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An evaluation of a brief motivational intervention among young ecstasy and cocaine users: no effect on substance and alcohol use outcomes

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ABSTRACT

Aims To investigate whether a stimulant- and alcohol-focused brief motivational intervention induces positive behaviour change among young, regular users of MDMA ('ecstasy'), cocaine powder and crack cocaine. **Design and measurements** A randomized trial of the intervention versus a control group who received written health risk information materials only. All participants completed a baseline self-assessment questionnaire before randomization. Outcome measures were self-reported period prevalence abstinence from ecstasy, cocaine powder and crack cocaine and the frequency and amount of stimulant and alcohol use in the previous 90 days, recorded at 6-month follow-up via self-completion questionnaire and personal interview. **Participants and setting** A total of 342 adolescent and young adult stimulant users (aged 16–22 years) were recruited and 87% were followed-up. The intervention was delivered by a team of 12 agency youth drug workers and two researchers at five locations in Greater London and south-east England. **Findings** There were no significant differences in abstinence for ecstasy, cocaine powder or crack cocaine use between the experimental and control groups. Contrasting follow-up with baseline self-reports, there were no between-group effects for changes in the frequency or amount of stimulant or alcohol use. Participant follow-up data suggested that the baseline assessment was a contributing factor in within-group behaviour change among experimental and control condition participants. **Conclusions** Our brief motivational intervention was no more effective at inducing behaviour change than the provision of information alone. We hypothesize that research recruitment, baseline self-assessment and contact with study personnel are influences that induce positive reactive effects on stimulant use.

Keywords Brief intervention, cocaine, controlled trial, crack, ecstasy, motivational interviewing.

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INTRODUCTION

There is long-standing international concern about the use of non-medical stimulant drugs by adolescents and young adults [1]. In the United Kingdom, it is estimated that 5.3% of 16–24-year-olds in England and Wales have used the ring-substituted amphetamine derivative MDMA (3,4-methylenedioxymethamphetamine, commonly known as 'ecstasy') in the past 12 months, and 4.9% and 0.4%, respectively, report using cocaine hydrochloride ('cocaine powder', herein) and 'crack' cocaine (the smokeable base form of the drug) [2]. In the United States, ecstasy, cocaine powder and crack cocaine are used by 3.1%, 6.6% and 0.8%, respectively, among those aged 18–25 years over the same recall period [3]. While international estimates of drug markets point to a recent reduction in the consumption of ecstasy, use of cocaine powder and crack cocaine remains stable after a decade of growth [1].

Users of non-medical stimulant drugs are at acute or chronic risk of cardiovascular dysrhythmias, pulmonary complications, myocarditis, temperature dysregulation (hyperthermia) and protracted drug withdrawal 'hangover' effects, which include anxiety, mood disturbance, restlessness and attention difficulty symptoms [4,5]. Early initiation to stimulant use increases the likelihood

that more harmful patterns of consumption will develop with concomitant risk of stimulant dependence, psychological health morbidity, cerebrovascular problems and neurocognitive deficits [6]. Many young people in the United Kingdom are also heavy users of alcohol and weekend 'binge' drinking is common [7,8]. Subjective reports from users suggest that both the stimulating and toxicity effects of cocaine and ecstasy may induce intensive simultaneous drinking [9,10]. This substance use combination may increase the risk of acute and chronic health problems [11].

The goal of illicit drug demand reduction policies in most countries is to prevent or limit substance use through general and targeted education programmes and to encourage those with specific substance use disorders to receive research evidence-based treatment. A key strategy in the United Kingdom is the development of early intervention behaviour change programmes which offer young users information about health risks and advice about ways of stopping or moderating their substance use [12]. However, as many early-stage users may not be motivated to alter their behaviour use and are unlikely to self-refer to specialist treatment services, it is unclear where these programmes should be sited and how they should operate [13]. However, there is evidence that this population may be willing to engage in discussions with staff of community-based drug misuse advice and counselling services who employ an accepting, empathic and non-confrontational communication style [14]. These workers are now found in a variety of different community teams, particularly in youth-orientated counselling and detached outreach services. These services are staffed typically by a mixed team of volunteers and paid employees which has varying levels of experience and skills. The term 'youth drug worker' is in common use to describe this role (and is used herein), but this does not denote a formal professional group in the UK treatment system.

Motivational interviewing (MI) is a very well-known style of counselling that was developed originally by William Miller as a method to increase the likelihood that adult heavy alcohol users would consider, initiate and maintain reductions in harmful drinking behaviours [15]. Since then, the majority of MI interventions evaluated in controlled trials have been adaptations of MI (AMI) rather than tests of the original 'pure' form. AMIs have been designed as stand-alone brief or multi-session interventions and as preludes to further services [16]. These interventions have now been evaluated successfully in various settings among adults and young people who are users of alcohol and other drugs [17–20]. Meta-analytical reviews of AMIs suggest that this approach should be appropriate and effective with young regular users of cocaine and ecstasy in the community [21,22]. However, there have been no published evaluations to date.

Stephen Rollnick and his colleagues developed an AMI called brief motivational interviewing (BMI) intended for use by non-specialists who come into contact with people who are using substances and who have an opportunity to motivate behaviour change [23,24]. This model incorporates the key principles and techniques of MI as well as a set of topic-based strategies to help its application by non-specialist practitioners. We were influenced and guided by Rollnick's AMI when developing our stimulant-focused brief intervention for community recruited adolescent and young adult users of ecstasy, cocaine powder and crack cocaine. The majority of the study population is unlikely to encounter skilled counsellors, but they may well come into contact with non-specialist drug and youth workers based in community agencies or teams or operating as a peripatetic or detached outreach resource. Our adapted model was based on a sequential set of topic strategies for delivery by youth drug workers who, overall, would have relatively limited counselling experience and skills. We judged that a single session would be the most acceptable form of intervention among a target population which is recognized to be a difficult group to engage and where there are likely to be considerable differences in the perceived need for behaviour change [25]. Having developed this intervention, a randomized controlled trial was conducted to investigate its effectiveness against an information-only control condition. In this report of the main results from the study, we test the hypothesis that the intervention would be more effective than the control condition in inducing abstinence from ecstasy and cocaine and reductions in the frequency and amount of stimulant and alcohol use.

METHOD

Participants

Participant inclusion criteria were: 16–22 years old, self-identified main substance to be ecstasy, cocaine powder or crack cocaine, regular use of one or more of these drugs in the previous month (on at least four occasions) and willingness to provide two personal contacts for use in case of difficulty in arranging follow-up. Participant exclusion criteria were life-time treatment for non-medical opioid drug use, current dependence and more than one injection of illicit drugs in the previous year. A feasibility assessment based on available resources for the trial supported the recruitment of 400 participants and we planned for a maximum attrition of 20% of the sample during follow-up. Our pilot work with 60 participants who received either a single-session brief intervention or health risk information only produced a

between-subjects standardized effect for the intervention of 0.38 for a reduction in days of stimulant use [95% confidence interval (CI), −0.13, 0.90] in favour of the intervention. With an estimated 160 available cases in the intervention and control groups at follow-up for the present study, it was estimated that there would be 97% power to detect an effect of this magnitude or greater and 81% power to detect an effect of at least 0.28 with a one-tailed Student's *t*-test at $\alpha = 0.05$.

Design

The study was a two-group randomized controlled trial with a baseline self-completion questionnaire and a 6-month follow-up interview. We originally designed the intervention as a research collaboration with a single community agency based in East London and South-west London (operating from three locations in Newham, Thamesmead and Sutton). This agency experienced management difficulties during the first weeks of participant recruitment that hampered the identification and recruitment of participants and the loss of some of the agency's youth drug workers who had been recruited to participate in the trial. Although these difficulties were subsequently resolved, the trial sponsor and steering committee approved the entry of a second community agency based in East Kent and the deployment of two members of the coordinating research team (H. B. and G. S.) to deliver the intervention on a peripatetic basis from the National Addiction Centre (NAC). With these new arrangements in place, all recruitment, intervention, control and follow-up tasks were undertaken by seven agency youth drug workers at the Newham, Thamesmead and Sutton locations, five agency youth drug workers in East Kent and the two research workers from the NAC base. This 14-worker team comprised nine males and five females and their average age was 27.4 years. To guard against bias, all follow-up interviews were conducted by a different worker from the one who had administered the participant's recruitment protocol.

Intervention

The experimental group completed a self-assessment questionnaire and then received a single-session intervention and standard printed information about the health risks of stimulant drugs and hazardous alcohol consumption. The intervention was a manual-guided, 45–60-minute discussion structured around eight sequential topics as follows: (1) framing and initiating the conversation; (2) a discussion of the participant's general life-style and interests; (3) discussion about activities and stimulant and alcohol use during a typical weekend; (4) an exploration of the participant's perceptions about the 'good' and 'bad' aspects of their stimulant use; (5) a discussion about problems and concerns relating to their stimulant use, alcohol consumption and other substance use; (6) a guided discussion about the participant's views and plans for behaviour change and the probable success and other outcomes arising. Where the participant did not appear ready to consider change they were asked to reflect on possible future scenarios that might make them perceive that their substance use was problematic (boundary setting); (7) a discussion of risks associated with stimulant use (if not already covered earlier); and (8) a closing description and discussion of local health and social support agencies and how to access them. In the manual, strategies 3–7 were each accompanied by a set of objectives and directions, including the need for the worker to summarize their understanding of what had been said before moving on. All the above strategies were intended to be covered in the single session intervention. As a working label, we called our intervention 'Assessment Information Motivation and Support'.

The main objectives for the worker during the intervention were to establish rapport and guide the participant through the various strategies above with the objective of raising awareness and increasing motivation for behaviour change. Feedback of information from the self-completion questionnaire was a required component. This information was transcribed by the worker onto a form and referred to during the intervention. Feedback information varied from case to case but focused generally on ecstasy, cocaine, alcohol use and reported concerns and problems. The degree of focus on the feedback of self-assessment information and worker-guided discussion was determined by the participant's interest, response and engagement during the session. As part of the trial's quality control procedure, all interventions were audio-recorded. We reviewed the initial recordings of each worker to ensure that the broad style of the intervention and research protocol was being followed correctly and gave feedback and additional training as necessary. After this we listened to a random one in 10 of the sessions as part of trial monitoring. All workers were supervised by their respective agencies and received further feedback and support during the study as we judged necessary.

Control condition

Following completion of the baseline self-assessment, those participants who were randomized to the control group were given the same written health risk information by the worker overseeing recruitment as was given to the intervention group. Each control participant was then thanked for their time but was not given any feedback from their self-assessment.

Intervention training

The minimum inclusion criterion for the intervention team was that the worker must have completed at least a basic drugs information and advice training course or have equivalent practical experience before joining the study. Prior to taking part in the trial's training programme, the workers reported a median of 151 hours of one-to-one work with drug users. Three of the agency workers reported having counselling qualifications and these workers all reported having received previous training in MI. A specialist training agency in the drugs misuse field was commissioned to assist us to develop the intervention training programme. The training sessions, delivered over 16 hours across 3 days, were facilitated by members of the research team and covered MI principles, motivational intervention techniques, the trial protocol, research procedures and human subjects ethical issues. We note that 15 hours has been reported as the average duration of training in a meta-analysis of adaptations of MI as applied to different behavioural domains and settings [26]. The content of training sessions included lecture-style presentations and role-play exercises. Trainees were shown a video that we produced ourselves on the intervention and video-recorded role-play exercises were included to provide additional performance feedback. Learning objectives of the training emphasized competence with the broad strategies required for the intervention over technical expertise with counselling techniques. All workers completed the training programme satisfactorily.

Recruitment and procedure

Participants were recruited via detached outreach contact, direct nomination by other participants (to a maximum of five friends and acquaintances) and by advertisements placed in community sites (e.g. colleges). These methods have been shown to be effective strategies when recruiting from relatively hidden populations [27,28]. A brief screening form was used to record the following information: gender, age, primary stimulant used (ecstasy, cocaine powder or crack cocaine) and frequency of stimulant use during a typical month in the previous year (recorded as the total number of days and then categorized as 'low', 4–17 days; or 'high', 18–30 days). Eligible, consenting participants were stratified across the two trial conditions on these potentially prognostic variables. Participants were informed that the purpose of the study was to encourage young people to consider health and social issues relating to their ecstasy and cocaine use. Consent from participants who were between 16 and 17 years old was obtained by two workers, each confirming that the participant fully grasped the purpose of the study and the study protocol as described on the participants' information sheet. Allocation of participants to the experimental and control condition was controlled and balanced by random permuted blocks. Once the participant had completed self-assessment questionnaire the worker telephoned the research co-ordination office to receive instruction about the participant's group allocation. The randomization and concealment procedure was overseen by the trial's statistician (C. T.). Due to the nature of the intervention it was not possible to blind participants and workers to the allocated trial condition beyond completion of the self-assessment questionnaire at baseline. Participant contact information was updated by telephone contact at 8 and 16 weeks. Each participant received £15 plus travel expenses for attending the recruitment session and a further £15 for the follow-up. Research ethics approval was obtained from both multisite and local institutional review boards.

Research assessments and outcome measures

At recruitment, a 45-minute self-completion questionnaire recorded substance use and other behavioural information. This was piloted in our locality with 26 individuals from the target population. The validated Maudsley Addiction Profile (MAP) [29] was used to record the following outcome measures during the previous 90 days: (1) period prevalence of ecstasy, cocaine powder and crack cocaine use; (2) the frequency of ecstasy, cocaine and alcohol use over the previous 90 days recorded on a 15-point scale and coded to reflect the total number of 'using days' as follows: never (scored 0), 1–5 days only (scored 1–5), 2 days per month (scored 6), 3 days per month (scored 7), 1–6 days per week (scored 8–13), every day (scored 14); and (3) the number of estimated grams of cocaine powder and crack cocaine (the number of tablets taken for ecstasy) consumed on a 'typical using day'. The frequency and amount of cannabis use on a typical using day was also recorded following the same procedure. Changes in cannabis consumption are presented in this report as supplementary information to contextualize the within- and between-subjects outcomes for stimulants and alcohol. The five-item Severity of Dependence Scale (SDS) was used to assess the extent of problematic stimulant use among the sample (using a score of four as a conservative cut-off criterion) [30–32]. The MAP also recorded the amount of alcohol consumed on a typical weekday (Monday–Thursday) and in total during a typical weekend (Friday night–Sunday night) over the previous 90 days. The 10-item Alcohol Use Disorders Identification Test (AUDIT) screened for hazardous drinking over the previous 90 days using a criterion score of eight or more [33]. In addition to the above substance use measures, behaviour change was evaluated on several other domains including physical health and psychological health status, drug- and alcohol-related

health problems, offending behaviour and engagement with treatment and other support services. These results are not reported here.

At follow-up, the worker invited the participant to self-complete the key measures from the baseline questionnaire and also additional items which captured behaviour change since recruitment. Participants in the experimental condition also completed a short interview with the worker which recorded more detailed information about behaviour change reported in the questionnaire. Procedures for increasing the validity of substance use self-reports were followed [34]. At follow-up toxicology testing was performed on a random sample of 45 participants from each condition (representing 30% of the sample that were followed-up) using samples of oral mucosal transudate (an ultra-filtrate of blood in saliva) to verify self-reported stimulant use over the previous 48 hours [35]. Analysis was performed by an independent laboratory using immunoassay, with gas chromatography/mass spectrometry characterizing for crack cocaine. Finally, those participants who reported an attempt to stop or reduce their stimulant use were asked which aspects (if any) of the recruitment session had influenced their behaviour.

Statistical analysis

The analysis of outcome was conducted on an intention-to-treat (ITT) basis (involving all participants who were randomly assigned) and baseline scores were substituted for cases lost to follow-up. The main analysis of abstinence and changes in the frequency and amount of substance use was conducted using logistic regression and analysis of covariance using generalized linear models (SPSS version 12.0). According to the analysis, these models contained a single within-subjects factor (change over time) and two between-subjects factors (trial condition and study location) and the standardized baseline response for each measure as a covariate. We expected the frequency distributions for reported ecstasy, cocaine and alcohol use to be positively skewed and the raw values were natural logarithm-transformed prior to modelling to mediate the influence of outliers and stabilize variances. Standardized (unit-free) effect sizes (d or partial η^2) and 95% CI were calculated for within-subjects and between-subjects contrasts using the pooled standard deviation and chance correction formulae recommended for meta-analysis [36]. While we cite conventional test statistics and probability levels for 'time' and 'group' contrasts, greater emphasis is placed on the interpretation and importance of the effect size and corresponding CI (where a range including zero is not statistically significant) [37]. The trial data analysis plan included the investigation of intervention moderation for two subgroups: those who screened positive for problematic stimulant use at baseline on the SDS and those who screened positive for hazardous drinking on the AUDIT. Because statistical testing was limited to specified hypotheses we did not perform an omnibus chance correction of probability levels [38].

RESULTS

Sample characteristics

Participants were recruited between January 2001 and June 2002 ($n = 342$) and the final follow-up interviews were completed by January 2003 (Fig. 1). The average achieved duration of follow-up was 28.9 weeks (mode 27 weeks, range 20–52 weeks) with no significant difference between trial conditions (Student's $t = 1.57$, $P = 0.118$). The numbers of participants recruited from the five agency locations was as follows: Newham ($n = 62$); Thamesmead ($n = 29$); Sutton ($n = 96$); NAC ($n = 98$) and East Kent ($n = 57$). A total of 172 participants were interviewed by agency workers and 170 participants by research workers ($\chi^2 = 0.57$, $P = 0.451$). There were similar baseline characteristics in the experimental and control groups (Table 1). Participants had initiated to ecstasy, cocaine powder or crack cocaine between 2.1 and 2.6 years prior to the study. More than half of the intervention and control groups reached the criterion for problematic stimulant use on the SDS (54% and 58%, respectively). A regular alcohol consumption pattern was well-established and approaching two-thirds of the sample was classified as hazardous drinkers on the AUDIT (66% of the intervention group and 65% of the control group). As a greater proportion of the intervention group was in full-time education ($P = 0.001$) and a smaller proportion in full-time work ($P = 0.004$), we adjusted for these differences in the analyses.

Follow-ups were conducted with 86.7% of the intervention group and 88.1% of the control group (87.4% overall). An attrition analysis, using a multiple logistic regression analysis, indicated that there were no differences across the two conditions in the characteristics of those who could not be followed-up. Seven participants declined to provide a sample for toxicology screening and these cases were recorded as stimulant use positives. There was a high level of agreement between self-report and stimulant toxicology as follows: ecstasy (84.8%; kappa = 0.71), cocaine powder (88.0%; kappa = 0.87) and crack cocaine (87.3%; kappa = 0.74) (all $P < 0.005$). There were no significant differences in these concordances across the trial conditions. We gave participants contact details of the research coordination office for complaints or to report any 'adverse effects' associated with taking part in the study. No complaints or other communications were received.

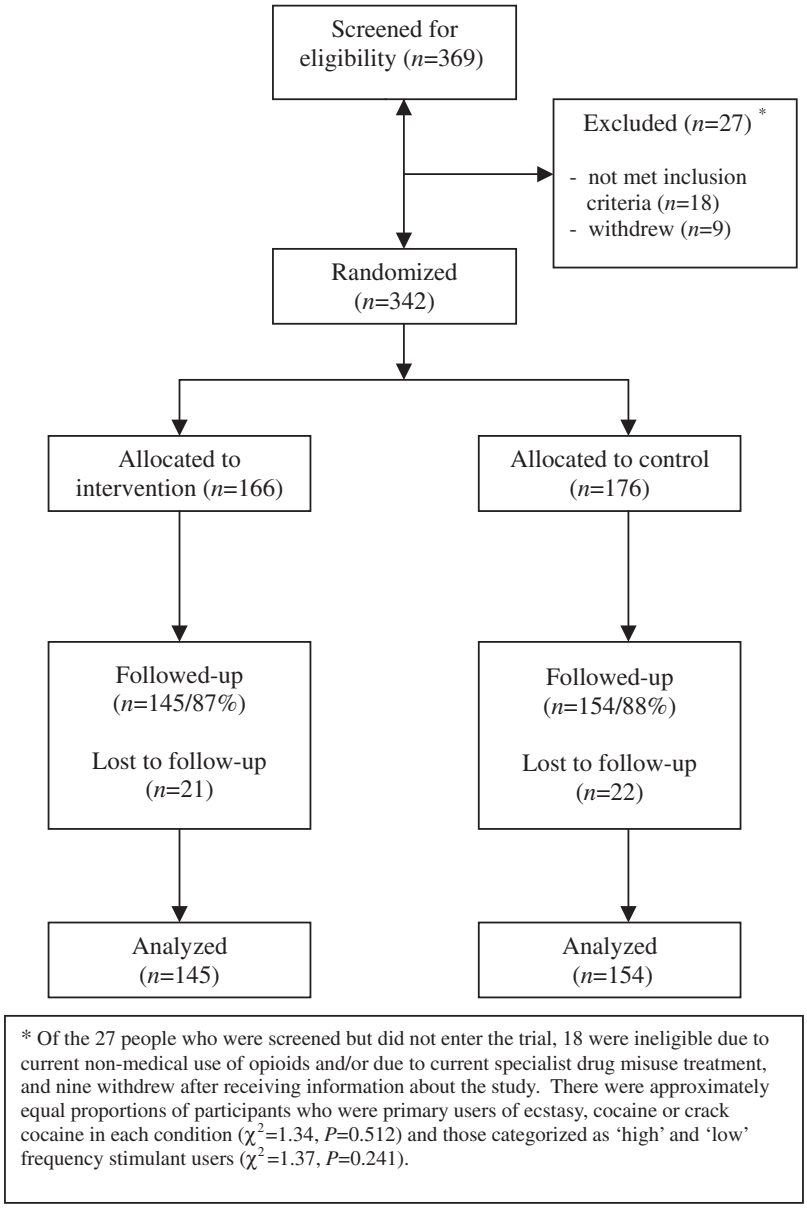

Figure 1 Flow diagram of phases through the trial

Abstinence from substance use at follow-up

Non-significant between-group point prevalence rates for abstinence from ecstasy, cocaine powder or crack cocaine in the 90 days prior to follow-up are shown in Table 2. The prevalence of drinking alcohol remained almost unchanged from 284 to 283 participants at follow-up (82.7%). For cannabis, there was a small overall reduction in use from 89.8% (307/342) to 86.0% (294/342) but no between-subjects differences at follow-up (relative risk = 0.76; 95% CI = 0.44, 1.29). We investigated the likelihood of abstinence for ecstasy, cocaine powder, crack cocaine, cannabis and alcohol in a series of standard logistic regression models with simultaneous entry of the following covariates: trial condition, the five study locations, the type of worker conducting the interventions (agency worker or research worker), the participant's baseline frequency of substance use and whether they were in full-time employment and education at recruitment to the study. The Hosmer–Lemeshow 'goodness-of-fit' test for each model was satisfactory (P = 0.243–0.662). For ecstasy, the odds of abstinence at follow-up was decreased among participants recruited from Thamesmead [adjusted odds ratio (OR) = 0.22; 95% CI = 0.56, 0.88] and also among participants who were in full-time employment at baseline (OR = 0.28; 95% CI = 0.10, 0.80). For cocaine, the odds of abstinence were more than twice as high among participants recruited from East Kent (OR = 2.44; 95% CI = 1.02, 5.85). For crack cocaine, the odds of abstinence were approximately three times higher among participants who were in full-time education at recruitment (OR = 2.93; 95%

Table 1 Baseline characteristics of the participants ($n = 342$).*

Characteristic	*Intervention group (n =166)*	*Control group (n = 176)*	*P value*†
Social demographic			
Age (years)	18.3 ± 2.0	18.5 ± 2.0	0.401
Male: no. (%)	111 (66.9)	116 (65.9)	0.851
Ethnic origin: no. (%)			0.911
White	125 (75.3)	135 (76.7)	
Black	21 (12.7)	18 (10.2)	
Asian	14 (8.4)	16 (9.1)	
Other	6 (3.6)	7 (4.0)	
In full-time education (%)	73 (44.0)	47 (26.7)	< 0.0005
In full-time employment (%)	10 (6.0)	28 (15.9)	0.004
Living with parents (%)	113 (68.1)	112 (63.6)	0.387
Ecstasy use			
Used in previous 90 days: no. (%)	129 (77.7)	136 (77.3)	0.923
Time since first use (years)	2.2 ± 1.6	2.6 ± 1.9	0.164
Days used in previous 90 days	18.8 ± 17.8	17.3 ± 16.2	0.433
Amount used on typical day (tablets)	2.3 ± 2.1	2.1 ± 2.1	0.475
Cocaine powder use			
Used in previous 90 days: no. (%)	101 (60.8)	111 (63.1)	0.672
Time since first use (years)	2.1 ± 1.5	2.2 ± 1.8	0.543
Days used previous 90 days	9.5 ± 13.8	9.4 ± 14.2	0.971
Amount used on typical day (g)	0.5 ± 0.7	0.6 ± 0.8	0.360
Crack cocaine use			
Used in previous 90 days: no. (%)	53 (31.9)	61 (34.7)	0.592
Time since first use (years)	2.6 ± 2.0	2.3 ± 1.9	0.515
Days used previous 90 days	9.5 ± 21.4	11.7 ± 22.9	0.348
Amount used on typical day (g)	0.2 ± 0.4	0.3 ± 0.6	0.153
Severity of stimulant use			
SDS score 4 ≥: no. (%)	90 (54.2%)	102 (58.0%)	0.486
Cannabis use			
Used in previous 90 days: no. (%)	150 (90.4)	157 (89.2)	0.724
Time since first use (years)	4.7 ± 2.2	4.8 ± 2.3	0.872
Days used previous 90 days	57.1 ± 34.7	59.3 ± 34.3	0.557
Amount used on typical day (g)	2.9 ± 3.7	3.1 ± 3.4	0.615
Alcohol use			
Used in previous 90 days: no. (%)	133 (80.1)	151 (85.8)	0.162
Days used previous 90 days	30.5 ± 27.1	32.2 ± 25.9	0.548
Amount used on typical weekday (g)‡	67.3 ± 79.9	100.9 ± 117.9	0.002
Amount used across typical weekend (g)‡	154.7 ± 148.8	231.6 ± 237.9	< 0.0005
Hazardous drinking			
Mean AUDIT score	11.1 ± 8.3	11.2 ± 8.1	0.880
AUDIT score 8 ≥: no. (%)	108 (65.5)	115 (65.3)	0.957

*Plus-minus values are ± SD. †P values from χ^2 test for categorical measures or *t*-test for continuous measures or scales. ‡Typical amounts were recorded by beverage type and brand and converted into standard units by participants. At data entry, these estimations were error checked and converted into grams ethanol [1 UK standard drink contains 8 g (10 ml) ethanol by volume].

CI = 1.17, 7.37). The model was not significant for cannabis or alcohol.

Changes in substance use and alcohol consumption

A repeated-measures analysis of covariance was performed to contrast changes in the frequency and amount of substance use between follow-up and baseline. (Table 3). There was satisfactory screening of baseline and follow-up scores on all measures for equality of covariance matrices and equality of error variances using Box's M and Levene tests. In comparison to the baseline assessment, the number of days of ecstasy, cocaine powder and crack cocaine use among intervention participants in the 90 days prior to follow-up fell by 10.6,

Table 2 Period prevalence for abstinence in the 90 days prior to follow-up ($n = 342$).

Stimulant	*Intervention (n = 166)*	*Control (n = 176)*	*Relative risk**
Ecstasy: no. (%)	71 (42.8)	77 (43.8)	0.98 (0.77, 1.25)
Cocaine powder: no. (%)	86 (51.8)	78 (44.3)	1.17 (0.94, 1.46)
Crack cocaine: no. (%)	135 (81.3)	128 (72.7)	1.12 (0.99, 1.26)

*Relative risk for abstinence (95% CI).

3.9 and 4.8 days, respectively. However, comparable improvements were also seen in the use of ecstasy, cocaine powder and crack cocaine among control participants (reductions of 8.6, 2.0 and 6.0 days, respectively).

There were no significant between-subjects effects in favour of the intervention condition. Although the between-subjects contrast for cocaine powder reached the criterion for statistical significance ($F = 6.80$, $P = 0.011$), the corresponding effect size did not ($d = 0.15$; 95% CI = –0.06, 0.37). There were significant within-subjects effects concerning the amount of the three stimulants used, but no between-subjects effects. There were also small and non-significant reductions in the number of drinking days (by 1.63 in the intervention group and 1.55 in the control group) and little change in the amount of weekday and weekend drinking. The analyses were also conducted with the addition of study location as a between-subjects factor. The group × study location interaction was not statistically significant for the stimulant and cannabis measures and the amount of alcohol consumed at the weekend (F-test values ranged from 0.23 to 1.98 ($P = 0.921$–0.101). There were significant but very weak group × study location effects for the number of drinking days ($F = 3.44$; $P = 0.009$; partial $\eta^2 = 0.04$) and the amount of alcohol consumed at the weekend ($F = 5.13$; $P = 0.001$; partial $\eta^2 = 0.06$), suggesting that there was a tendency for reduced frequency of alcohol consumption and amount consumed at the weekend among participants recruited from Newham relative to the other four locations.

As a check on the above conservative ITT results, we also performed the analyses of changes in the frequency of ecstasy, cocaine powder, crack cocaine and alcohol use on a per-protocol basis ($n = 299$). There was little change in the results (ecstasy, $F = 0.78$, $P = 0.380$; cocaine powder, $F = 6.31$, $P = 0.013$, $d = 0.16$, -0.06, 0.39; crack cocaine, $F = 1.34$, $P = 0.250$, alcohol, $F = 0.24$, $P = 0.630$).

Moderation analyses

We then investigated if there was evidence for moderation of substance use behaviour change. These GLM null hypothesis analyses were limited to the following contrasts: (1) the type of intervention worker (research team member or agency worker); (2) those participants screened positive for stimulant problems and for hazardous drinking; and (3) those respondents who considered that they were motivated to change their stimulant use at baseline. Baseline scores on each outcome variable were used as a covariate and checks on equality of covariance matrices and equality of error variances for these contrasts were satisfactory. Results of the analysis for worker type are shown in Table 4. There was a single significant 'worker type' × trial group interaction effect for the reported number of drinking days in the past 3 months ($F = 5.57$, $P = 0.020$; partial $\eta^2 = 0.16$). Further investigation of this small effect indicated that it reflected baseline differences on this measure among participants in the intervention condition (mean difference between researcher and agency workers = 10.35 days; 95% CI = 2.18, 18.52). Among the comparisons for the stimulant problems and hazardous drinking, a single significant interaction was observed for stimulant problems and the typical amount of cocaine powder used at follow-up ($F = 5.37$, $P = 0.020$; partial $\eta^2 = 0.16$), indicating a tendency for greater improvement among participants in the experiment condition who scored higher on this measure. For the baseline self-assessment measure of motivation participants were asked to estimate the strength of motivation to change stimulant use using a seven-point rating scale (1 = low motivation; 7 = high motivation). There was no difference on this measure between the groups (intervention group mean = 2.68 versus control mean = 2.57; $P = 0.610$). For the GLM analyses, we categorized respondents who scored 1–4 as having 'low motivation' for change, and those scoring 5–7 to have 'high motivation' for change. There was equivalence on this criterion between the experimental and control group (77.1% versus 78.4%, $\chi^2 = 0.08$, $P = 0.778$). The inclusion of this term in the models did not exert any significant effects on either the main effects (F-test values ranged from 0.06 to 1.37; $P = 0.800$–0.240) or interaction effects × trial group (F-test values ranged from 0.00 to 0.81; $P = 0.999$–0.370).

Subjective reports about change

To provide further insight into the trial we asked participants at follow-up to give us their subjective report about

Table 3 Changes in frequency and amount of substance use at follow-up ($n = 342$).*

	Baseline		*Follow-up*					
Substance use†	*Intervention ($n = 166$)*	*Control ($n = 176$)*	*Intervention ($n = 166$)*	*Control ($n = 176$)*	*F within subjects*‡	*Within subjects d*§	*F between subjects*‡	*Between subjects d*§
Ecstasy: no. days	18.75 ± 17.8	17.31 ± 16.2	8.20 ± 13.5	8.70 ± 13.2	166.20 ($P < 0.0005$)	0.63 (0.46, 0.77)	0.10 ($P = 0.75$)	0.04 (−0.18, 0.25)
Ecstasy: tablets	2.30 ± 2.1	2.14 ± 2.1	1.53 ± 2.2	1.44 ± 1.9	83.40 ($P < 0.001$)	0.34 (0.19, 0.49)	0.02 ($P = 0.89$)	−0.04 (−0.26, 0.17)
Cocaine powder: no. days	9.47 ± 13.8	9.42 ± 14.2	5.54 ± 11.5	7.40 ± 12.6	32.4 ($P < 0.0005$)	0.2 (0.7, 0.37)	6.4 ($P = 0.01$)	0.15 (−0.06, 0.37)
Cocaine: g/day	0.49 ± 0.7	0.58 ± 0.8	0.40 ± 0.7	0.49 ± 0.8	5.46 ($P = 0.02$)	0.12 (−0.03, 0.27)	0.49 ($P = 0.49$)	0.12 (−0.09, 0.33)
Crack: no. days	9.48 ± 21.4	11.73 ± 22.9	4.67 ± 15.1	5.73 ± 15.8	51.63 ($P < 0.0005$)	0.28 (0.13, 0.43)	1.10 ($P = 0.30$)	0.06 (−0.15, 0.28)
Crack: g/day	0.18 ± 0.4	0.26 ± 0.6	0.11 ± 0.4	0.18 ± 0.6	41.10 ($P < 0.0005$)	0.14 (−0.01, 0.29)	2.07 ($P = 0.15$)	0.13 (−0.08, 0.35)
Cannabis: no. days	57.07 ± 34.7	59.26 ± 34.3	52.01 ± 36.5	57.24 ± 36.3	5.46 ($P = 0.02$)	0.10 (−0.05, 0.25)	0.47 ($P = 0.49$)	0.14 (−0.7, 0.36)
Cannabis—grams/day	2.93 ± 3.7	3.11 ± 3.4	3.34 ± 4.56	3.23 ± 3.9	0.27 ($P = 0.62$)	0.03 (−0.12, 0.18)	0.02 ($P = 0.89$)	−0.03 (−0.24, 0.19)
Alcohol: no. days	30.50 ± 27.1	32.21 ± 25.9	28.87 ± 25.7	30.66 ± 25.3	0.42 ($P = 0.52$)	0.06 (−0.09, 0.21)	2.2 ($P = 0.14$)	0.11 (−0.14, 0.28)
Alcohol: g/weekday	67.32 ± 79.9	100.93 ± 117.9	62.04 ± 76.0	77.76 ± 90.2	0.43 ($P = 0.51$)	0.15 (0.0, 0.30)	0.32 ($P = 0.86$)	0.19 (−0.03, 0.40)
Alcohol: g/weekend	154.71 ± 148.8	231.56 ± 237.9	151.13 ± 149.1	214.64 ± 211.8	0.926 ($P = 0.34$)	0.05 (−0.10, 0.20)	0.001 ($P = 0.97$)	0.34 (0.13, 0.55)

*Plus–minus values are ±SD. †Reports are for the previous 90-days at follow-up. ‡*F*-tests are from generalized linear models using natural logarithm-transformed scale scores. The inclusion of study location, lapsed time between baseline and follow-up, full-time education and full-time employment as covariates did not exert significant influence on the models. There were no treatment moderation effects detected for the problematic stimulant users and hazardous drinker subgroups. §Standardized effect size (95% CI).

Table 4 Analysis of covariance by outcome measure and type of intervention worker.*

	Intervention (n = 166)		*Control (n = 176)*		
Substance use†	*Agency worker (n = 80)*	*Research worker (n = 86)*	*Agency worker (n = 92)*	*Research worker (n = 84)*	*F worker × group*
Ecstasy: no. days	8.81 (6.19, 11.43)	7.11 (4.58, 9.65)	9.32 (6.87, 11.77)	8.55 (5.99, 11.11)	0.13 ($P = 0.72$)
Ecstasy: tablets	1.33 (0.88, 1.78)	1.69 (1.26, 2.12)	1.67 (1.26, 2.09)	1.22 (0.78, 1.65)	3.46 ($P = 0.06$)
Cocaine powder: no. days	6.08 (3.91, 8.25)	5.02 (2.92, 7.11)	8.19 (6.17, 10.21)	6.56 (4.44, 8.67)	0.07 ($P = 0.79$)
Cocaine powder: g/day	0.31 (0.17, 0.46)	0.53 (0.33, 0.67)	0.54 (0.40, 0.67)	0.41 (0.27, 0.55)	5.86 ($P = 0.02$)
Crack cocaine: no. days	6.02 (3.37, 8.67)	4.40 (1.83, 6.97)	3.93 (1.47, 8.39)	6.72 (4.15, 9.29)	2.86 ($P = 0.09$)
Crack cocaine: g/day	0.13 (0.03, 0.23)	0.12 (0.03, 0.22)	0.16 (0.06, 0.25)	0.17 (0.08, 0.27)	0.08 ($P = 0.78$)
Cannabis: no. days	48.78 (42.53, 55.04)	56.43 (50.42, 62.45)	56.51 (50.69, 62.33)	56.58 (50.50, 62.66)	1.50 ($P = 0.22$)
Cannabis: g/day	3.35 (2.52, 4.17)	3.45 (2.65, 4.24)	3.69 (2.92, 4.45)	2.63 (2.92, 4.45)	2.04 ($P = 0.15$)
Alcohol: no. days	24.97 (19.74, 29.04)	33.97 (29.51, 38.44)	30.78 (26.48, 35.09)	29.62 (25.10, 34.14)	5.57 ($P = 0.02$)
Alcohol: g/weekday	80.13 (65.74, 94.15)	60.04 (45.13, 74.94)	67.64 (53.75, 81.53)	72.24 (57.68, 86.79)	1.12 ($P = 0.29$)
Alcohol: g/weekend	165.40 (133.29, 197.51)	183.15 (152.63, 213.68)	188.65 (159.12, 218.18)	196.74 (165.49, 227.98)	0.10 ($P = 0.76$)

*Values in table are adjusted means (95% CI) using baseline score as a covariate and shown in original units. †Reports are for the previous 90-days at follow-up.

whether they had attempted to change their substance use. Fifty-nine per cent of the intervention group (86/145) and 41% (62/153) of the control group reported that they had attempted to stop or reduce their stimulant use since recruitment (relative risk, 1.47; CI = 1.16, 1.86). Among intervention participants, the majority (78%; 67/86) reported that the intervention had prompted them to change their behaviour; 14% (12/86) thought the completion of the baseline self-assessment had prompted them to attempt behaviour change; and five participants (5.8%) thought the combination of the two prompted change. In the control group, 87% (54/62) reported that self-assessment had prompted their behaviour change and 13% (8/62) believed that reading the health information had been most influential.

DISCUSSION

This report presents the main findings from the first randomized controlled trial in England of a brief motivational intervention among young regular users of ecstasy, cocaine powder and crack cocaine. Contrary to expectation, our adaptation of BMI for the target population and worker team was no more effective at inducing abstinence and reducing stimulant use than an information-only control condition. While both intervention and control groups reported reductions in their stimulant use, there were no significant between-subjects effects for abstinence or changes in frequency and amount used. Follow-up feedback reports indicated that more members of the experimental group considered that they had made attempts to stop or reduce stimulant use (relative risk, 1.47), but this must be considered to be weak evidence for the intervention given the nature of the data.

We observed disappointing results for alcohol consumption. Intervention and control participants continued to drink at high levels on a typical weekday (62.0 g ethanol, or 7.8 standard drinks versus 77.8 g, or 9.7 drinks) and during a typical weekend (151.1 g ethanol, or 18.9 drinks versus 214.6 g, or 26.8 drinks). These between-subjects differences did not reach statistical significance after adjustment for marked baseline differences in our models. There were also non-significant within-subjects and between-subjects changes in stimulant and alcohol use among those participants screened as problematic users and hazardous drinkers at baseline. Although drinking issues were not the main focus of the intervention, we put an emphasis on alcohol during worker training and supervision and all workers were aware of the importance of engaging in discussion about drinking and encouraging change as thought appropriate. The expectation that reduced stimulant use would be accompanied by reduced alcohol consumption was not observed, and a greater focus on drinking themes and

issues may be needed when developing brief interventions targeting this population. Our moderation analyses did not reveal any consistent pattern and just two significant but modest effects were observed. There was a worker type × trial condition interaction effect for the reported number of drinking days in the past 3 months, but we believe that this reflects differences in baseline scores. There was also a significant interaction between stimulant problems and the typical amount of cocaine powder used at follow-up, indicating a tendency for greater improvement among participants in the experiment condition who screened positive for stimulant problems at recruitment.

Our study has several specific strengths. First, there was careful development of a manual-guided motivational intervention for stimulant users which was supported by training, supervision and monitoring. Secondly, we evaluated the intervention in the context of research collaboration with two community-based counselling and detached outreach agencies—the service most likely to come into contact with adolescent and young adult stimulant users. Thirdly, baseline characteristics of the participants were generally well-balanced across the trial conditions. Finally, we achieved a good follow-up rate. These qualities serve to support good internal and external validity of the results.

Nevertheless, four study limitations and potential weaknesses are acknowledged. First, the effect size for stimulant use change observed in the pilot study was considerably greater (although more variable) than the effects produced in the full trial. This may have arisen because the pilot follow-up was limited to 3 months and there was a smaller sample size. Secondly, positive intervention effects may have been present during the first 3 months of follow-up and then decayed relative to the control. Evaluations of AMIs have used various follow-up periods ranging from 4 weeks to 4 years (average, 18 weeks) [21]. On reflection, we believe that given the objectives of the study we were correct in selecting a 6-month follow-up as an interval in which it is reasonable to expect clinically meaningful behaviour change to be initiated and maintained. We believe it was also advisable to use a single follow-up to minimize potential participant reactivity effects due to follow-up contacts which may have the unintended consequence of diminishing group differences through a form of therapeutic input [39]. Thirdly, we observed quite large baseline differences in reports of the volume of drinking between participants in the experimental and control groups, with controls consuming 33.6 g (four standard drinks) more on a typical weekday and 63.5 g more (eight drinks) during a typical weekend. It would have been preferable to stratify participants by drinking amount, although this would have been difficult to conduct with accuracy given the use of a brief screening procedure. Fourthly, we must consider the possibility that social desirability demand characteristics were operating among our young stimulant users when the interviewers asked follow-up questions, so that participants were more likely to report that they had changed their behaviour. While each participant's follow-up interview was conducted by a different worker to the one overseeing the baseline session, we cannot rule out bias. However, this risk is lessened by the fact that there were no significant changes in reports of cannabis use or alcohol consumption at follow-up.

The goal of the present study was to develop and evaluate a brief intervention that, if effective, could be recommended for use by non-specialist youth drug workers in the United Kingdom who are based in community counselling and detached outreach services. We were unable to find evidence that our intervention had relatively greater effectiveness when delivered by our worker team over an information-only control. It is possible that MI practitioners with more experience and skill could facilitate greater behaviour change among the present study population. However, our intention was to develop and study an AMI for potential use by the broad community of youth drug workers in the United Kingdom. Also, taking in the wider context, we note that two trials of an AMI delivered by workers who were trained to deliver MI to a high standard among adult stimulant users found no significant difference between the intervention and control conditions [40,41]. Our study now joins these two negative studies in reporting positive improvement among a non-intervention control group among substance users where stimulants were the primary drug class of choice. Our results suggest that the process of recruiting young drug users into a study and focusing their attention on substances before a brief intervention may be, in itself, sufficient to induce positive reactive effects on behaviour. There has been awareness of this phenomenon among researchers for some time [42]. In the present study, when asked what had prompted behaviour change, 14% of the intervention group believed it had been the self-assessment alone and a further 6% considered that it had been the combination of the self-assessment and worker intervention. Among the controls who reported a change attempt, the majority (87%), thought that the self-assessment had prompted their behaviour change. We believe this is a finding of sufficient importance to encourage researchers to use trial designs which separate assessment, research protocol and intervention effects. Accordingly, we are now testing this hypothesis in a further randomized trial of a single-session brief intervention among stimulant users using assessment-only, recruitment-only and follow-up-only control groups.

We conclude that our single-session adaptation of BMI among young cocaine and ecstasy users is not effective. A

testable hypothesis is that research recruitment, baseline self-assessment and contact with study personnel are influences that induce positive reactive effects on substance use behaviours. If true, these phenomena have important implications for the design, analysis and interpretation of brief interventions among this study population and for psychosocial interventions more generally.

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