The effectiveness of an indicated prevention programme for substance use in individuals with mild intellectual disabilities and borderline intellectual functioning: results of a quasi-experimental study

Esmée P. Schijven[1,2] (iD), Daan H. G. Hulsmans[1,2] (iD), Joanneke E. L. VanDerNagel[3,4,5,6] (iD), Jeroen Lammers[7] (iD), Roy Otten[1,2,8] (iD) & Evelien A. P. Poelen[1,2] (iD)

Research and Development, Pluryn, Nijmegen, the Netherlands,[1] Behavioural Science Institute, Radboud University, Nijmegen, the Netherlands,[2] Tactus, Centre for Addiction and Intellectual Disability (CAID), Deventer, the Netherlands,[3] Radboud University, Nijmegen Institute for Scientist-Practitioners in Addiction, Nijmegen, the Netherlands,[4] Aveleijn, Borne, the Netherlands,[5] Faculty of Electrical Engineering, Mathematics, and Computer Science, Human Media Interaction, University of Twente, Enschede, the Netherlands,[6] Trimbos Institute, Netherlands Institute of Mental Health and Addiction, Utrecht, the Netherlands[7] and REACH Institute, Department of Psychology, Arizona State University, Tempe, AZ, USA[8]

ABSTRACT

Aims To assess the effectiveness of Take it personal!, a prevention programme for individuals with mild intellectual disabilities and borderline intellectual functioning (MID-BIF) and substance use (SU). The prevention programme aims to reduce SU (alcohol, cannabis and illicit drugs) among experimental to problematic substance users. **Design** A quasi-experimental design with two arms and a 3-month follow-up. **Setting** Adolescents were recruited from 14 treatment centres in the Netherlands specialized in offering intra- and extramural care for people with MID-BIF and behavioural problems. **Participants** Data were collected from 66 individuals with MID-BIF assigned either to the intervention condition ($n = 34$) or to the control condition ($n = 32$). **Interventions** Take it personal! was designed to target four personality traits: sensation-seeking, impulsive behaviour, anxiety sensitivity and negative thinking. For each of these profiles, interventions were developed that were structurally the same but contained different personality-specific materials, games and exercises. The control group received care as usual. **Measurements** Primary outcomes at 3-month follow-up were frequency of SU, severity of SU and binge drinking. **Results** Results showed intervention effects for SU frequency ($F_{(1, 50.43)} = 9.27$, $P = 0.004$) and binge drinking ($F_{(1, 48.02)} = 8.63$, $P = 0.005$), but not for severity of SU ($F_{(1, 42.09)} = 2.20$, $P = 0.145$). **Conclusions** A prevention programme to reduce substance use among experimental to problematic users with mild intellectual disabilities and borderline intellectual functioning helped participants to decrease substance use frequency and binge drinking.

Keywords Alcohol, cannabis, illicit drugs, indicated prevention, intellectual disabilities, personality.

Correspondence to: Esmée P. Schijven, Behavioural Science Institute, Radboud University, PO Box 9104, 6500 HE Nijmegen, the Netherlands. E-mail: eschijven@pluryn.nl
Submitted 22 August 2019; initial review completed 20 December 2019; final version accepted 5 June 2020

INTRODUCTION

Adolescents and young adults with mild intellectual disability [MID; intelligence quotient (IQ) range = 50–69] or borderline intellectual functioning (BIF; IQ range = 70–85) [1] are vulnerable to problems in different domains, such as mental, physical and socio-economic functioning [2,3]. They are also at higher risk for substance use disorders (SUD) compared to their non-disabled peers [3,4]. As with individuals without MID-BIF, substance use (SU) is common among individuals with MID-BIF and develops at a similar age [5–7]. However, common consequences of SU, such as difficulties in day-to-day functioning at school, work or home, have more impact on individuals with MID-BIF than on non-disabled individuals [2,3], as SU is often inter-related with MID-BIF and behavioural problems [2,6]. Various risk factors, including impairment in cognitive and social skills, inhibition problems, deficits in coping skills and susceptibility to peer pressure account for the increased risk for SUD in individuals with MID-BIF

[2,3]. Clearly, there is a great need for effective prevention programmes for people with MID-BIF before SUD emerges [2,3,8].

Prevention programmes for the general population are not suitable for the complex nature of SU observed among individuals with MID-BIF and the support they receive from these programmes is only minimal, because of their intellectual disabilities and problems with social adaptability [2,9]. SU prevention programmes are often less accessible to individuals with MID-BIF and typically are poorly adapted to their cognitive level [2,3,8,9]. Programmes that have demonstrated effectiveness in individuals without intellectual disability need to be adapted to the needs and learning style of individuals with MID–BIF [10–12]. A few prevention programmes have been developed particularly for people with MID-BIF, but evidence of their effectiveness is still weak [8,9]. A recent review of the literature on SU prevention programmes for this group found only six studies, including two randomized controlled trials on the effectiveness of programmes [8]. These studies, however, did not demonstrate intervention effects on reducing SU [8]. These programmes are often too short and do not consider the complex nature of SU among individuals with MID-BIF. In addition, existing prevention programmes are aimed at a broad heterogeneous group of individuals with MID-BIF. Clearly, there is a need for prevention programmes for this specific high-risk target group. To provide each individual with MID-BIF appropriate intervention, a high level of customization is necessary [8]. As such, personality-targeted prevention programmes have been shown to be effective in reducing SU among adolescents without MID-BIF [10–12], and are referred to as the most appropriate SU prevention strategy for high-risk groups [13].

These personality-targeted prevention programmes are based on four personality profiles: sensation-seeking, impulsivity, anxiety sensitivity and negative thinking (SS, IMP, AS and NT, respectively) [14]. These profiles have been associated with risky SU in the general population [11,13,15] and in individuals with MID-BIF [16]. Each personality profile has its own patterns and motives for SU. Individuals with externalizing profiles (sensation-seeking and impulsivity) tend to be vulnerable to positive reinforcement and positively rewarding effects of substances [15]. Individuals with internalizing personality profiles (anxiety sensitivity and negative thinking) use SU as an emotion regulation strategy to deal with negative feelings [17,18].

Take it personal! is an indicated prevention programme for adolescents and young adults (aged 14–30 years) with MID-BIF and SU. The programme aims to reduce SU (alcohol, cannabis and illicit drugs) among experimental to problematic substance users. Take it personal! is based on the theoretical underpinnings of effective personality-targeted prevention programmes [10–12]. Moreover, the intervention is based on the principles of motivational interviewing (MI) and cognitive behavioural therapy (CBT), both of which have demonstrated effectiveness in decreasing alcohol and drug use among non-disabled adolescents [19,20], and in adapted form they are also effective in people with MID-BIF [21,22]. Another technique that has been used especially for the target group is psychomotor therapy, a complementary less verbal therapy based on exercises and practice in movement and body experience. Psychomotor therapy is commonly used and shows promising results in behaviour intervention for individuals with MID-BIF [23]. The aim of the present study was to examine the effectiveness of Take it personal! on reducing the frequency and severity of SU (alcohol, cannabis and illicit drugs) among adolescents and young adults with MID-BIF.

METHOD

Design

This study was originally set up and registered as a randomized controlled trial [24]. However, the design was changed to a quasi-experiment with two arms, because individual or cluster randomization was not possible. Adolescents with MID-BIF were screened at baseline and subsequently assigned to either the intervention condition (Take it personal!) or the control condition; follow-up measures were assessed after 3 months. Participants in the control condition received care as usual, which was neither standardized nor protocolled, and they were free to attend other programmes and/or therapies for their own specific problems (information concerning type of care was not assessed).

Participants

A total of 76 adolescents with MID-BIF were recruited from 14 treatment centres in the Netherlands specialized in offering intra- and extramural care for people with MID-BIF and behavioural problems. All participants received treatment because of their behavioural problems, such as aggression, criminal behaviour or internalizing problems. Inclusion criteria were: (1) life-time prevalence of alcohol, cannabis or illicit drug use, (2) belonging to one of the four personality high-risk groups (SS, IMP, AS or NT) and (3) providing signed informed consent along with the signed informed consent from parents or a legal representative. A contraindication was moderate to severe SUD according to the DSM-5 [1], because these problems require more intensive treatment programmes [25]. Overall, 66 adolescents (47 male) from 11 treatment centres met these criteria, and they were assigned to either the intervention

or control condition (Fig. 1). Participants in the intervention condition attended Take it personal! in eight groups of three to four adolescents. The average (and median) cluster size was seven participants per treatment centre (ranging from two to 14 per treatment centre).

Procedure

Treatment centres were informed about the prevention programme and were invited to participate in this study. Adolescents who were found to be eligible to participate were then approached by their care-giver or clinician who invited them to participate. Upon registration, adolescents were pre-screened and sex and date of birth were registered using self-reported questionnaires (see Outcome measures). The questionnaires included pictograms and images administered via a web-application on a tablet computer that adolescents operated themselves. A researcher read every question aloud and, if necessary, provided further clarification with simple wording. An adolescent's personality profile (SS, IMP, AS or NT) was determined according to the highest score on the Substance Use Risk Profile Scale (SURPS) [14]. If more than one high-risk personality profile was identified in one adolescent, the independent researcher contacted that adolescent's clinician and appealed to his/her clinical experience to determine the profile that explained the adolescent's SU the most clearly. In addition, case files were used to collect information about IQ (measured with the WAIS or WISC). These files include recent and relevant information concerning the client (never older than approximately 2 years).

An independent researcher assigned adolescents to the intervention and control conditions based on participants' numbers, their treatment centre and their personality profile. Individual or cluster randomization was not possible with regard to the number of available treatment centres and participants and the fact that the prevention programme required a group of three or four adolescents with the same personality profile. Furthermore, groups comprised adolescents who were already receiving treatment in the same treatment centre. This was conducted to lower the threshold for participation, as travelling between treatment centres on a weekly basis would cause too much inconvenience for adolescents and care-givers. Hence, adolescents within the same treatment centre were assigned either to the control condition or to the intervention condition. Adolescents and parents (or legal representatives) were informed that the intervention was designed to reduce problems with alcohol and drug use and that their data would be processed anonymously. For each measurement, the participants received a €5 gift card. Data were collected between January 2015 and April 2017.
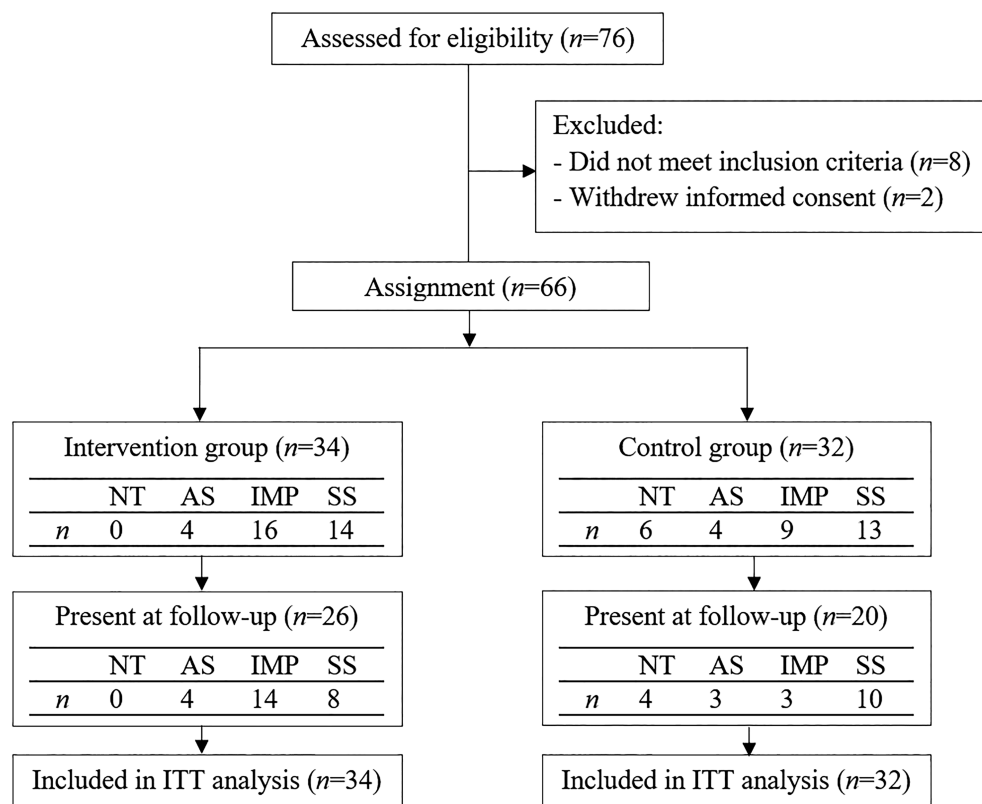

Figure 1 Flow diagram of enrolment and retention by treatment arm

Both adolescents and parents provided active informed consent. The Ethics Committee of Radboud University approved this study (ECSW2015–0903-303), and the trial was registered at the Dutch Trial Register (NTR5037; 15 April 2015).

Intervention

The prevention programme comprised five 45-minute group sessions and five 30-minute individual sessions conducted within a 6-week time-span. For each of the four personality profiles (SS, IMP, AS and NT), specific interventions were developed that were structurally the same but contained different personality-specific materials, games and (psychomotor therapy) exercises. Trainers were a psychologist and psychomotor therapist from the participant's own treatment centre, who had received specific training on Take it personal! prior to the start of the study, including training in MI, CBT and the theoretical background of the programme. Both trainers conducted the group sessions together, and for the individual sessions the adolescents were equally allocated to one of the two trainers. In each individual session, adolescents could bring a confidant from their team of care-givers at their treatment centre with whom they were familiar. This was conducted to maximize the transfer of training to daily life situations and to ensure that adolescents felt safe and prepared for the group sessions.

Take it personal! comprised three main components: (1) psycho-education about the participants' personality profile and related problematic coping behaviour, (2) training of behavioural coping skills and (3) training of cognitive coping skills to cope with personality-related thoughts and behaviours resulting in problematic behaviour. MI, CBT and psychomotor therapy were used to deliver these components. Although the prevention programme could target any SU (alcohol, cannabis, illicit drugs), adolescents set personalized goals and edited a personal 'changing plan' to deal with their own problematic behaviours and SU. Hence, in practice, the prevention programme addressed the use of substance(s) that was/were most problematic for the individual. The content of Take it personal! is described in more detail in the intervention mapping paper []. Programme fidelity was assessed in evaluation forms completed by trainers after the prevention programme. Overall, evaluation shows that the programme was reported to be delivered as protocolled.

Outcome measures

Baseline assessment

For baseline screening, the 23-item SURPS [14] was used to distinguish the four high-risk personality profiles for SU. Items were measured on a four-point Likert scale that ranged from (1) 'strongly agree' to (4) 'strongly disagree'.

To adapt the SURPS to adolescents with MID-BIF, the wording of some items was simplified and response options were complemented with pictograms of thumbs-up and thumbs-down. The SURPS has been validated for use with people with MID-BIF [16]. In the current sample, the SURPS demonstrated an acceptable internal consistency, with Cronbach's $\alpha = 0.71$ for AS, 0.87 for NT, 0.62 for IMP and 0.67 for SS.

Primary outcomes

Substance use frequency

One item from the Substance Use and Misuse in Intellectual Disability Questionnaire (SumID-Q) [26] was used to measure the frequency of SU, assessing three substances separately. Adolescents answered the questions: 'How often do you drink alcohol/smoke weed/do hard drugs?', with answer categories ranging from (1) 'never' to (5) 'almost every day'. In contrast to the original design [24], we did not use life-time use of cannabis and illicit drugs (i.e. assessed with the item: 'Have you ever used weed/illicit drugs (1) 'yes' (2) 'no') as primary outcomes. At baseline, 85% of our participants showed life-time use of cannabis and 58% showed life-time use of illicit drugs; examining change on these measures would not be useful.

Substance use severity

To assess the severity of SU, the Alcohol Use Disorders Identification Test (AUDIT) [27] and the Drug Use Disorders Identification Test (DUDIT [28], as incorporated in the SumID-Q, were used. Each scale consisted of 10 items that could be rated on a five-point Likert scale, with answer categories ranging from (1) 'never' to (5) 'almost every day'. The AUDIT and DUDIT items relate to frequency and quantity of use, dependency and problems related to use. An example is: 'How often could you not stop drinking/drug use?'. The AUDIT and DUDIT have been shown to be applicable in people with MID-BIF [29]. In the current sample, both AUDIT and DUDIT showed good internal consistency, with Cronbach's $\alpha = 0.75$ for the AUDIT and $\alpha = 0.81$ for the DUDIT.

Binge drinking

The frequency of binge drinking was assessed with one item from the Alcohol Use Disorders Identification Test [27] of the SumID-Q [28]. Adolescents replied to the question: 'How often do you drink more than six glasses on one occasion?'; the answer categories ranged from (1) 'never' to (5) 'almost every day'.

Statistical analyses

Sample size calculation was based on a previous personality-targeted intervention study with a medium

effect size [15]. Power-analysis based on an average effect size of $F = 0.25$ [15], a two-sided test at alpha = 0.05, a statistical power (1-β) of 0.80 and 10% loss-to follow-up after randomization. Based on these assumptions, a sample size of 140 adolescents was required [24]. In the Results section we elaborate on power and effect size calculations.

Descriptive analyses were performed to examine baseline distributions of age, gender, total IQ and outcome measures among adolescents in the intervention and control groups. Because Take it personal! was personalized and aimed to teach adolescents skills to reduce the most relevant substance(s), effectiveness was assessed for each adolescent's most frequently or severely used substance and compared at baseline and follow-up. If more than one substance was equally frequently or severely used at baseline, then the average baseline and follow-up scores for these substances were compared. For example, if a person used alcohol and cannabis daily at baseline and other drugs monthly, then the baseline score for frequency of alcohol and cannabis [(5), 'almost every day'] was compared to the average frequency score for alcohol and cannabis at the follow-up measurement. Additionally, we assessed intervention effectiveness for each substance separately. All analyses were performed using R version 3.6.1 [30].

Mixed-effects regression models were used to test the effect of Take it personal! on SU frequency, SU severity and binge drinking. Time, condition and time × condition interaction were entered as fixed effects in the models. The intervention effect was estimated by the interaction effect on each dependent variable. Time was centred and sum-to-zero contrasts were used. To correct for data clustering at baseline, each model included random intercepts for participant, gender and treatment centres. Random slopes were added to the models to control for a clustered effect of time (i.e. the change between baseline and follow-up) within gender and treatment centres. Graphical model diagnostics plots [31] were visually inspected to assess goodness of model fit. Attrition analysis by means of logistic regression and Little's MCAR test indicated that values were missing completely at random, warranting the use of a multiple imputation strategy for intention-to-treat analyses. To obtain *P*-values, conditional *F*-tests were performed on both models using the Kenward–Roger approximation for degrees of freedom, a method that gives the most optimal type I error rates in linear mixed-effects models [32].

RESULTS

Characteristics of the participants

Participant characteristics are displayed in Table 1. Adolescents in each group did not significantly differ in age, IQ, all outcomes of SU frequency or drug use severity at baseline. However, the groups differed significantly in gender,

alcohol use severity and binge drinking. Overall, 24% of the adolescents were frequent alcohol users, reporting weekly or daily alcohol consumption at baseline, 41% used cannabis weekly or daily and 20% used illicit drugs weekly or daily. In total, 23% of the adolescents were weekly or daily polyusers of more than one substance.

Intervention effects on SU frequency, SU severity and binge drinking

Table 2 and Fig. 2 present the intervention effects (biavarita correlations are shown in the appendix). Visual inspection of model diagnostics plots reveals good model fit for all models without violations of statistical assumptions. The results showed a stronger decrease in SU frequency in the intervention condition compared to the control condition, as the interaction time × condition was significant, $F_{(1, 50.43)} = 9.27$, $P = 0.004$. Similarly, a stronger decrease in binge drinking was found for adolescents in the intervention condition compared to those in the control condition, $F_{(1, 48.02)} = 8.63$, $P = 0.005$. For SU severity, the interaction time × condition was not significant, $F_{(1, 42.09)} = 2.20$, $P = 0.145$, indicating no differences between conditions over time on adolescents' most severely used substance at baseline. Intervention effects were thus found for SU frequency and binge drinking, but not for SU severity.

Intervention effects per substance

Table 2 presents effects of frequency and severity on individual substances. These additional analyses on separate substances reveal, in addition to intervention effects on alcohol and cannabis frequency, a stronger decrease in the severity of alcohol use in the intervention group compared to the control group, $F_{(1, 48.26)} = 5.37$, $P = 0.025$.

Power and effect size

Results should be seen in the light of our sample size ($n = 66$), that was smaller than intended [27]. Nevertheless, *post-hoc* power analyses using 100 Monte Carlo simulations revealed a 90, 45 and 85% chance of finding a statistically significant effect ($\alpha = 0.05$) for the interaction time × condition in models for, respectively, SU frequency, SU severity and binge drinking. Marginal R^2 [33] was 0.16, 0.13, 0.17 for the combined fixed effects in models for, respectively, SU frequency, SU severity and binge drinking, reflecting the medium effect sizes [33] we aimed for with our a priori power analysis.

DISCUSSION

This study evaluated the effectiveness of Take it personal!, an indicated prevention programme for SU (alcohol,

Table 1 Adolescent's demographics and outcome characteristics (mean (SD)).

		Total sample (n = 66)	Intervention (n = 34)	Control (n = 32)	t/χ^2	d.f.	P
Demographics	Age (years)	17.45 (2.76)	17.21 (2.67)	17.72 (2.88)	−0.75	64	0.455
	Total IQ	73.68 (7.92)	72.39 (9.13)	74.85 (6.91)	0.94	30.86	0.329
	Gender (n male, %)	47 (71%)	20 (59%)	27 (84%)	3.20	1	0.043*
Outcomes	Baseline alcohol use frequency	2.71 (1.06)	2.92 (1.14)	2.50 (0.95)	1.59	64	0.117
	Follow-up alcohol use frequency	2.41 (0.72)	2.31 (0.69)	2.52 (0.75)	1.23	64	0.225
	Baseline cannabis use frequency	2.98 (1.52)	3.26 (1.52)	2.69 (1.49)	1.55	64	0.125
	Follow-up cannabis use frequency	2.51 (1.06)	2.34 (0.95)	2.69 (1.15)	1.32	64	0.191
	Baseline other drug use frequency	1.97 (1.64)	2.17 (1.78)	1.75 (1.48)	1.05	64	0.296
	Follow-up other drug use frequency	1.82 (0.92)	1.66 (0.87)	1.98 (0.96)	1.46	64	0.148
	Baseline substance use frequency[a,b]	3.58 (1.10)	3.82 (1.05)	3.31 (1.09)	2.16	64	0.058
	Follow-up substance use frequency[a,b]	2.59 (0.90)	2.42 (0.91)	2.78 (0.86)	1.68	64	0.097
	Baseline alcohol use severity	8.12 (6.12)	10.02 (6.72)	6.09 (4.72)	2.74	64	0.008**
	Follow-up alcohol use severity	6.27 (3.76)	6.74 (4.20)	5.78 (3.21)	−1.03	64	0.306
	Baseline drug use severity	10.83 (9.44)	12.02 (10.33)	9.56 (8.35)	1.06	64	0.292
	Follow-up drug use severity	7.63 (5.95)	7.80 (6.01)	7.45 (5.97)	−0.24	64	0.813
	Baseline substance use severity[a,b]	13.32 (8.22)	15.24 (8.63)	11.28 (7.35)	2.13	64	0.050
	Follow-up substance use severity[a,b]	8.43 (5.39)	7.52 (5.39)	7.99 (5.37)	−0.68	64	0.498
	Baseline binge drinking[a]	2.02 (0.92)	2.32 (1.06)	1.67 (0.60)	3.02	52.24	0.004**
	Follow-up binge drinking[a]	1.77 (0.62)	1.67 (0.56)	1.86 (0.68)	1.22	64	0.226

*P < 0.05; **P < 0.01. d.f. = degrees of freedom. [a]The three primary outcome variables; [b]frequency/severity of each adolescent's most frequently/severely used substance at baseline. Outcomes on frequency and binge drinking were assessed on a five-point Likert scale: (1) 'never', (2) 'less than once a month', (3) 'every month', (4) 'every week' and (5) 'almost every day'. Severity scores were AUDIT and DUDIT sum-scores of 10 items with this five-point Likert scale. Follow-up was based on (in part) imputed data at 3 months post-intervention.

Table 2 Fixed-effects parameters of linear mixed-effects models assessing intervention effectiveness on different outcome variables.

	Condition				Time			Condition × time		
Outcome variable	n d.f.	dn d.f.	F	P	dn d.f.	F	P	dn d.f.	F	P
Substance use frequency[a,b]	1	54.52	0.33	0.744	0.94	5.33	0.279	50.43	9.27	0.004**
Alcohol use frequency	1	42.09	0.25	0.618	0.61	1.96	0.485	48.53	4.15	0.047*
Cannabis use frequency	1	63.11	2.13	0.149	0.95	0.98	0.509	54.54	13.56	<0.001***
Other drug use frequency	1	60.66	0.58	0.458	1.12	1.18	0.448	54.95	2.88	0.096
Substance use severity[a,b]	1	42.09	1.81	0.357	0.39	22.87	0.366	42.09	2.20	0.145
Alcohol use severity	1	45.14	4.28	0.044*	1.22	3.32	0.284	48.26	5.37	0.025*
Drug use severity	1	45.02	0.55	0.462	0.38	6.55	0.463	42.09	1.22	0.275
Binge drinking[a]	1	50.04	1.23	0.600	1.17	1.00	0.491	48.02	8.63	0.005**

*P < 0.05; **P < 0.01; ***P < 0.001. [a]The three primary outcome variables. [b]The frequency/severity of each adolescent's most frequently/severely used substance at baseline. Condition is the between-subject factor distinguishing those in intervention and control condition. Kenward–Roger approximation for degrees of freedom was used; n d.f. = numerator degrees of freedom; dn d.f. = denumerator degrees of freedom.

cannabis, illicit drugs) in adolescents with MID-BIF. Intervention effects were found for SU frequency and binge drinking, but not for SU severity.

Results on specific substances reveal a nuance to the latter, as the intervention showed effectiveness for severity of alcohol use, indicating that adolescents whose drug use was most problematic were able to reduce the severity of alcohol use at 3-month follow-up, but not the severity of drug use. Our results were consistent with the effectiveness studies of personality-targeted SU prevention programmes
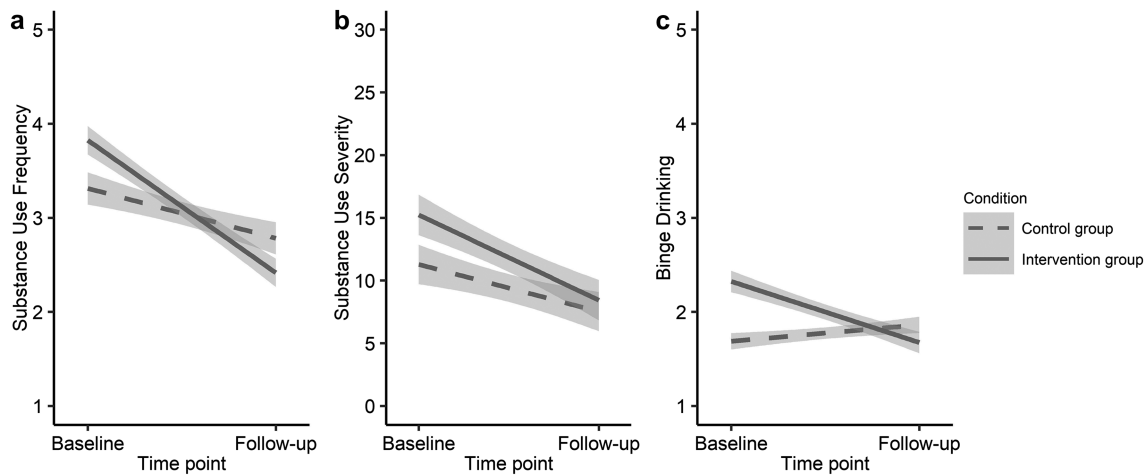
Figure 2 Interaction plot for intervention effects on (a) substance use frequency, (b) substance use severity, (c) binge drinking. Grey bars reflect 95% confidence intervals; *y*-axis indices on graphs A and C reflect frequency scores on a five-point scale with categories (1) 'never', (2) 'less than once a month', (3) 'every month', (4) 'every week' and (5) 'almost every day', while *y*-axis indices in graph B reflect the sum score of 10 items with these five-point scales assessing severity of alcohol (AUDIT) or drug (DUDIT) use. Graph A is the frequency of the substance(s) (alcohol and/or cannabis and/or other drugs) that each adolescent most frequently used at baseline. Graph B reflects the severity each adolescent's most severely used substance (alcohol or drugs) at baseline. Graph C reflects the frequency with which adolescent consume more than six glasses of alcohol per day

for non-disabled adolescents that showed intervention effects for alcohol use frequency [31,34], binge drinking [10,35] and cannabis use [12,36] over periods of 4–6 months in British, Canadian and Australian adolescents. Moreover, other studies on the severity of use did not find intervention effects on problematic drinking in Dutch and British adolescents [11,35]. However, a Canadian study found a significant reduction in symptoms of problematic drinking in the short (4 months) and long term (24 months) [37]. Take it personal! mainly helped adolescents to decrease their alcohol, cannabis or illicit drug use frequency, but this decrease was only reflected in a decrease of severity of alcohol use and not in a decrease of severity of cannabis and illicit drug use. Indicators of SU severity are—in addition the frequency of SU—symptoms of dependence and problems related to use [27,28]. Most participants in our study participated in Take it personal! for help with their problematic cannabis use (although often in combination with alcohol or illicit drug use). For this reason, it can be expected that problems related to cannabis are more persistent and more difficult to change than problems related to alcohol use in this particular group. A decrease of drug use dependence symptoms and problems may very well follow after a longer period of decreased SU frequency.

Limitations

The current study has some limitations. First, participants were assigned to the intervention and control condition based on treatment centre. The absence of participant randomization between conditions may have influenced the results. Secondly, in our study the personality profiles sensation-seeking and impulsive behaviour were over-

represented. Adolescents in our sample often obtain high scores on more than one personality profile, and in most cases SU was attributed to the externalizing profiles, as internalizing profiles might stand out less. Moreover, trainers speculated that adolescents with anxiety sensitivity- or negative-thinking profiles have less motivation to participate in a prevention programme for SU and effectiveness study. There are different reasons why adolescents with anxiety sensitivity or negative thinking have less motivation to participate. Research suggests that the presence of anxiety sensitivity or depression affects motivation in general, and more specifically motivation and adherence to interventions due to a variety of client-related factors such as illness beliefs and attitudes [38]. In a similar vein, adolescents with negative and anxious personalities may find it harder to be motivated to participate in our study. Thirdly, in this study we only investigated short-term intervention effects. Although the initial plan was to also conduct long-term assessments of the effects, for practical reasons (e.g. clients leaving the treatment facility) this appeared to be impossible. Therefore, it was not possible to draw conclusions concerning the long-term effects of the intervention. Future studies should focus on long-term effects of Take it personal!.

This study shows that cannabis use is the most significant problem in adolescents with MID-BIF, and clinicians from several treatment centres confirmed that cannabis contributes to the greatest problems in the daily life of our target population. Most participants in our study were enrolled into the prevention programme for problems related to cannabis use. Take it personal! showed to be effective in reducing SU frequency in this specific group. Although clinicians from several participating treatment

centres confirmed that cannabis contributes to the greatest problems in the daily life of our participants, we also know that alcohol use is known to be severely underestimated by staff and often not seen as a big problem. Moreover, in this study, we did not reach the planned number of participants [24], while previous personality-targeted SU interventions recruiting from school settings for adolescents without disabilities did not face difficulties with inclusion [10,11]. Difficulties in our study were related to the complexity of the clinical population of adolescents with MID-BIF and behavioural problems. These adolescents are often in need for interventions for multiple problems besides substance use, such as behavioural problems and trauma. Timing of interventions is crucial with regard to compliance, motivation and readiness to change. In addition, Take it personal! intervention groups were composed based on personality profile. It often occurred that timing for several individuals was right to start Take it personal!, but that personality profiles did not match and that intervention groups could not start. Moreover, participants dropped out because they moved away from the treatment centre or were simply not motivated to complete follow-up questionnaires. Adolescents with MID-BIF, as well as clinical MID-BIF practice, may benefit from a more personalized study approach, so future studies could focus on $n = 1$ research to determine if and how the intervention works for each adolescent.

CONCLUSION

In summary, Take it personal! seems to fill the gap of effective SU prevention programmes in treatment services for the high-risk target group on individuals with MID-BIF. Instead of treating adolescents as uniform, Take it personal! seems to address the individual needs of members of this complex target group by offering a personalized prevention programme. The approach of Take it personal! strengthens efforts to reduce SU among adolescents with MID-BIF and intervene before SUD emerges.

Clinical trial registration

This trial is registered in the Dutch Trial Register as NTR5037.

Declaration of interests

D.H. and R.O. declare that they have no competing interests. E.S., J.N., J.L. and E.P. were involved in the development of Take it personal!

Acknowledgements

Author Contributions

Esmee P. Schijven: Conceptualization; investigation; methodology; project administration; resources; validation; visualization. **Daan H.G. Hulsmans:** Data curation; formal analysis; methodology; visualization. **Roy Otten:** Conceptualization; methodology; supervision. **Evelien A.P. Poelen:** Conceptualization; funding acquisition; methodology; supervision.

References

1. American Psychiatric Association *Diagnostic and Statistical Manual of Mental Disorders, 5th edn. Washington, DC: Author; 2013.*

2. Didden R., VanDerNagel J. E., Delforterie M., Van Duijvenbode N. Substance use disorders in people with intellectual disability. *Curr Opin Psychiatry* 2020; **33**: 124–9.

3. Van Duijvenbode N., VanDerNagel J. E. A systematic review of substance use (disorder) in individuals with mild to borderline intellectual disability. *Eur Addict Res* 2019; **25**: 263–82.

4. Emerson E., Einfeld S., Stancliffe R. J. The mental health of young children with intellectual disabilities or borderline intellectual functioning. *Soc Psychiatry Psychiatr Epidemiol* 2010; **45**: 579–87.

5. Taggart L., McLaughlin D., Quinn B., Milligan V. An exploration of substance misuse in people with intellectual disabilities. *J Intellect Disabil Res* 2006; **50**: 588–97.

6. Van Duijvenbode N., Van Der Nagel J. E., Didden R., Engels R. C., Buitelaar J. K., Kiewik M., *et al.* Substance use disorders in individuals with mild to borderline intellectual disability: current status and future directions. *Res Dev Disabil* 2015; **38**: 319–28.

7. To W. T., Neirynck S., Vanderplasschen W., VanHeule S., VanDerVelde S. Substance use and misuse in persons with intellectual disabilities (ID): results of a survey in ID and addiction services in Flanders. *Res Dev Disabil* 2014; **35**: 1–9.

8. Kiewik M., VanDerNagel J. E., Engels R. C., de Jong C. A. Intellectually disabled and addicted: a call for evidence based tailor-made interventions. *Addiction* 2017; **112**: 2067–8.

9. Kerr S., Lawrence M., Darbyshire C., Middleton A. R., Fitzsimmons L. Tobacco and alcohol-related interventions for people with mild/moderate intellectual disabilities: a systematic review of the literature. *J Intellect Disabil Res* 2013; **57**: 393–408.

10. Conrod P. J., O'Leary-Barrett M., Newton N., Topper L., Castellanos-Ryan N., Mackie C., *et al.* Effectiveness of a selective, personality-targeted prevention program for adolescent alcohol use and misuse: a cluster randomized controlled trial. *JAMA Psychiatry* 2013; **70**: 334–42.

11. Lammers J., Goossens F., Conrod P., Engels R., Wiers R. W., Kleinjan M. Effectiveness of a selective intervention program targeting personality risk factors for alcohol misuse among young adolescents: results of a cluster randomized controlled trial. *Addiction* 2015; **110**: 1101–9.

12. Mahu I. T., Doucet C., O'Leary-Barrett M., Conrod P. J. Can cannabis use be prevented by targeting personality risk in schools? Twenty-four-month outcome of the adventure trial

on cannabis use: a cluster-randomized controlled trial. *Addiction* 2015; **110**: 1625–33.

13. Sher K. J., Bartholow B. D., Wood M. D. Personality and substance use disorders: a prospective study. *J Consult Clin Psychol* 2000; **68**: 818–29.

14. Woicik P. A., Stewart S. H., Phil R. O., Conrod P. J. The substance use risk profile scale: a scale measuring traits linked to reinforcement-specific substance use profiles. *Addict Behav* 2009; **34**: 1042–55.

15. Conrod P. J., Stewart S. H., Comeau N., Maclean A. M. Efficacy of cognitive-behavioral interventions targeting personality risk factors for youth alcohol misuse. *J Clin Child Adolesc Psychol* 2006; **35**: 550–63.

16. Poelen E. A., Schijven E. P., Otten R., Didden R. Personality dimensions and substance use in individuals with mild to borderline intellectual disabilities. *Res Dev Disabil* 2017; **63**: 142–50.

17. Comeau N., Stewart S. H., Loba P. The relations of trait anxiety, anxiety sensitivity, and sensation seeking to adolescents' motivations for alcohol, cigarettes and marijuana use. *Addict Behav* 2001; **26**: 803–25.

18. Cooper M. L., Frone M. R., Russell M., Mudar P. Drinking to regulate positive and negative emotions: a motivational model of alcohol use. *J Pers Soc Psychol* 1995; 69: 990–1005.

19. Davis M. L., Powers M. B., Handelsman P., Medina J. L., Zvolensky M., Smits J. A. Behavioral therapies for treatment-seeking cannabis users: a meta-analysis of randomized controlled trials. *Eval Health Prof* 2015; **38**: 94–114.

20. Smedslund G., Berg R. C., Hammerstrøm K. T., Steiro A., Leiknes K. A., Dahl H. M., *et al.* Motivational interviewing for substance abuse. *Cochrane Database Syst Rev* 2011; **11**: CD008063.

21. Vereenooghe L., Langdon P. E. Psychological therapies for people with intellectual disabilities: a systematic review and meta-analysis. *Res Dev Disabil* 2013; **34**: 4085–102.

22. Frielink N., Embregts P. Modification of motivational interviewing for use with people with mild intellectual disability and challenging behaviour. *J Intellect Dev Disabil* 2013; **38**: 279–91.

23. Bellemans T., Didden R., Van Busschbach J. T., Hoek P. T., Scheffers M., Lang R. B., *et al.* Psychomotor therapy targeting anger and aggressive behaviour in individuals with mild or borderline intellectual disabilities: a systematic review. *J Intellect Dev Disabil* 2017; **44**: 121–30.

24. Schijven E. P., Engels R. C., Kleinjan M., Poelen E. A. Evaluating a selective prevention program for substance use and comorbid behavioral problems in adolescents with mild to borderline intellectual disabilities: study protocol of a randomized controlled trial. *BMC Psychiatry* 2015; **15**: 167.

25. McHugh R. K., Hearon B. A., Otto M. W. Cognitive behavioral therapy for substance use disorders. *Psychiatr Clin North Am* 2010; **33**: 511–25.

26. Van der Nagel J. E., Kiewik M., van Dijk M., de Jong C., Didden R. *Handleiding SumID-Q, Meetinstrument voor het in kaart brengen van middelengebruik bij mensen met een lichte verstandelijke beperking [SumID-Q Manual Instrument to Assess Substance Use in Individuals With Mild Intellectual Disability].* Tactus: Deventer; 2011.

27. Babor T. F., Higgins-Biddle J. C., Saunders J. B., Monteiro M. G. *AUDIT: the Alcohol Use Disorders Identification Test: guidelines for use in primary care.* Geneva: World Health Organization; 2001.

28. Berman A. H., Bergman H., Palmstierna T., Schlyter F. *DUDIT: the Drug Use Disorders Identification Test: MANUAL.* Stockholm: Karolinska Institute; 2003.

29. Van Duijvenbode N., Didden R., Korzilius H. P., Engels R. C. The addicted brain: cognitive biases in problematic drinkers with mild to borderline intellectual disability. *J Intellect Disabil Res* 2016; **60**: 242–53.

30. R Core Team *R: A Language and Environment for Statistical Computing.* Vienna: R Foundation for Statistical Computing; 2017.

31. Bates D., Mächler M., Bolker B. M., Walker S. C. Fitting linear mixed-effects models using lme4. *J Stat Softw* 2015; **67**: 1–48.

32. Nakagawa S., Schielzeth H. A general and simple method for obtaining R2 from generalized linear mixed-effects models. *Methods Ecol Evol* 2013; **4**: 133–42.

33. Cohen J. *Statistical Power Analysis for the Behavioral Sciences, 2nd edn. Hillsdale, NJ: Laurence Erlbaum Associates; 1988.*

34. Conrod P. J. Personality-targeted interventions for substance use and misuse. *Curr Addict Rep* 2016; **3**: 426–36.

35. Conrod P. J., Castellanos N., Mackie C. Personality-targeted interventions delay the growth of adolescent drinking and binge drinking. *J Child Psychol Psychiatry* 2008; **49**: 181–90.

36. Newton N. C., Teesson M., Mather M., Champion K. E., Barrett E. L., Stapinski L., *et al.* Universal cannabis outcomes from the climate and Preventure (CAP) study: a cluster randomised controlled trial. *Subst Abuse Treat Prev Policy* 2018; **13**: 34.

37. Conrod P. J., Castellanos N., Mackie C. Long-term effects of a personality-targeted intervention to reduce alcohol use in adolescents. *J Consult Clin Psychol* 2011; **79**: 296–306.

38. Lingam R., Scott J. Treatment non-adherence in affective disorders. *Acta Psychiatr Scand* 2002; **105**: 164–72.

Supporting Information

Additional supporting information may be found online in the Supporting Information section at the end of the article.

Appendix S1 Bivariate correlations of study outcome measures for intervention and control groups