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Controlled case study

Evaluating the Effectiveness of Take it Personal!+ in People With Mild Intellectual Disability or Borderline Intellectual Functioning and Substance Use Disorder: A Multiple Baseline Single-Case Experimental Study

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Individuals with mild intellectual disabilities or borderline intellectual functioning are at increased risk to develop a substance use disorder—however, effective treatment programs adapted to this target group are scarce. This study evaluated the effectiveness of Take it Personal!+ in individuals with mild intellectual disabilities or borderline intellectual functioning and substance use disorder. Take it Personal!+ is a personalized treatment based on motivational interviewing and cognitive-behavioral therapy supported by an mHealth application. Data were collected in a nonconcurrent multiple baseline single-case experimental design across individuals with four phases (i.e., baseline, treatment, posttreatment, and follow-up). Twelve participants were randomly allocated to baseline lengths varying

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between 7 and 11 days. Substance use quantity was assessed during baseline, treatment, and posttreatment with a daily survey using a mobile application. Visual analysis was supported with statistical analysis of the daily surveys by calculating three effect size measures in 10 participants (two participants were excluded from this analysis due to a compliance rate below 50%). Secondary, substance use severity was assessed with standardized questionnaires at baseline, posttreatment, and follow-up and analyzed by calculating the Reliable Change Index. Based on visual analysis of the daily surveys, 10 out of 12 participants showed a decrease in mean substance use quantity from baseline to treatment and, if posttreatment data were available, to posttreatment. Statistical analysis showed an effect of Take it Personal!+ in terms of a decrease in daily substance use in 8 of 10 participants from baseline to treatment and if posttreatment data were available, also to posttreatment. In addition, data of the standardized questionnaires showed a decrease in substance use severity in 8 of 12 participants. These results support the effectiveness of Take it Personal!+ in decreasing substance use in individuals with mild intellectual disabilities or borderline intellectual functioning.

Keywords: motivational interviewing; cognitive-behavioral therapy; substance use disorder; intellectual disabilities; multiple baseline design

THE PREVALENCE of substance use disorder (SUD) in individuals with mild intellectual disability or borderline intellectual functioning (MID-BIF; IQ range 50–85) is high (Van Duijvenbode & VanDerNagel, 2019). Prevalence studies have been conducted in different countries and show different prevalence rates that vary due to differences in samples and definitions of SUD (Van Duijvenbode & VanDerNagel, 2019). In sum, prevalence rates of SUD in intellectual disability care vary between 0.1% and 46.0% while prevalence rates of MID-BIF in addiction care were around 30.0%–40.0% (Didden et al., 2020; Van Duijvenbode & VanDerNagel, 2019; Van Duijvenbode et al., 2015). Individuals with MID-BIF have impairments in intellectual and adaptive functioning (e.g., memory, language, organizing tasks; American Psychiatric Association, 2013), which is a risk factor for the development of SUD. Other specific risk factors for substance use in this population pertain to the increased vulnerability to peer pressure, limited coping skills, and inhibition problems, among others (Didden et al., 2020; Van Duijvenbode & VanDerNagel, 2019). In general, one may conclude that known risk factors for SUD are more prevalent and more prominent in individuals with MID-BIF than in peers without MID-BIF. Consequently, they are at increased risk of developing a SUD of which the consequences are also more severe than in individuals without MID-BIF (Didden et al., 2020; Van Duijvenbode & VanDerNagel, 2019). Individuals with MID-BIF often suffer from problems in the social domain, they are more at risk for the development of mental health problems, and they have more difficulties in participating in society. Having a SUD aggravates these problems (Slayter, 2008; Van Duijvenbode et al., 2015). It is agreed that the biological, social, and psychological consequences of SUD are severe in those with MID-BIF. Compared to peers without MID-BIF, they have more difficulties in managing these consequences, which poses a further risk to aggravation of substance use (SU).

Generally, addiction care is not adapted to the impairments and needs of individuals with MID-BIF. Individuals with MID-BIF experience access barriers to SUD treatment (Krahn et al., 2006; Slayter, 2010, 2016; VanDerNagel et al., 2018) and dropout rates are high (Van Duijvenbode & VanDerNagel, 2019). Barriers, high dropout rates, and the fact that addiction care is often not adapted to the needs and learning style of people with MID-BIF stresses the need for an adapted SUD treatment for these individuals. SUD treatment is usually based on motivational interviewing (MI) and cognitive-behavioral therapy (CBT), since many studies showed their effectiveness in decreasing SU in individuals without MID-BIF (Davis et al., 2015; Naar & Safren, 2017; Riper et al., 2014; Smedslund et al., 2011). However, studies evaluating the effectiveness of SUD treatment programs in individuals with MID-BIF are scarce (Van Duijvenbode & VanDerNagel, 2019).

As far as we know, only one feasibility study has been published on an MI-CBT SUD treatment program in individuals with MID-BIF (Kouimtsidis et al., 2017). This study tested the feasibility of an extended brief intervention based on MI and CBT in three community intellectual disability networks of services in England (Kouimtsidis et al., 2017). This study showed that MI and CBT are feasible in individuals with MID-BIF and SUD (Kouimtsidis et al., 2017). Further research is necessary to assess the effectiveness of MI-CBT programs in reducing SU in individuals with MID-BIF and SUD. Furthermore, this treatment program uses a "one-size-fits-all" protocol, while SUD treatment needs to be personalized to the characteristics of a client to be effective (Volkow, 2018). An example of a personalized approach is

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personality-targeted CBT (Morin et al., 2017). Personality-targeted CBT takes into account an individual's personality profile (i.e., anxiety sensitivity, negative thinking, impulsivity, and sensation seeking), as these four personality profiles have shown to be associated with SU (e.g., risk factor, reasons, type of substance; Hecimovic et al., 2014; Krank et al., 2011; Mackinnon et al., 2014), also in individuals with MID-BIF (Pieterse et al., 2020; Poelen et al., 2022).

Prevention programs already implemented the personality-targeted approach and showed to be effective in decreasing SU in youth without MID-BIF (Conrod et al., 2013; Edalati et al., 2019; Mahu et al., 2015; O'Leary-Barrett et al., 2010) and with MID-BIF (Schijven et al., 2021). One study evaluated the personality-targeted approach in SUD treatment and showed a decrease in SU frequency, albeit individuals with MID-BIF were excluded (Conrod et al., 2000). Considering the complexity of SUD and the potential of personality-targeted SUD treatment, there is a high need for such a treatment adapted to the needs of individuals with MIB-BIF.

Take it Personal!+ is a recently developed personality-targeted SUD treatment for individuals with MID-BIF that responds to this need (Gosens et al., 2021). It is an MI-CBT protocol differentiating four personality profiles (i.e., anxiety sensitivity, negative thinking, impulsivity, and sensation seeking), adjusted to the needs of individuals with MID-BIF and aims to decrease SU in individuals with MID-BIF and SUD (Gosens et al., 2021). In the present study, the effectiveness of Take it Personal!+ was evaluated in a multiple baseline single-case experimental design in 12 individuals with MID-BIF and a SUD. We expected to find a decrease in daily SU quantity following treatment and maintenance of the results at 1 month posttreatment.

Materials and Method

STUDY DESIGN

Data were collected in a nonconcurrent multiple baseline single-case experimental across individuals design (Kazdin, 2011) with four phases (i.e., baseline, intervention, posttreatment, and follow-up; Gosens et al., 2020). Twelve participants were randomly allocated to one of the five baseline lengths varying from 7 to 11 days. Onset of treatment was randomized, which enhances internal validity (Kratochwill & Levin, 2010). In some cases, the baseline period was extended due to a no-show in the planned first treatment session. The treatment phase lasted between 2 and 12 months for a variety of reasons (e.g., client characteristics, illness, vacation, dropout). The posttreatment phase lasted 1 month and the follow-up phase consisted of one measurement 3 months after the intervention.

A diary method was applied during baseline, intervention, and posttreatment phase, in which participants answered a daily survey using a mobile application for cellular phones (EthicaData, 2019). Standardized questionnaires were administered at baseline, posttreatment, and follow-up. The study was conducted between spring 2019 and winter 2022. The trial was registered in the Netherlands Trial Register (Trial NL4935, registered July 2, 2019), and approved by the Ethics Committee Social Sciences of the Radboud University (ECSW-2019-033). In reporting the results, the Single-Case Reporting Guidelines in Behavioral Interventions (SCRIBE) were followed (Tate et al., 2016).

PARTICIPANTS

Twelve clients from two Dutch health care organizations for people with MID-BIF participated in the study. In the Netherlands, unlike in most other countries, individuals with BIF are eligible to the same specialized care facilities as people with intellectual disability, whereas in most other countries only people with MID and not those with BIF are eligible for these facilities. In this way, specialized diagnostics and treatment are also available for individuals with BIF and attention is given to the impact of BIF on comorbid problems, such as SU. Eligibility for specialized MID-BIF care is based on clinical assessment of intellectual impairments and deficits in adaptive functioning as assessed by a multidisciplinary team, mostly accompanied by standardized intelligence tests. At inclusion most recent IQ scores of our participants were derived from client files (being the only available quantified indicator of MID-BIF in the file). In addition to clinical assessment of MID or BIF, participants were eligible to participate in the current study if they met criteria of SUD in cannabis, alcohol, XTC, cocaine, and/or amphetamine/methamphetamine, according to the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* (DSM-5; American Psychiatric Association, 2013) and showed SU at least 3 days a week. Participants were excluded if they were at risk of severe withdrawal symptoms; severe psychiatric comorbidity, such as suicidality, psychosis, or major depressive disorder; severe somatic problems; and psychosocial problems that interfere with treatment (e.g., homelessness).

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In total 24 clients were assessed for eligibility. Three clients were not eligible: one client was referred to addiction care due to a high risk of withdrawal symptoms and two clients were referred to mental health care due to acute mental health problems. Seven participants dropped out in the first 2 weeks of the treatment protocol due to lack of motivation ($n = 2$), acute mental health problems ($n = 4$), in detention ($n = 1$) or only needed low-frequency supportive sessions ($n = 1$). These participants were excluded from the study because it was not possible to assess the effectiveness of Take it Personal!+. One participant was excluded from the study due to lack of outcome data: The participant had a compliance rate of 43% in the daily surveys, no posttreatment and follow-up measure, and no therapist evaluation form. Participant characteristics are shown in Table 1. All participants had deficits in adaptive skills based on clinical assessment by a multidisciplinary treatment team. Ten participants had a Dutch cultural background and two participants had a non-Western cultural background.

OUTCOME MEASURES

The primary outcome was quantity of SU, assessed with a daily survey using a mobile application (EthicaData, 2019) during baseline, intervention, and posttreatment phase. Participants answered the following questions daily regarding SU frequency and quantity: (a) "Did you use [the primary substance] today?", which could be answered by "yes" or "no." If the participant answered in the affirmative, the quantity of SU was measured with an open-ended question: (b) "How many times?", which was tailored to the primary substance (e.g., "How many joints did you smoke today?"). Frequency of other daily SU was measured with the following question: "Did you use another substance today?", assessed by personalized response categories (e.g., "no," "yes, alcohol," "yes, XTC," "yes, cocaine") Prior to each treatment session the therapist received summaries of the daily measures e-mailed by the researcher, and discussed these summaries with the client during the treatment session. Missing daily measures of SU were also discussed during these sessions, whereafter the therapist shared these data with the researcher.

Additional information on SU was gathered with standardized questionnaires at baseline, posttreatment, and follow-up (i.e., 3 months after the intervention). The severity of alcohol use was assessed by the Alcohol Use Disorders Identification Test (AUDIT; Babor et al., 2001) and the severity of cannabis and illicit drug use by the Drug Use Disorders Identification Test (DUDIT; Bergman et al., 2003). Both questionnaires are screeners to identify risk of substance use. The AUDIT and DUDIT were conducted at baseline, posttreatment, and follow-up if the participant had used the specified substance during the last month. This way, we could assess changes in the severity of the targeted substance, as well as collateral effects in nontargeted substances. The AUDIT and DUDIT are part of the Substance Use and Misuse in Intellectual Disability—Questionnaire (SumID-Q; VanDerNagel et al., 2011), in which the authors adapted the AUDIT and DUDIT to individuals with MID-BIF. In the present study, Cronbach's alpha of the AUDIT and DUDIT varied between .71 and .97.

PROCEDURE

Participants were recruited for Take it Personal!+ in two ways: (a) professionals invited clients to participate in the treatment or (b) clients asked professionals for a treatment for their SU problem. The researcher provided information about the research by letter and verbally during the first meeting with the therapist, the client, and their relative or caregiver. Clients had 1 week to consider participation and sign the informed consent form. If necessary, permission of parents or legal representatives was obtained. During intake, the therapist assessed whether the client was eligible to participate; in some cases a physician (e.g., intellectual disability physician, psychiatrist, general practitioner, addiction physician) was consulted.

Next, a briefing by the researcher took place. In this briefing, the daily questions were discussed and adjusted to make sure the participants understood the items. Furthermore, the timing of the push notifications was determined in consultation (i.e., some participants received the push notification in the morning and some in the evening) to guarantee that the complete quantity of SU for that day was assessed. In addition, the time frame to complete the daily survey was determined together with the participant (i.e., varied from 360 to 720 minutes). Last, the mobile application was downloaded. From March 2020 on, the briefing took place online due to the COVID-19 pandemic. The baseline phase started the day after the briefing. After the first day of the baseline phase the researcher contacted the participant to check whether the participant had any questions or problems using the application. During the entire study period the researcher contacted the participants if they did not fill in the daily surveys for approximately 4 days to check whether they experienced any problems.

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Table 1
Participants' Characteristics

	Age	Sex	SUD	Treatment goal	Co morbidity	IQ	Care setting	Personality profile
P1	35	M	Moderate Alcohol	Maximum 3 glasses a day	ADHD ASD	Scores between 66 and 86**	Extramural	Impulsivity
P2	23	M	Severe Cannabis	Reluctant in change plan	ASD	Scores between 62 and 79*	Intramural	Impulsivity
P3	21	F	Severe Cannabis	Quit cannabis	PTSD	TIQ: 62	Extramural	Anxiety sensitivity
P4	23	F	Severe Cannabis	Quit cannabis	ASD	Scores between 60 and 79*	Extramural	Impulsivity
P5	18	M	Severe Cocaine Ketamine	Quit cocaine and ketamine	ADHD ODD	TIQ: 67	Extramural	Impulsivity
P6	23	M	Severe Cannabis	Decrease cannabis	ADHD	TIQ: 78	Extramural	Impulsivity/anxiety sensitivity
P7	29	M	Severe Alcohol	Quit alcohol	ASPD ADHD	TIQ: 70	Extramural	Impulsivity
P8	22	M	Moderate Cannabis	Quit cannabis	RAD	Scores between 81 and 95**	Extramural	Anxiety sensitivity
P9	18	F	Severe Cannabis	Quit cannabis	PTSD BPD	TIQ: 80	Extramural	Negative thinking
P10	22	M	Severe Cannabis	Once a weekend max 3 joints	PTSD	Scores between 65 and 92**	Extramural	Impulsivity
P11	19	F	Mild Cannabis	Smoke only recreationally	FASD ADHD RAD	Scores between 83 and 101**	Intramural	Impulsivity
P12	22	M	Severe Cannabis	Quit cannabis	ADHD	Scores between 65 and 92**	Intramural	Impulsivity

Note. SUD = substance use disorder; P = participant; M = male; F = female; ADHD = attention-deficit/hyperactivity disorder; ASD = autism spectrum disorder; PTSD = posttraumatic stress disorder; TIQ = total IQ; ODD = oppositional defiant disorder; ASPD = antisocial personality disorder; RAD = reactive attachment disorder; BPD = borderline personality disorder; FASD = fetal alcohol spectrum disorder.

* Disharmonic profile at index level.

** A diagnosis of mild intellectual disability or borderline intellectual functioning (MID-BIF) was set on disharmonic profile, IQ scores above BIF level but clear deficits in adaptive skills as assessed by a multidisciplinary treatment team; intramural = residential care; extramural = living at home or in sheltered housing.

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After treatment completion or dropout the researcher planned directly (posttreatment), and 3 months later (follow-up), a meeting with the participant to complete the standardized questionnaires. This meeting took place online from March 2020 on due to the COVID-19 pandemic.

TAKE IT PERSONAL!+

Take it Personal!+ is a personality-targeted MI-CBT SUD treatment aimed to reduce SU in individuals with MID-BIF (Gosens et al., 2021). Take it Personal!+ is designed to last for 11 weeks, based on two sessions of 45 minutes per week (A and B sessions), although the therapist can adjust the duration depending on the needs of the participant (e.g., some clients need more repetition, shorter sessions, or only one session a week). Session A is an individual session with the client and in Session B the client brings along a confidant from their social network or professional care. Take it Personal!+ was adjusted to the intellectual and adaptive impairments of the target group by repetition of content, presence of the confidant, simplified communication, and communication supported by pictures. More information about these adjustments are shown in Table 2.

The Substance Use Profile Risk Scale (SURPS; Woicik et al., 2009) was completed at intake to assign participants to one of the four personality profiles. The Take it Personal!+ manual is adapted to the different personality profiles and consists of eight key components. In the first 2 weeks, the focus is on MI to increase participants' motivation to change their SU and to provide psycho-education regarding the personality profile. In Session 2B the client decides to change their SU and if so, they make a plan to change their SU (i.e., treatment goal). From Week 3 on, functional analyses of SU are made, self-control skills are taught, personality profile and associated signals (e.g., emotions, thoughts, and body signals) are recognized, weekly goals are set, behavioral and cognitive coping skills are taught, and the last sessions focus on relapse prevention. The psycho-education and rec-

Table 2
Adjustments to the Intellectual and Adaptive Impairments

Adjustment	Description	Reason	Different from regular CBT protocol*
Repetition of content	– Two sessions a week with the same theme – Key information repeated in TiP! – Minimal 22 sessions – Duration is not fixed; if more repetition is needed, sessions are added – Amount of content per session is limited	Individuals with MID-BIF experience memory problems.[a]	In regular CBT there is one session a week, consisting of 13 sessions, and content is not repeated over sessions.
Presence of confidant	– Once a week the confidant is present – Confidant receives information after each session – Confidant supports during sessions – Confidant supports in daily life by generalizing learned skills to daily life	Individuals with MID-BIF experience difficulties in generalizing learned skills.[a]	In regular CBT there is no confidant.
Simplified communication and supported with pictures	– Communication is simplified (e.g., self-control skills are named as A's) – In TiP! communication is also simplified and supported with pictures – For example: scale questions are limited to 0–5 and supported with pictures	Individuals with MID-BIF have limitations in language.	For example, scale questions in regular CBT are from 0 to 10 and not supported with pictures and contain more difficult words (e.g., self-control skills).

Note. CBT = cognitive-behavioral therapy; MIB-BIF = mild intellectual disability or borderline intellectual functioning.
* Merkx (2014).
[a] Willner and Lindsay (2016); For more detailed information see Gosens et al. (2021).

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ognized personality profile and corresponding signals of SU are adjusted to the personality profile. The other key components (i.e., motivation to change SU, setting goals and make a plan to change, functional analysis, increasing self-control skills, behavioral coping training, and cognitive coping training and relapse prevention) are the same in each personality profile with a link to the personality profile (e.g., making the functional analysis the role of the personality profile is discussed).

The mHealth application TiP! is developed to support the treatment sessions and to promote the transfer of treatment to daily life. And TiP! can also be reinforcing in itself. TiP! consists of exercises, set goals, set future wishes, a help! button, key information from the treatment sessions (e.g., explanation of the self-control skills), and a relapse prevention plan. Further, the client wins accessories for an avatar and points for personal rewards by making exercises and working on goals. For more detailed information of the treatment protocol, TiP! and the adjustments to the program—based on the intellectual and adaptive impairments of the target group—see Gosens et al. (2021).

In the present study, six therapists who were experienced in providing treatment to individuals with MID-BIF and SUD, MI and CBT certified (i.e., followed the CBT course that is certified by the Dutch association of CBT), and trained in carrying out the treatment protocol, carried out the treatment. After each session, therapists completed an evaluation form to monitor treatment fidelity and individual and contextual factors that can affect the change process. According to the evaluation forms, all therapists implemented the key components, whereas in some cases therapists made small adjustments to further personalize the treatment (e.g., a participant was already capable in saying "no"; the therapist therefore shortened this information and matching exercises).

STATISTICAL ANALYSIS

First, visual analysis was conducted according to the guidelines of visual analysis in single-case designs, wherein data patterns within and between phases were examined using six aspects: (a) level, (b) trend, (c) variability, (d) immediacy of the effect, (e) overlap, and (f) consistency of data patterns across similar phases (Kratochwill et al., 2010).

Visual analysis was supported by statistical analysis of the daily data. Several effect size measures were used: (a) nonoverlap of all pairs (NAP; Parker & Vannest, 2009), (b) pooled standardized mean difference (Cohen's d; Hedges et al., 2012), and (c) percent of goal obtained (PoGO; Ferron et al., 2020) for each participant. The NAP and Cohen's d were calculated in the Shiny SCDA web app (De et al., 2020) using the single-case meta-analysis (SCMA) R package (Bulté & Onghena, 2013). A NAP value lower than 0.50 indicates no effect or an effect in the opposite direction as expected; values between 0.50 and 0.65, weak effect; values between 0.66 and 0.92, medium effect; and values between 0.93 and 1.0, large effect (Parker & Vannest, 2009). Cohen's d effect size value lower than 0.20 indicates no effect; between 0.20 and 0.50, weak effect; between 0.50 and 0.80, medium effect; and higher than 0.80, large effect. The PoGO was calculated by hand taking into account (a) the treatment goal of the participant, (b) the expected level of the behavior in the absence of the intervention, and (c) the level of the behavior obtained during the intervention (Ferron et al., 2020). In the present study, the mean score in the baseline phase was used as an estimate of the expected level of the behavior in the absence of the intervention and the mean score of the last 2 weeks of the treatment phase was used as an estimate of the level of the behavior obtained during the intervention. It was only possible to calculate the PoGO if the treatment goal of the participant was quantified. A PoGO value can be interpreted as a percentage of goals obtained with values smaller than 20 indicating no effect; between 20 and 40, weak effect; between 40 and 60, medium effect; between 60 and 80, moderately large; and higher than 80, large effect (Ferron et al., 2020). Participants were excluded from statistical analysis if the compliance rate of the daily survey was below 50% ($n = 2$).

In addition, to test whether severity of alcohol use, measured by the AUDIT, and severity of cannabis and illicit drug use, measured by the DUDIT, decreased from baseline to posttreatment and from baseline to follow-up, the Reliable Change Index (RCI) was calculated for each participant (Jacobsen & Truax, 1991). The RCI was calculated as follows:

$$\mathrm{RC} = \frac{X_2 - X_1}{S_{\mathrm{diff}}}$$

X_2 represents posttest score (i.e., posttreatment or follow-up) and X_1 represents baseline score, S_{diff} is calculated based on the alpha coefficient of the AUDIT and DUDIT (Hildebrand & Noteborn, 2015) and the standard deviation of the pretest score of the 12 participants (Jacobsen & Truax, 1991). An RCI score smaller than –1.96 indicates a clinically

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significant decrease and an RCI score larger than 1.96 indicates a clinically significant increase (Jacobsen & Truax, 1991).

Results

TREATMENT CHARACTERISTICS

Five participants (numbers 1, 4, 7, 8, 11) completed the Take it Personal!+ protocol with a treatment duration between 5 and 11 months. Participant 7 extended the treatment duration during posttreatment by receiving low-frequency sessions (i.e., approximately one session per 2 weeks), with the focus on maintaining his change in alcohol use and decreasing his cannabis use. Other participants did not fully complete the Take it Personal!+ protocol. Participant 2 received treatment until Session 5A, after which he decided to quit treatment because his motivation was too low and he mentioned that some environmental factors needed to improve first before he was able to change his cannabis use. Participant 3 received treatment until Session 7B in 1 year, which is a long treatment duration containing periods of no treatment because of a range of problems; she received eye movement desensitization reprocessing (EMDR) in the same period. After 1 year she was satisfied with the achieved results after which she was referred for treatment targeting other mental health problems, which were associated with cannabis use. Participant 5 received treatment until Session 4B after 2 months; he decided to stop because he achieved his goals and had a 40-hour job, which was also important for him in maintaining the achieved goals. Participant 6 quit with treatment after session 6B because he had a lot on his mind and found treatment too burdensome at that point in his life. In addition, he was satisfied with the decrease he reached and decided that having a job would help to maintain this change. Participant 9 quit treatment after Session 4A, at which time she decided she needed clinical treatment. She had been in clinical treatment a couple of years before and felt that she needed that again. Participant 10 received treatment until Session 6B and parts of 8A/B and 9A because the content of these sessions were important for him (i.e., saying "no"). He decided to stop treatment because he was satisfied with his achievements and had a full-time job, which was important for him in maintaining his achievements. Participant 12 received treatment until Session 6B. He decided to stop at that point because he had a lot on his mind and treatment was too burdensome. In addition, he already decreased his cannabis use and from the court order he needed to quit his cannabis use because of his child.

VISUAL ANALYSIS

Figure 1 shows the course of daily measured substance use per participant in which the horizontal lines represent the mean scores of the phases. Baseline phases appear to be stable across all participants based on visual inspection, except for Participant 12. For this participant the stability is questionable; due to personal reasons the treatment started later, which resulted in an extended baseline phase with missing data of the last 9 days. However, we did not expect the stability to be problematic because the observed trend in the baseline did not continue in the treatment phase.

In 10 participants (3–12), the mean score of daily SU decreased during treatment compared to baseline. Where posttreatment data were available (4, 7, 8, 12), a further decrease in posttreatment was found. In contrast, Participant 2 showed a small increase in mean score during treatment compared to baseline and a stable mean in posttreatment. And Participant 1 showed no change in mean score across the phases.

PERCENT OF GOAL OBTAINED

The PoGO value indicates a large effect in four participants (4, 5, 7, 8) and a moderately large effect in one participant (12; see Table 3). For the other five participants (1, 2, 6, 10, 11) the PoGO could not be calculated as their treatment goals were not quantified. However, they mentioned that they had achieved several goals: Participant 1 mentioned he reached his treatment goal, which is supported by visual analysis, which was drinking not more than three glasses a day since Week 3 of treatment, with one exception in the last week of treatment. Participant 2 mentioned he completed other goals—for example, he had more control over his cannabis use (e.g., he was able to postpone his cannabis use to later in the evening). Participant 6 mentioned he was satisfied with the decrease he reached. Participant 10 mentioned he was satisfied with his achieved results and he reached his goal, which is supported by visual analysis showing a maximum of one joint a day and at most of the days no cannabis use in the last weeks of treatment. At last, Participant 11 mentioned she achieved her goal because she had more control over her cannabis use whereby she mostly smoked recreationally.

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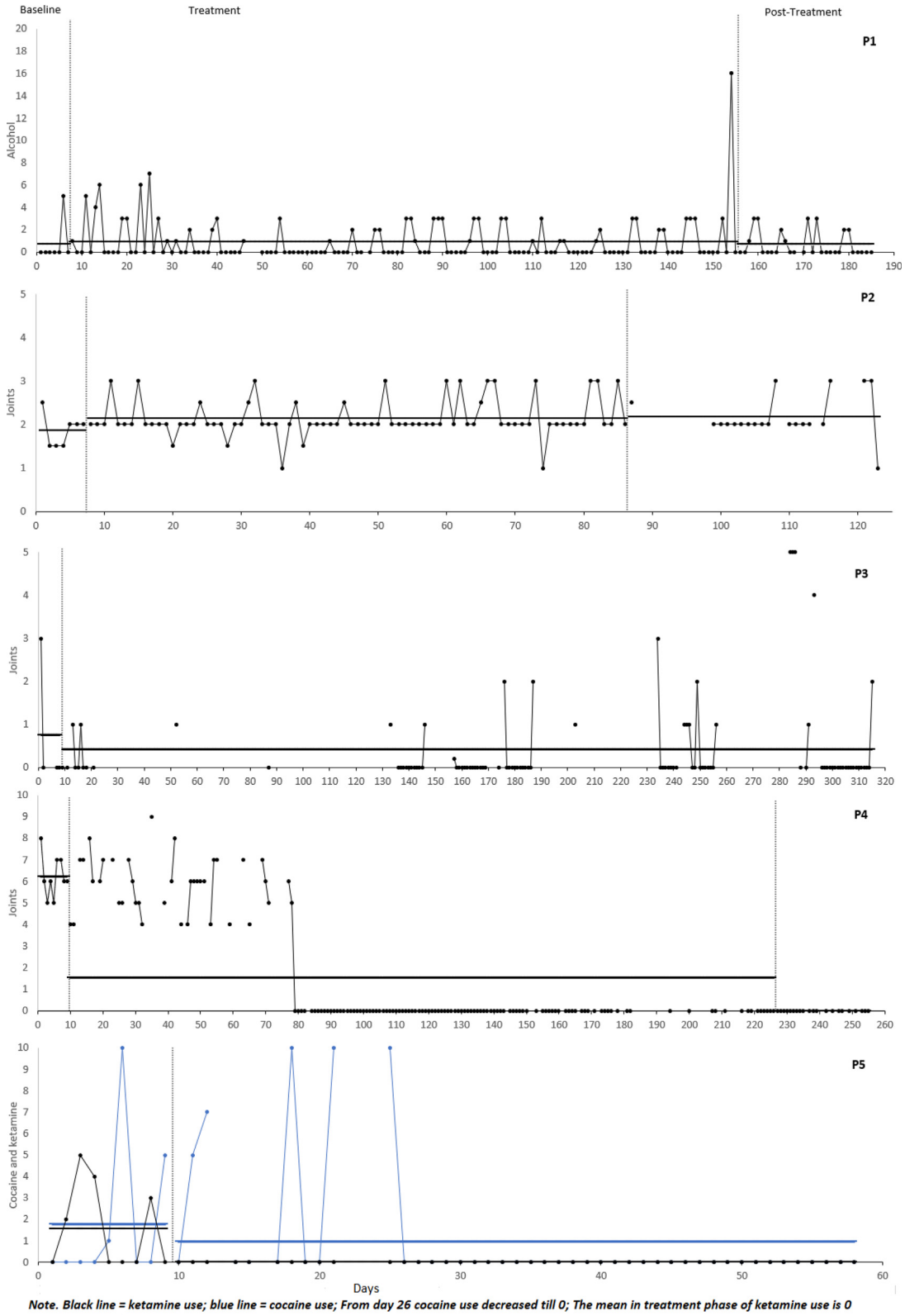

FIGURE 1 Daily measured substance use across phases and participants. *Note.* Due to the variability in treatment duration and quantity of substance use, the values of the *x*-axis and *y*-axis vary between participants.

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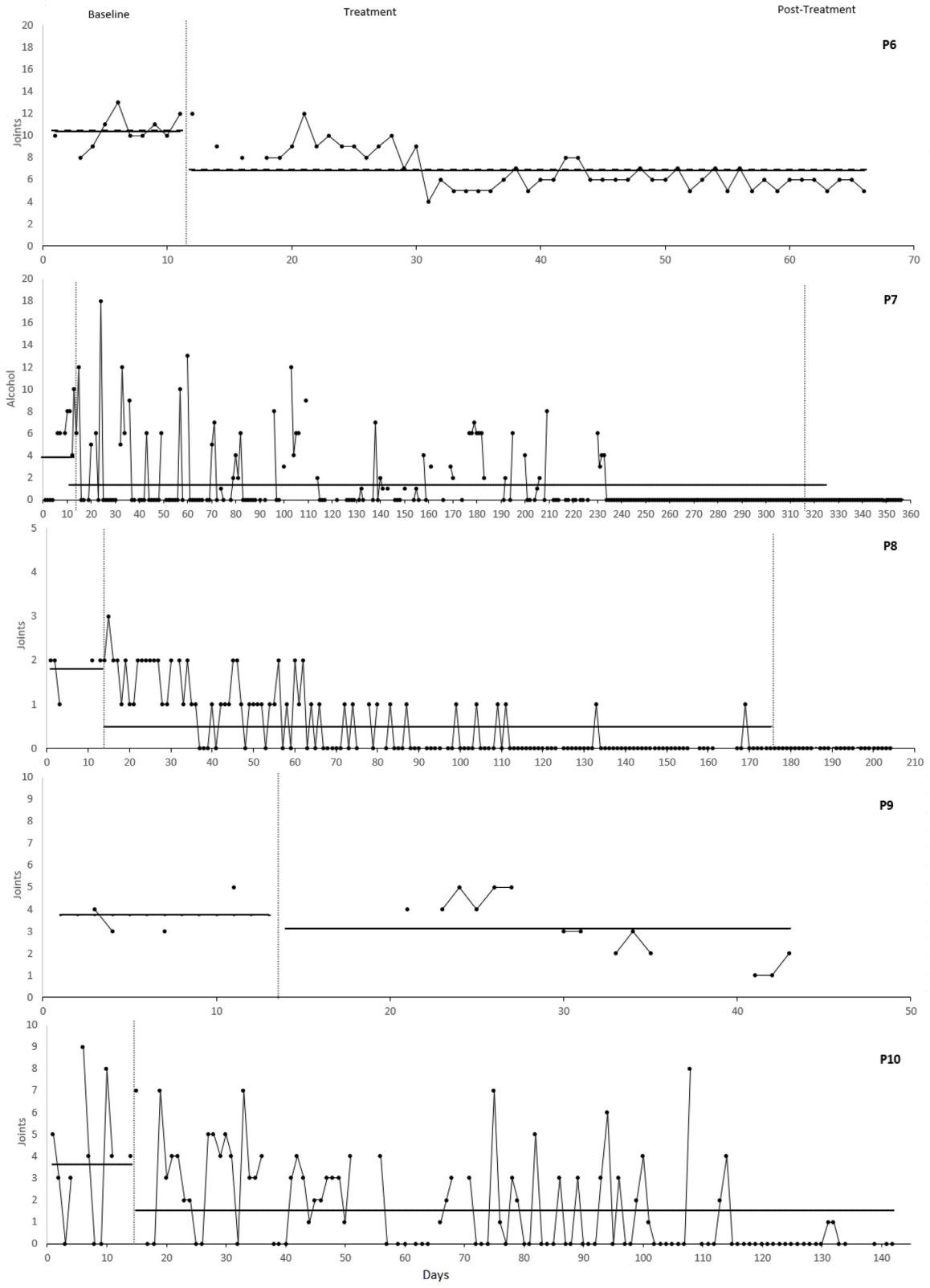

Fig 1. *(continued)*

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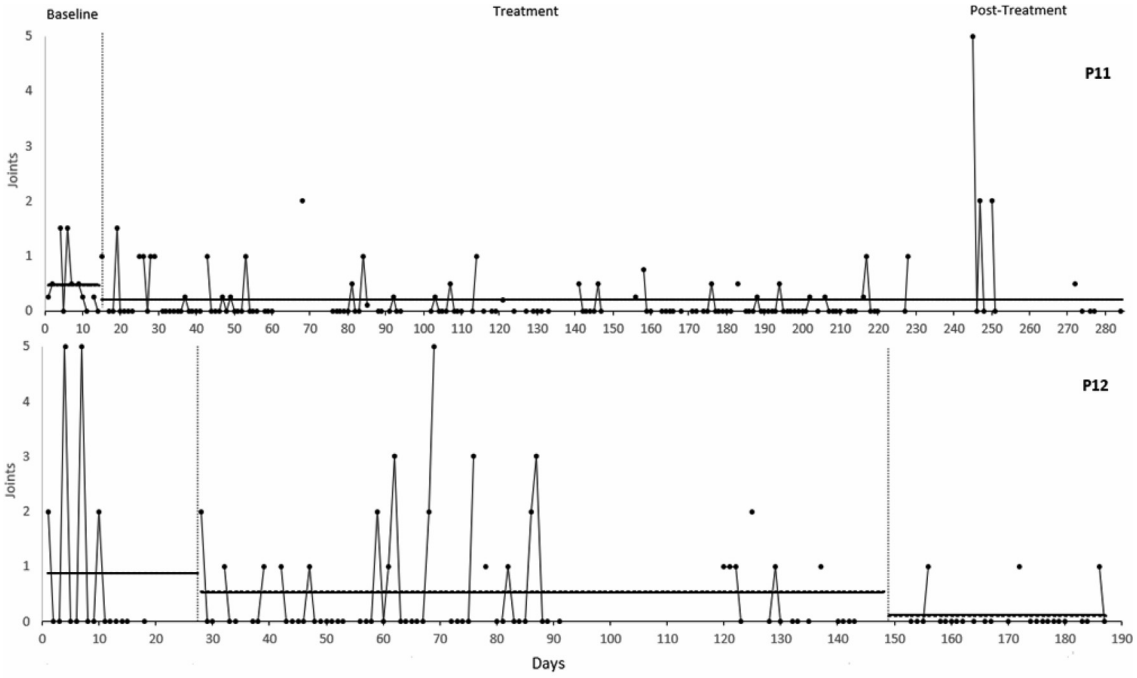

Note. Due to the variability in treatment duration and quantity of substance use the values of the x-axis and y-axis vary between participants.

Fig 1. *(continued)*

Table 3
Effect Sizes and RCI Scores per Participant

	Compliance rate (%)	NAP		Cohen's *d*		PoGO	RCI	
		B-T	B-PT	B-T	B-PT	B-T	B-PT	B-FU
P1	97.3	0.43	0.44	−0.11	0.02	–	−0.99[a]	–
P2	86.2	0.31	0.30	−0.66	−0.68	–	−2.50*[b]	−3.93*[b]
P3	32.6	–	–	–	–	–	5.00*[b]	2.14*[b]
P4	68.2	0.89	1.00	1.81	13.77	100	−7.15*[b]	−7.15*[b]
P5	91.4						−8.82*[c]	–
Cocaine		0.60		0.28		100		
Ketamine		0.72		1.96		100		
P6	86.1	0.93		1.98		–	−2.50*[b]	–
P7	64.8	0.68	0.78	0.84	4.20	100	−9.60*[a]	−9.60*[a]
P8	88.3	0.90	1.00	1.79	10.84	96.0	−3.57*[b]	−5.72*[b]
P9	40.6						1.07[b]	–
P10	85.2	0.71		0.97		–	−2.50*[b]	−3.93*[b]
P11	54.5	0.73		0.49				2.14*[b]
P12	59.7	0.50	0.58	0.30	0.68	79.5	−3.93*[b]	−5.72*[b]

Note. RCI = Reliable Change Index; NAP = nonoverlap of all pairs; PoGO = percent of goal obtained; B = baseline; T = treatment; PT = posttreatment; P = participant.
* Score is significant.
[a] Alcohol Use Disorder Identification Test.
[b] Drug Use Disorder Identification Test—cannabis.
[c] Drug Use Disorder Identification Test—illicit drugs

NONOVERLAP OF ALL PAIRS

In the NAP effect size measure, the overlap of data between phases is analyzed. The NAP value indicates a large effect in Participant 6, a medium effect in six participants (4, 5, 7, 8, 10, 11), a weak effect in Participant 12 and in cocaine use of Participant 5, and no effect in two participants (1, 2) in decreasing daily SU from baseline to treat-

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ment (see Table 3). From baseline to posttreatment, NAP indicates a large effect in two of the six participants (4, 8), a medium effect in Participant 7, a weak effect in Participant 12, and no effect in two participants (1, 2; see Table 3).

COHEN'S D

The Cohen's *d* effect sizes of all participants are depicted in Table 3, indicating a large effect in 6 of the 10 participants (4, 5, 6, 7, 8, 10), a negative medium effect in Participant 2, a weak effect in two participants (11, 12) and in cocaine use of Participant 5, and no effect in Participant 1 in decreasing daily SU from baseline to treatment. In addition, from baseline to posttreatment indicating a large effect in three of the six participants (4, 7, 8), a medium effect in Participant 12, a negative medium effect in Participant 2, and no effect in Participant 1.

RELIABLE CHANGE INDEX

The RCI was calculated (see Table 3) to assess if SU severity significantly changed from baseline to posttreatment and from baseline to follow-up. In eight participants (2, 4, 5, 6, 7, 8, 10, 12), the severity of SU significantly decreased from baseline to posttreatment and, if follow-up data were available, also to follow-up. The RCI scores of Participants 3 and 11 showed an increase in severity of cannabis use. In Participant 3 this can be explained by the fact that the posttreatment measure was conducted 1 month after the last treatment session and the follow-up measure was a new baseline measure. This participant ended up in a "user social network" and was not able to stop with cannabis on her own and restarted with Take it Personal!+. In Participant 11 follow-up data were collected 5 months after the last treatment session.

COLLATERAL EFFECTS

If other substances than the target substance were used at baseline, posttreatment, or follow-up, we also calculated the RCI score for these substances. These RCI scores indicate positive collateral effects on untreated substances in three participants: Two participants (10, 12) showed a significant decrease in alcohol use severity from baseline to follow-up, in addition to the treated cannabis use. One participant (5) showed a significant decrease in cannabis use severity from baseline to treatment and to follow-up in addition to the treated illicit drug use.

In contrast, the RCI score indicates negative collateral effects in two participants: Participant 11 showed a significant increase in illicit drug use severity from baseline to follow-up. Also, Participant 3 showed a significant increase in illicit drug use severity from baseline to posttreatment and to follow-up. After the follow-up measure Participant 3 restarted with Take it Personal!+ also to decrease illicit drug use. In both participants the daily measures showed no illicit drug use during treatment, which indicates that they started to use illicit drugs after treatment.

Discussion

The aim of this study was to evaluate the effectiveness of Take it Personal!+, a personalized MI-CBT SUD treatment for individuals with MID-BIF. Overall, Take it Personal!+ was effective in decreasing daily SU in 8 of 10 participants with maintenance of these effects at least 1 month (if data were available). Take it Personal!+ was also effective in decreasing SU severity in 8 of 12 participants with maintenance of these effects at least 3 months (if data were available). Overall, the results suggest that MI and CBT can be effective in individuals with MID-BIF and SUD, which is in line with the outcomes of studies in individuals without MID-BIF (Davis et al., 2015; Naar & Safren, 2017; Riper et al., 2014; Smedslund et al., 2011).

In two participants the severity of SU was increased at follow-up. In one of these participants the follow-up data were collected 5 months after treatment instead of 3 months and posttreatment. Therefore, it is unknown whether treatment was not effective at all or if the effects were not maintained after 5 months. In the other participant it was clear that she had ended up in a user social network. Both participants showed an increase in untreated SU in addition to the increase in treated SU. Research has shown that if recovery is less socially embedded, the risk of using other substances is higher (Hodgins et al., 2017). In individuals with MID-BIF this seems more important due to their vulnerability of peer pressure and the need of a caregiver to generalize skills (Willner & Lindsay, 2016).

In three of the eight participants results showed a decrease in severity of untreated SU in addition to the decrease in treated SU. This is in line with research in individuals without MID-BIF that showed that in polysubstance users an intervention can affect multiple substances (Hodgins et al., 2017). As far as we know this is the first study assessing untreated SU in individuals with MIB-BIF. The positive collateral effects are remarkable because the target group is known to have problems in response generalization (i.e., change in nontargeted behavior; Park et al., 2020). However, some individuals showed no change in

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untreated SU. Therefore, it is unknown whether these individuals had problems in generalization or other SU was not problematic and change was not necessary.

In addition to the main findings of the study, the study provided some additional outcomes that are worth discussing here. First, results provided preliminary support for the feasibility of daily measures in individuals with MID-BIF and SUD. As far as we know, this is the first study applying daily surveys for a long period (i.e., varied between 2 and 12 months) in individuals with MID-BIF. The average compliance rate in this study was 71.2%, which shows that individuals with MID-BIF are on average able to fill in a daily survey during a relatively long period of time. However, the compliance rate fluctuated between and within participants (i.e., varied between 32.6% and 97.3%) in which we see similarities with treatment characteristics: Individuals with more "no shows" or periods of no treatment also had a lower compliance rate. Although an earlier study tested the feasibility, reliability, and validity of a variant of daily measures (i.e., experience sampling method; Wilson et al., 2020), further research is recommended to determine the feasibility of daily measures in research in individuals with MID-BIF and SUD.

Second, another important finding of the present study was the large variation in treatment duration (i.e., between 2 and 12 months). The need to adapt the duration of CBT to the individual needs of clients has been stressed by other researchers (Mennis et al., 2019; Persons & Thomas, 2019). Take it Personal!+ was originally designed to last for 11 weeks—however, in this study therapists were explicitly told they were free in adjusting the duration of the intervention to the needs of the participants. The variation in treatment duration can be explained by several reasons (e.g., quit treatment because of a job, shorter sessions, more repetition, no-shows, complex problems), and is reflective of the high level of personalization and adaptation of the treatment to the individual.

Take it Personal!+ was examined under real-world circumstances of daily practice in health care organizations for people with MID-BIF in the Netherlands. Unlike in most other countries, people with both MID and BIF are eligible for these specialized facilities. Individuals with BIF function on the border between normal intellectual functioning and intellectual disability (Martinez-Leal et al., 2020). Clinical assessment mostly accompanied by standardized intelligence tests (sometimes long before inclusion in the current study) has resulted in admission of our participants in MID-BIF care. Although Full-Scale IQ is no longer leading as diagnostic indicator of both MID and BIF, we derived IQ scores from client files. Results show that five participants with disharmonic intelligence profiles score on some subscales above the cutoff of 85 (common criterion BIF IQ 70–85). Based on clinical assessment, our participants were evidently at some point in their lives diagnosed with MID or BIF and admitted to specialized MID-BIF care. We do not have information on the course of IQ scores of these cases, but other research has indicated that on population level Full-Scale IQ among individuals with MID-BIF is relatively stable, on individual level IQ scores are only moderately stable (Jenni et al., 2015). Willingness, motivation, attention, stress, and fatigue during IQ assessments may play a role in explaining changes in IQ scores, rather than true change of IQ (Jenni et al., 2015). Also, in our participants with comorbid problems related to mental instability, distress, and attention, this might have been the case; notwithstanding, results of these cases should be generalized with care.

Comorbidity of SU and psychological problems is known to be high in this population, which stresses the importance of a comprehensive screening at the start of treatment (Van Duijvenbode & VanDerNagel, 2019). In the present study, seven participants dropped out of treatment within the first 2 weeks. Suffering from mental health problems was given as the main reason for dropout. This may indicate that the screening at the start of this treatment was not comprehensive. A comprehensive screening at the start of the intervention may not only prevent patients from dropping out of the treatment, it also helps guide them toward the treatment that fits best for them. This in turn may lead to more effective and efficient care.

Some limitations of this study warrant consideration. First, 2 of the 12 participants had a low compliance rate, making it impossible to establish the effectiveness of the intervention. In addition, 6 of the 12 participants did not fill in daily surveys during posttreatment, making it impossible to assess whether the decrease of daily SU was maintained at posttreatment. Moreover, we had a follow-up measure only at 3 months; therefore, longer-term effects of Take it Personal!+ are unknown. Future studies should put more effort in establishing the long-term effects of the intervention (e.g., 6-month and 1-year follow-up), while keeping in mind that dropout is high.

Second, despite the positive findings of the intervention, these effects are not sufficient to establish

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generalizability of our findings to the other clients with a MID-BIF and SUD. Replication in a multiple baseline design, as well as with other designs, is necessary for the generalizability of the results. In this study we had direct replications (e.g., same therapist) and systematic replications (e.g., different participants' characteristics, different therapist and settings). However, to establish an evidence-based treatment, research has to be conducted by a minimum of three different research teams with the combined number of minimal 20 cases (Kratochwill et al., 2010, 2013).

Third, the outcome data are based on self-report, which may increase the risk of acquiescence bias. However, a study by VanDerNagel et al. (2017) showed that SU assessments in individuals with MID-BIF based on self-report measures are similar to those based on biomarker analysis, indicating that self-reports are accurate to assess SU in individuals with MID-BIF.

Last, this is the first study evaluating the effectiveness of a personalized MI-CBT SUD treatment in decreasing SU in individuals with MID-BIF. The results of this study showed that adapted MI-CBT can be effective in decreasing SU in individuals with MID-BIF and SUD. Future research is necessary to establish whether Take it Personal!+ is an evidence-based treatment and effective in the long run.

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