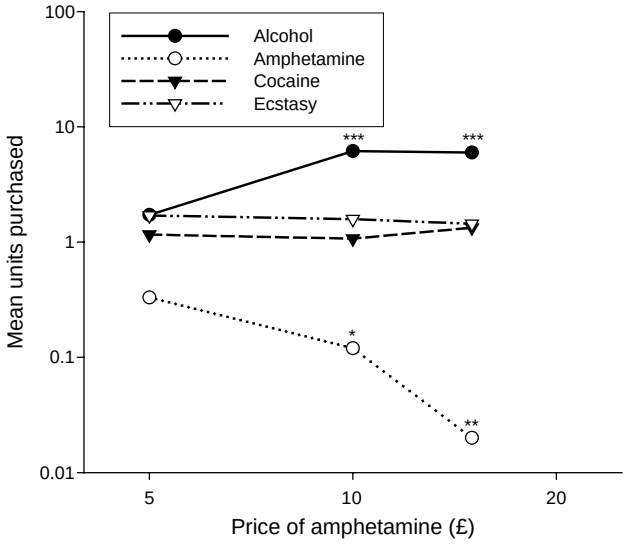

Fig. 2. Mean units of alcohol, cocaine, ecstasy and amphetamine purchased as the price of a wrap of amphetamine increased from £5 to £15. Data are plotted on log–log co-ordinates and the plot slopes equal E_{own} and E_{cross} detailed in Table 3. ⋆ $P < 0.05$; ⋆⋆ $P < 0.01$; ⋆⋆⋆ $P < 0.001$, number of purchases differs significantly from the £5 amphetamine condition.

3.2.2. Amphetamine (Fig. 2)

Increasing the price of amphetamine significantly reduced the number of purchases ($F_{2,42} = 6.214$, $P < 0.01$, £10 versus £5 ($P < 0.05$), £15 versus £5 ($P < 0.01$)), although amphetamine purchases were low across all test conditions. $E_{own} = -2.43$, indicating that demand was elastic (i.e. drug purchases decreased at rates proportionally greater than price increases). Changes in the price

Table 3
Elasticities of demand for alcohol, amphetamine, cocaine and ecstasy

	Own-price	Cross-price			
		Alcohol	Amphetamine	Cocaine	Ecstasy
Alcohol	−0.54⋆⋆⋆	–	1.74⋆⋆⋆	−0.23⋆	0.04
Amphetamine	−2.43⋆⋆	1.21⋆⋆⋆	–	0.10	−0.15
Cocaine	−2.44⋆⋆⋆	0.48⋆⋆⋆	2.47	–	0.86⋆⋆⋆
Ecstasy	−1.98⋆⋆⋆	0.16	−0.16	0.93⋆⋆⋆	–

⋆$P < 0.05$; ⋆⋆ $P < 0.01$; ⋆⋆⋆ $P < 0.001$.

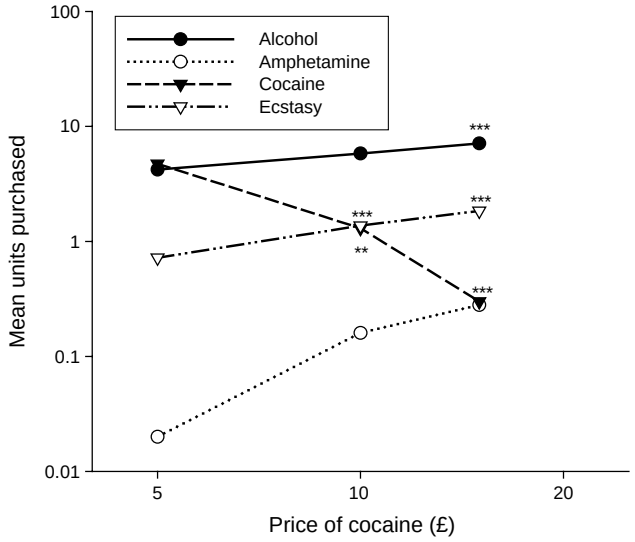

Fig. 3. Mean units of alcohol, cocaine, ecstasy and amphetamine purchased as the price of a wrap of cocaine increased from £5 to £15. Data are plotted on log–log co-ordinates and the plot slopes equal E_{own} and E_{cross} detailed in Table 3. * $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$, number of purchases differs significantly from the £5 cocaine condition.

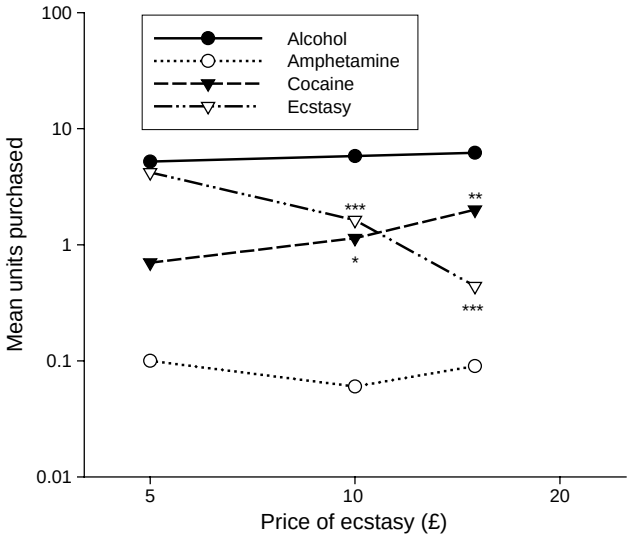

Fig. 4. Mean units of alcohol, cocaine, ecstasy and amphetamine purchased as the price of a tablet of ecstasy increased from £5 to £15. Data are plotted on log–log co-ordinates and the plot slopes equal E_{own} and E_{cross} detailed in Table 3. * $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$, number of purchases differs significantly from the £5 ecstasy condition.

of amphetamine significantly increased alcohol purchases ($E_{cross} = 1.21$; $F_{2,42} = 31.797$, $P < 0.001$; £10 and £15 versus £5 (both $P < 0.001$)), indicating that the drug was a substitute. Changes in amphetamine price had no effect upon cocaine ($E_{cross} = 0.10$; $F_{2,42} = 1.230$, $P = 0.297$) and ecstasy ($E_{cross} = -0.15$; $F_{2,42} = 1.171$, $P = 0.315$) purchases, indicating both substances were independent of amphetamine (see Table 3).

3.2.3. Cocaine (Fig. 3)

Increasing the price of cocaine significantly reduced the number of purchases ($F_{2,42} = 135.407$, $P < 0.001$, £10 and £15 versus £5 both ($P < 0.001$). $E_{own} = -2.44$ indicating that demand was elastic. Changes in the price of cocaine significantly affected purchases of alcohol ($E_{cross} = 0.48$; $F_{2,42} = 8.615$, $P < 0.001$, £10 versus £5 ($P < 0.05$), £15 versus £5 ($P < 0.001$) and ecstasy ($E_{cross} = 0.86$; $F_{2,42} = 15.565$, $P < 0.001$, £10 versus £5 ($P < 0.01$), £15 versus £5 ($P < 0.001$)), indicating that both drugs were substitutes for cocaine. In contrast amphetamine purchases were independent of cocaine price ($E_{cross} = 2.47$; $F_{2,42} = 2.703$, $P = 0.073$) (see Table 3).

3.2.4. Ecstasy (Fig. 4)

Increasing the price of ecstasy significantly reduced the number of purchases ($F_{2,42} = 111.350$, $P < 0.001$, £10 and £15 versus £5 (both $P < 0.001$)). $E_{own} = -1.98$, indicating that demand was elastic. Changes in the price of ecstasy only significantly affected purchases of cocaine ($E_{cross} = 0.93$; $P < 0.001$, £10 versus £5 ($P < 0.05$), £15 versus £5 ($P < 0.01$)), suggesting that cocaine was a substitute drug for ecstasy. Alcohol $E_{cross} = 0.16$ ($F_{2,42} = 1.140$, $P = 0.325$) and amphetamine $E_{cross} = -0.16$ ($F_{2,42} = 0.423$, $P = 0.657$), indicating that purchase of these two drugs was independent in changes in ecstasy price (see Table 3).

Finally, to evaluate test–retest reliability of drug choices, Pearson's correlations were performed between units of drugs purchased in repeated exposure to the same price condition (i.e. £2 alcohol, £10 ecstasy, £10 amphetamine, £10 cocaine). All analyses produced significant correlation coefficients between 0.4 and 0.5 ($P < 0.01$).

4. Discussion

To the best of our knowledge, this is the first study to have investigated alcohol, amphetamine, cocaine and ecstasy choice as a function of price in a non-clinical sample of polysubstance misusers. These data suggest that the purchase and use of controlled drugs by polysubstance misusers is to a large extent determined by their price (assuming that they are available with an acceptable level of purity). Purchases of all four drugs decreased with increases in price, however, only the demand for alcohol was inelastic with purchases decreasing at a rate proportionally smaller than the increase in price. The demand for amphetamine, cocaine and ecstasy was elastic, indicating that purchases decreased at rates proportionally greater than the increases in prices. As these purchases were simulated it is important to interpret these data cautiously, however, Johnson and Bickel (2002) found that both hypothetical and real rewards were equivalent in the delay discounting procedure. This indicates that these simulations are a suitable method of modelling real world phenomena. Assuming that drug use patterns follow the simulated

purchases in this experiment, one would predict that polysubstance misusers would alter their drug using behaviour based on the purchase price of the drugs available to them. This is commensurate with the view that polysubstance misusers use a range of controlled drugs for reasons other than a simple preference (e.g. Boys and Marsden, 2003).

The asymmetrical relationship between cocaine and alcohol was interesting with cocaine acting as a complement for alcohol but alcohol acting as a substitute for cocaine (Petry, 2000). The formation of the subjectively reinforcing cocaethylene may provide a rationale for this relationship (Perez-Reyes and Jeffcoat, 1992). In clinical studies, alcohol pre-treatment increases preference for cocaine (Higgins et al., 1996) and the mixing of cocaine and alcohol can prolong the duration of the cocaine experience (McCance et al., 1993), hence cocaine acts as a complement for alcohol. However, when cocaine is expensive there may not be sufficient cocaine supplies for this to be worthwhile and instead alcohol acts as a substitute. Alcohol also substituted for both amphetamine and ecstasy, which reflects its social ubiquity in this type of population (e.g. Hansen et al., 2001;Riley et al., 2001;Winstock et al., 2001). Cocaine and ecstasy substituted for each other, which may indicate a shared function as social facilitators and enhancers of positive mood (Boys et al., 2001), but there were no relationships between either and amphetamine. Epidemiological indicators suggest that amphetamine is currently falling out of favour with polysubstance misusers in the UK, probably due to the arrival of cheap, good quality cocaine onto the market (EMCDDA, 2003;IDMU, 2003). The overall low level of amphetamine purchases and independent relationship with the other controlled drugs support this hypothesis.

As can be seen in Table 1 a very large proportion of this sample was using both alcohol and cannabis on a (near) daily basis in the month prior to this study. This indicates that the majority of the subjects may have been experiencing either intoxication or the after effects of controlled drug use whilst taking part in this experiment. Given the self-reported drug use patterns of this population this is unavoidable and, therefore, all studies of this population must take this into consideration. The dilemma faced in this instance was that both intoxication and deprivation would probably influence the purchase of controlled drugs. It was decided that the subjects' normal psychological state was the appropriate one to test them in as this is when they would be making the cost/benefit decisions to purchase and subsequently use controlled drugs. It was felt that enforced abstinence for several days may have created a desire for controlled drugs which would have compromised the experiment. It is interesting to note that very few subjects actually responded to a direct question about being under the influence of drugs when their self-reported pattern of use clearly indicated that they should have been (data not shown). This is an important point for studies investigating this population, self-reported abstinence may be unreliable and, therefore, quantification is required. Further work is clearly warranted to investigate enforced abstinence on the decision to purchase and subsequently use controlled drugs.

This type of population (i.e. polysubstance misusers) is widely believed to have higher levels of psychopathology than their peers (e.g. Sumnall et al., 2004) and this may have influenced their decision to purchase and use certain controlled drugs over others in an attempt to self-medicate this psychopathology (e.g. Boys and Marsden, 2003;Khantzian, 1985). In line with other studies there was no evidence that this sample was experiencing greater than normal levels of psychopathology based on the use of the SCL-90-R as a screening tool (e.g. Simon and Mattick, 2002). This suggests that this sample was psychiatrically normal and, therefore, the decision to purchase controlled drugs was not influenced by psychopathology.

Whilst the majority of the users self-reported a preference for using ecstasy their actual behaviour was discrepant. That is, in the current model, alcohol was actually their controlled drug of choice as demand was inelastic and it would substitute for the other three if they were perceived to be poor value for money. Similarly, cocaine would substitute for ecstasy if the price of ecstasy rose and vice versa. This suggests that this group of polysubstance misusers valued intoxication per se over the specific effects of a single drug. It is uncertain how the price of ecstasy (which was higher than the subjects typically paid due to an unexpected street price drop in the UK) affected this relationship, but it is clear that despite their expressed preference for ecstasy, cocaine would be used. Overall, this suggests that classifying this type of population into groups based upon their self-reported preference for specific drugs may be misleading because the current price, availability and purity of those drugs may also be major determinants of this preference.

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References

Bean, P., Stratford, N., White, C., Goodman, M., Maylon, T., Charles, V., O'Hagan, C. Woolvert, G., 1997. Release Drugs and Dance Survey: An Insight into the Culture. Release Publications, London.

Boys, A., Marsden, J., 2003. Perceived functions predict intensity of use and problems in young polysubstance users. Addiction 98, 951–963.

Boys, A., Marsden, J., Strang, J., 2001. Understanding reasons for drug use among young people: a functional perspective. Health Educ. Res. 16, 457–469.

Derogatis, L.R., 1994. Symptom Checklist-90-R: Administration, Scoring and Procedures Manual. National Computer Systems, USA.

European Monitoring Centre for Drugs and Drug Addiction (EMCDDA), 2003. The State of the Drugs Problem in the European Union and Norway. Annual Report 2003. Office for Official Publications of the European Communities, Luxembourg.

Forsyth, A.J., 1996. Places and patterns of drug use in the Scottish dance scene. Addiction 91, 511–521.

Gervin, M., Hughes, R., Bamford, L., Smyth, L.B.P., Keenan, E., 2001. Heroin smoking by chasing the dragon in young opiate users in Ireland: stability and associations with use to come down off Ecstasy. J. Subst. Abuse Treat. 20, 297–300.

Golub, A., Johnson, B.D., Sifaneck, S.J., Chesluk, B., Parker, H., 2001. Is the U.S. experiencing an incipient epidemic of hallucinogen use? Subst. Use Misuse 36, 1699–1729.

Hansen, D., Maycock, B., Lower, T., 2001. Weddings, parties, anything. . . , a qualitative analysis of ecstasy use in Perth, Western Australia. Int. J. Drug Policy 12, 181–199.

Higgins, S.T., Roll, J.M., Bickel, W.K., 1996. Alcohol pretreatment increases preference for cocaine over monetary reinforcement. Psychopharmacology 123, 1–8.

Independent Drug Monitoring Unit (IDMU), 2003. Drug price trends 1984–2002. Online report, http://www.idmu.co.uk/pricetrends8402.htm. Accessed 05/12/2003.

Johnson, M.W., Bickel, W.K., 2002. Within-subject comparison of real and hypothetical money rewards in delay discounting. J. Exp. Anal. Behav. 77, 129–146.

Khantzian, E.J., 1985. The self-medication hypothesis of addictive disorders: focus on heroin and cocaine dependence. Am. J. Psychiatry 142, 1259–1264.

McCance, E.F., Price, L.H., Kosten, T.R., Jatlow, P.I., 1993. Concurrent cocaine-ethanol ingestion in humans: pharmacology, physiology, and behavioral effects in humans. Psychopharmacology 111, 39–46.

Measham, F., Parker, H., Aldridge, J., 2001. Dancing on Drugs: Risk, Health, Hedonism in the British Club Scene. Free Association Books, London.

Morgan, M.J., McFie, L., Fleetwood, H., Robinson, J.A., 2002. Ecstasy (MDMA): are the psychological problems associated with its use reversed by prolonged abstinence? Psychopharmacology 159, 294–303.

Parry, C.D., Bhana, A., Pluddemann, A., Myers, B., Siegfried, N., Morojele, N.K., Flisher, A.J., Kozel, N.J., 2002. The South African Community Epidemiology Network on Drug Use (SACENDU): description, findings (1997–99) and policy implications. Addiction 97, 969–976.

Perez-Reyes, M., Jeffcoat, A.R., 1992. Ethanol/cocaine interaction: cocaine and cocaethylene plasma concentration and their relationship to subjective and cardiovascular effects. Life Sci. 51, 553–563.

Petry, N.M., 2000. Effects of income on polysubstance abuse: a comparison of alcohol, cocaine, and heroin abusers. Addiction 95, 706–717.

Petry, N.M., 2001. A behavioral economic analysis of polysubstance abuse in alcoholics: asymmetrical substitution of alcohol and cocaine. Drug Alcohol Depend. 62, 31–39.

Petry, N.M., Bickel, W.K., 1998. Polysubstance abuse in heroin addicts: a behavioral economic analysis. Addiction 93, 321–335.

Riley, S.C., James, C., Gregory, D., Dingle, H., Cadger, M., 2001. Patterns of recreational drug use at dance events in Edinburgh, Scotland. Addiction 96, 1035–1047.

Siliquini, R., Faggiano, F., Geninatti, S., Versino, E., Mitola, B., Ippolito, R., 2001. Patterns of drug use among young men in Piedmont, Italy. Drug Alcohol Depend. 64, 329–335.

Simon, N.G., Mattick, R.P., 2002. The impact of regular ecstasy use on memory function. Addiction 97, 1523–1529.

Staines, G.L., Magura, S., Foote, J., Deluca, A., Kosanke, N., 2001. Polysubstance use among alcoholics. J. Addict. Dis. 20, 53–69.

Sumnall, H.R., Wagstaff, G.F., Cole, J.C., 2004. Self-reported psychopathology in polysubstance users. J. Psychopharmacol. 18, 63–69.

Winstock, A., Griffiths, P., Stewart, D., 2001. Drugs and the dance music scene: a survey of current drug use patterns among a sample of dance music enthusiasts in the UK. Drug Alcohol Depend. 64, 9–17.