



The predictive value of brief measures of externalizing behavior and internalizing problems in young people receiving substance use treatment: A secondary analysis

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ARTICLE INFO

Keywords:

Young adults
Substance use
Externalizing
Internalizing
Substance abuse treatment
Brief screening

ABSTRACT

Background: Identifying people at risk of poor outcomes following treatment for substance use disorders is important for developing tailored services. The aim of this study was to test whether a brief measure of internalizing and externalizing behavior could identify young adults at high risk of psychiatric care episodes and criminal offending up to four years after enrolment in treatment for substance use disorder.

Methods: Clients aged 15–25 years from a randomized multicenter study were included (N = 457). At baseline, all completed the YouthMap12 screener, a measure of internalizing symptoms (IP6) and externalizing problems (EP6). We used accelerated failure time regression to assess time to psychiatric care and criminal offending, adjusting for baseline occurrence, gender, age, treatment group, and uptake area. Youden's J was used to assess optimal cut-points for risk of events.

Results: The IP6 was associated with shorter time to psychiatric care following treatment enrolment (beta = -0.71, 95% confidence interval [CI] = -0.94 to -0.48; adjusted beta = -0.45, 95% CI = -0.66 to -0.25). The EP6 was associated with shorter time to criminal offending, coefficient = -0.32, 95% CI = -0.44 to -0.19; adjusted coefficient = -0.18, 95% CI = -0.30 to -0.06). Optimal cut-points were two or more for the IP6 and three or more for the EP6.

Conclusions: The IP6 and the EP6, two simple and easily administered instruments, can identify young adults who are at an increased risk of future criminal offending or in need of psychiatric care. The findings lend support to using the 12-item YouthMap, as it identifies relevant risks, is compatible with local service delivery needs, and is theoretically and empirically supported.

1. Introduction

1.1. Young adults' substance use

Substance use is a serious public health problem in young adults, and problematic use of drugs or alcohol during adolescence is associated with other risky behaviors such as risky sexual behavior, risky driving, and criminal behavior (Heerde & Hemphill, 2016; Krohn, Lizotte, & Perez, 1997), as well as the risk of developing a substance use disorder (Crabbe, Harris, & Koob, 2011; Grant et al., 2006). A recent review of diseases, injuries, and other risk factors affecting the health of young

people by Mokdad et al. (2016) highlighted the ages of 15–19 as particularly risky for young adults worldwide. In the study, accidents and injuries (including road injuries, interpersonal violence, self-harm, and drowning) were the top causes of death in this age group, while substance use was one of the leading causes of disability (Mokdad et al., 2016).

As many negative outcomes are linked to substance use among young adults, providing effective and timely treatment has great potential to prevent further harms and adverse consequences for the young adults, their families, and society as a whole. However, although promising interventions targeting substance use problems in adolescents and

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<https://doi.org/10.1016/j.addbeh.2022.107574>

Received 17 August 2022; Received in revised form 10 November 2022; Accepted 5 December 2022

Available online 10 December 2022

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young adults have been developed in recent decades, including family-based interventions (Austin, Macgowan, & Wagner, 2005; von Sydow, Retzlaff, Beher, Haun, & Schweitzer, 2013), relatively few young people receive treatment and long-term abstinence rates remain low (Brewer, Godley, & Hulvershorn, 2017; Feldstein Ewing, Apodaca, & Gaume, 2016).

1.2. Externalizing behavior problems

Problematic substance use often co-occurs with mental health conditions (Kessler, Berglund, Demler, Jin, & Walters, 2005). Among the most common co-occurring conditions are disorders characterized by impulsive and destructive behaviors, such as conduct disorder and attention-deficit/hyperactivity disorder (Pianca et al., 2016), often referred to as externalizing psychopathology (Achenbach, Ivanova, & Rescorla, 2017). Beyond specific psychiatric disorders, externalizing problems may also include truancy and aggressiveness (Knollmann, Reissner, & Hebebrand, 2019). The co-occurrence of substance use disorders and externalizing behavior problems poses a challenge to treatment for substance disorders, as clients presenting with these co-occurring problems have poorer outcomes, more difficulties engaging in treatment, and higher treatment dropout rates (Blonigen, Bui, Britt, Thomas, & Timko, 2016; Levin, Evans, Brooks, & Garawi, 2007; Wise, Cuffe, & Fischer, 2001).

1.3. Internalizing problems

In addition to externalizing problems, many young adults with substance use disorders suffer from conditions such as anxiety or depression, commonly referred to as “internalizing disorders” (Hawke, Koyama, & Henderson, 2018; Kuitunen-Paul, Roessner, Basedow, & Golub, 2021), and experience other internalizing problems such as hypochondriasis or obsessions (Goodman & Scott, 1999). While these types of co-morbid difficulties may have minimal impact on abstinence or retention in substance use disorder treatment, they have a significant impact on quality of life (Shirowa, Noto, & Fukuda, 2021; Yang et al., 2021). Screening could identify people with co-occurring anxiety or depression in need of psychiatric care or psychotherapy (Delgado et al., 2015a).

1.4. The interaction between internalizing and externalizing problems

Externalizing problems may interact with internalizing problems so that one type of problem has different effects in the presence of the other. For instance, internalizing problems may be associated with substance use but only when externalizing problems are also present (Maslowsky & Schulenberg, 2013). There is also evidence suggesting that internalizing problems may have some protective effect on substance use, as people with externalizing problems and high levels of internalizing problems are less likely to use substances (Colder et al., 2018). Further complicating the matter, people with externalizing problems may have reduced access to psychiatric care because this type of behavior is perceived as “difficult” by mental health providers; for instance, people with drug use disorders who report more criminal offending are less likely to receive later psychiatric care (Thylstrup, Bloomfield, & Hesse, 2018).

1.5. The need for brief, validated screening instruments

Methods that help clients cope with co-occurring substance use problems and externalizing behavior might improve treatment outcomes (Delgado et al., 2015b; Hesse, 2009; Watkins et al., 2011). As externalizing behavior is likely to negatively impact treatment prognosis, interventions should ideally be able to address high levels of behavioral problems through targeted treatments (Edalati, Afzali, Castellanos-Ryan, & Conrod, 2019; Hesse & Thylstrup, 2012; Thylstrup

& Hesse, 2016; Thylstrup, Schroder, & Hesse, 2015). However, in order to identify individuals with internalizing or externalizing problems, we need an instrument that is easy to administer in clinical practice.

Screening tools are important elements in treatment and can be used to identify difficulties that individuals currently experience, as well as factors that may predict future problems. Such instruments should be brief and easily administered in clinical practice in order to minimize treatment costs and strain on clients. The use of such instruments should be guided by at least three considerations: (a) their appropriateness for the intended use, (b) their technical adequacy, and (c) their usability (Glover & Albers, 2007). An example of such an instrument is the ASRS v.1.1. that was developed to assess ADHD symptoms in adult populations and recently has been adapted for adolescent populations (Sonnby et al., 2015). However, while the ASRS v.1.1. has strong psychometric properties as well as acceptable specificity and sensitivity in assessing ADHD symptomatology, even in adult substance use treatment populations (Daigre et al., 2009), there is a need for brief instruments that measure externalizing problems more broadly in order to capture those with behavioral problems who do not qualify for a diagnosis such as ADHD.

1.6. The YouthMap and the YouthMap12 screener

The YouthMap is a structured interview developed for treatment planning and monitoring purposes in substance use treatment services in Denmark. It was developed in collaboration with several Danish outpatient community treatment centers that primarily serve adolescents and young adults with substance use problems. At present, the YouthMap is used in more than 70 of the 92 municipalities in Denmark.

The YouthMap consists of 70–90 items (depending on responses to filter questions) and includes questions about drug and alcohol use, physical condition, sleep patterns, social and family relations, academic skills/problems, stressful/traumatic experiences, and mental/behavioral problems. Several of the items were adapted or selected from widely used instruments, such as the European Adolescent Drug Abuse Diagnosis (Friedman, Terras, & Oberg, 2001) and the European Addiction Severity Index (Blacken et al., 1994).

The YouthMap contains the YouthMap12, a brief two-factor screener for externalizing and internalizing behavior problems (Pedersen, Romer Thomsen, Pedersen, & Hesse, 2017; Pedersen et al., 2018). The YouthMap12 screener comprises two subscales: a six-item scale measuring externalizing problems (EP6) and a six-item scale measuring internalizing problems (IP6) (Pedersen et al., 2017).

Latent class analysis indicated that the YouthMap12 screener was able to identify six groups at various levels of risk in the general population: Low, Moderate internalizing, Severe internalizing, Moderate externalizing, Severe externalizing, and Mixed with both internalizing and externalizing problems. Respondents classified as Moderate/Severe externalizing or Mixed were more likely to report regular use of cigarettes, cannabis, and alcohol. Respondents classified as Mixed or Moderate/Severe internalizing were more likely to report use of over-the-counter and prescription medicine (Pedersen et al., 2017). The results have since been replicated across multiple samples from other countries (Pedersen et al., 2018). However, until now, no studies have been published on the usefulness of the YouthMap12 screener in clinical samples.

For clinical use, we reduced the six groups so that the Moderate externalizing and Severe externalizing groups were collapsed into one group, and the Moderate internalizing and Severe internalizing groups were collapsed into one group. Thus, in this study, there are four groups: Low, Internalizing, Externalizing, and Mixed.

1.7. Aims

Using data from a randomized clinical trial, the aim of this study was to assess the validity of the YouthMap12 in terms of identifying young

adults at high risk of psychiatric episodes or criminal offending after enrolment in substance use treatment. Our hypothesis was that high EP6 scores would identify young adults at high risk of criminal offending leading to convictions, while high IP6 scores would be associated with receiving psychiatric care. Further, we aimed to assess optimal cut-points for the EP6 to predict future convictions and for the IP6 to predict future psychiatric care. Using these cut-points, we aimed to identify evidence-based groups at high risk for offending and psychiatric care. Based on the assumption that young adults with high scores on both the EP6 and the IP6 (Mixed) could potentially have worse outcomes than those scoring high on one scale only, we assessed interactions between the IP6 and EP6 scales to predict both outcomes.

2. Methods

2.1. Parent study

The results of the present study are based on a multicenter randomized controlled trial comparing four interventions: 1. Standard treatment consisting of 12 sessions using cognitive behavioral therapy and motivational interviewing (N = 113); 2. Standard treatment plus \$33 vouchers for attendance delivered at every other session (N = 112); 3. Standard treatment plus a mutually agreed upon treatment contract, text reminders before each treatment session, a written treatment status every four weeks, and six-month follow-up treatment (N = 112); and 4. Standard treatment plus \$33 vouchers for attendance, a mutually agreed upon treatment contract, text reminders before each treatment session, written status every four weeks, and six-month follow-up treatment (N = 120). Details of the study have been previously published (Del Palacio-Gonzalez, Hesse, Thylstrup, Pedersen, & Pedersen, 2021; Hesse, Thylstrup, Karsberg, Mulbjerg Pedersen, & Pedersen, 2021; Pedersen et al., 2021).

2.1.1. Setting and participants

The trial was carried out at nine community outpatient substance use treatment centers in Denmark. Eligibility criteria included being between the ages of 15 and 25 years and entering treatment for a non-opioid drug use disorder. Clients were excluded from the trial if they had been expelled from the clinic due to threats or violent behavior against staff members, if they had one or more psychotic disorders, or if they had severe cognitive deficits as indicated by a diagnosis of mental retardation.

2.1.2. Procedures

From September 2014 to May 2016, a total of 545 clients signed a written consent to participate in the study and were randomly assigned to one of the four treatment groups. At the first session, after enrolment in the study, the counsellor completed a YouthMap interview with the client and entered the responses into a secure web-based interface. These responses constitute the study's baseline data. As 85 clients never showed up to their baseline assessment and another three had invalid individual identifier numbers, the present study is based on the remaining 457.

2.1.3. Measures

We used the YouthMap12 screener to measure internalizing and externalizing problems. For the present sample, McDonald's reliability scores were $\omega = 0.72$ for the externalizing sub-scale and $\omega = 0.72$ for the internalizing sub-scale. In addition to the EP6 and IP6, the YouthMap form contained questions about past 30-day use of cannabis, cocaine, MDMA, amphetamine, and "other drugs". Additionally, the YouthMap contained questions about frequency and quantity of alcohol intake. The YouthMap12 screener is available as [Appendix A](#), reproduced with permission from Elsevier.

2.1.4. Ethics

The study was approved by the Danish Data Protection Agency and the Regional Committee for Medical and Health Research Ethics, Denmark. All participants signed an informed consent form. For participants aged 15–17 years, parents were informed about the study; however, informed parental consent is only required for study participants younger than 15 years of age in Denmark.

2.2. Outcomes

Outcome variables were drawn from the Danish Psychiatric Central Research Register (Mors, Perto, & Mortensen, 2011) and the Danish Central Crime Register (Seid, Hesse, Houborg, & Thylstrup, 2021).

A psychiatric care episode was defined as any hospital-based episode in which a psychiatric diagnosis was given. Psychiatric diagnoses included any of the following ICD-10 codes: F2X (schizophrenia and related disorders), F3X (mood (affective) disorders), F4X (neurotic, anxiety, and somatoform disorders), or F6X (disorders of adult personality and behavior) (World Health Organization, 2004).

A criminal offense was defined as any violent, sexual, or property offense leading to a conviction (i.e., excluding instances in which charges were dropped or the participant was found not guilty). The date of offense was defined as the date on which the police indicated that the offense had begun, as, in some instances, such as drug dealing, offending may take place over a long period.

For both outcomes, we calculated time-to-event as the date of the first such event after study enrolment. Participants were censored at December 31st 2018 if no event had occurred.

2.3. Statistical analyses

Means, standard deviations, and percentages are reported for descriptive statistics. We used accelerated failure time regression analysis to assess prospective associations between the EP6 and the IP6 and offending leading to convictions or psychiatric care episodes after enrolment in treatment. For both outcomes, the maximum follow-up time was 4.3 years. We report median time to event, mean number of events per observation year, and median time to event for those who had the event.

For both outcomes, we estimated accelerated failure time models with no covariates for Weibull, exponential, log–log, log-normal, exponential, and generalized Gamma distributions; we then selected the model with the lowest value on the Schwartz information criterion, which, in both cases, was the log-normal distribution.

In the next model, we calculated the uni-variable relationship between the IP6 and the EP6 and time to psychiatric care episode and offending. In the final adjusted models, we controlled for previous history of criminal offending or psychiatric care (in the models investigating the EP6 and IP6, respectively), gender, age, and treatment group, with a random intercept for site.

We chose to control for baseline history of offending or psychiatric care in order to attenuate the impact of the correlation between our screening measures and baseline history of the outcome. However, this does not mean that our analyses predicted change in status (Sorjonen, Melin, & Ingre, 2019).

Finally, we analyzed the interactions between the IP6 and gender in predicting psychiatric care episodes and the EP6 and gender in predicting offending leading to conviction. To assess whether the interactions were a better fit than the simple models without interactions, we only selected interaction models when they had lower values on the Schwartz information criterion compared with the models without the interaction (e.g., we only report the interaction effect between EP6 and gender as the predictor of offending if the model with EP6 by gender was a better fit than EP6 plus gender).

We estimated optimal cut-points for the EP6 to predict later offending, as well as optimal cut-points for the IP6 to predict later

psychiatric care episodes using Youden’s J (Youden, 1950). This statistic is generally as good as, or better than, alternative statistics used to identify cut-points for diagnostic tests (Hajian-Tilaki, 2018), although its usefulness will depend on both the prevalence of the condition for which it tests and the costs of false negative and false positive tests (Smits, 2010). Further, we calculated the positive and negative predictive values for the EP6 and the IP6 at the cut-points derived from Youden’s index (Altman & Bland, 1994).

3. Results

Descriptive statistics are reported in Table 1. Participants were predominantly male, with a mean age of 20.5 years. At the time of admission, clients had used cannabis an average of 20 days within the past month, and 20% had consumed alcohol above the Danish Board of Health thresholds for harmful use (i.e., 14 units of alcohol per week for women and 21 for men).

3.1. Offending leading to conviction

After enrolment in treatment, 228 (49.9%) committed an offense leading to a conviction. The incidence of convictions was 0.22 per person-year, and the median time to first offense was 3.6 years. Among the subset of participants who committed an offense leading to conviction, the median time to offense was 0.6 years.

Table 2 shows the predictors of offending leading to conviction during follow-up. The EP6 was associated with time to first offending in both the unadjusted ($p < .001$) and the adjusted models ($p = .005$). In both the unadjusted model ($p = .001$) and the adjusted model ($p = .007$), IP6 was associated with longer time to offending.

We assessed whether IP6 and EP6 interacted to predict higher risk of offending after treatment enrolment. However, the interaction was not significant, and the model was not a better fit than the simple model (BIC for interaction model = 3943.1; BIC without interaction = 3754.0; results not shown). Finally, we assessed whether a model in which EP6 interacted with gender to predict time to offending was a better fit than a model in which the two were added as separate covariates in the same model. The model with no interaction had a lower Schwartz Information

Table 1
Descriptive statistics (N = 457).

Gender	N	Percentage
Men	352	77.0
Women	105	23.0
Age (mean/standard deviation)	20.5/2.6	
In education, employment, or training		
No	235	51.0
Yes	222	49.0
Treatment condition		
Condition 1	113	24.7
Condition 2	112	24.5
Condition 3	112	24.5
Condition 4	120	26.3
Grouping according to the EP6/IP6		
Low	107	23.4
Externalizing	186	40.7
Internalizing	54	11.8
Mixed	110	24.1
Past psychiatric history		
No	326	71.3
Yes	131	28.7
Past conviction		
No	252	55.1
Yes	205	44.9

Notes: EP6: externalizing problems six-item scale. IP6: internalizing problems six-item scale. Low: Low externalizing and internalizing problems. Mixed: Severe externalizing and internalizing problems.

Table 2
Predictors of time to criminal offending (n = 457).

	Univariate	P-value	Multivariable	P-value
EP6	-0.32 (0.44 to -0.19)	<0.001	-0.18 (-0.30 to -0.06)	0.005
IP6	0.29 (0.13 to 0.45)	0.001	0.22 (0.07 to 0.38)	0.007

Notes: EP6: externalizing problems six-item scale. IP6: internalizing problems six-item scale. Multivariable models included a random slope for uptake area and controlled for both measures, gender, age, treatment condition, and a history of conviction (EP6) or psychiatric hospitalization (IP6).

Criterion (3755.4) than the model with an interaction (3757.7). Thus, we do not report the interaction.

3.2. Predictors of psychiatric care

After enrolment in treatment, 98 received psychiatric care (21.4%). The incidence of psychiatric care was 0.07 per person-year, and the median survival time was 4.3 years. For those who did have an episode of psychiatric care, the median time to first episode was 1.1 years.

Table 3 shows the predictors of time to psychiatric care during follow-up. The IP6 was associated with time to psychiatric care in both the unadjusted ($p < .001$) and the adjusted models ($p < .001$). In the unadjusted model, EP6 was associated with longer time to psychiatric care ($p = 0.045$), although this did not hold in the adjusted model ($p = 0.140$).

We assessed whether IP6 and EP6 interacted to predict higher risk of psychiatric care after treatment. However, the interaction was not significant, and the model did not fit the data as well as the simple model (BIC for interaction model = 1837.2, BIC without interaction = 1832.1, results not shown). Finally, we assessed whether a model in which IP6 interacted with gender in predicting time to psychiatric care was a better fit for the data than a model in which the two were added as separate covariates in the same model. The model with no interaction had a lower Schwartz Information Criterion (1820.3) than the model with an interaction (1826.3). Thus, we do not report the interaction.

3.3. Cut-points for the EP6 and IP6

We estimated optimal cut-points for the EP6 to predict later offending, as well as optimal cut-points for the IP6 to predict later psychiatric care using Youden’s J. The derived cut-point for the EP6 was three or more points, yielding a probability value of 0.5. At three or more points, both the sensitivity and the specificity of the EP6 were 58%. The positive predictive value at this cutoff was 0.58, and the negative predictive value was 0.58.

For the IP6, the optimal value to predict psychiatric care was two or more points, yielding a probability value of 0.50. At two or more points, the sensitivity of the IP6 was 48.0% and the specificity was 84.7%. The positive predictive value at this cutoff was 0.35, and the negative predictive value was 0.86.

The Kaplan-Meier graphs using a four-group classification based on the adjusted cut-points are shown in Fig. 1. The time to events is capped at four years because of the small number of study participants at risk beyond this point. As can be seen, participants belonging to the group classified as Internalizing were more likely to receive psychiatric care

Table 3
Predictors of time to psychiatric care (n = 457).

	Univariate	P-value	Multivariable	P-value
EP6	0.21 (0.00 to 0.41)	0.045	0.13 (-0.04 to 0.30)	0.140
IP6	-0.71 (-0.94 to -0.48)	<0.001	-0.45(-0.66 to -0.30)	<0.001

Notes: EP6: externalizing problems six-item scale. IP6: internalizing problems six-item scale. Multivariable models included a random slope for uptake area and controlled for both measures, gender, age, treatment condition, and a history of conviction (EP6) or psychiatric hospitalization (IP6).

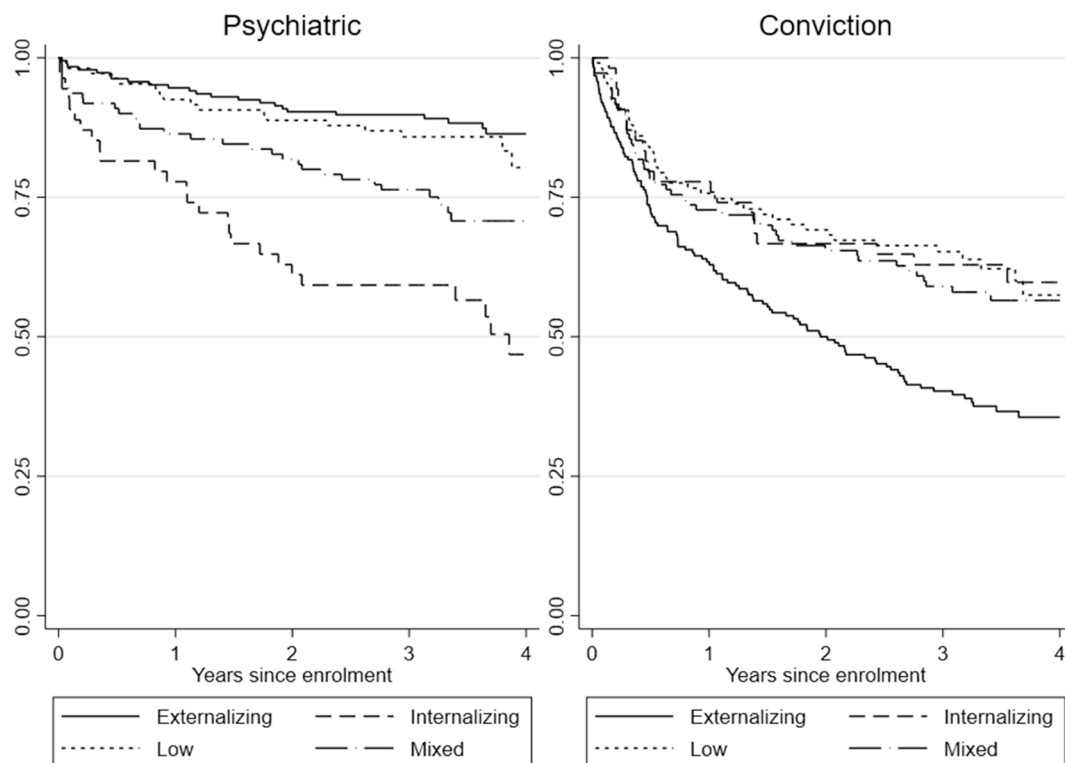


Fig. 1. Time to psychiatric care (left-hand panel) and offending (right-hand panel) by categorization ($n = 457$).

than any of the other groups, with the group classified as Mixed falling between the Low and Externalizing groups and the Internalizing group. Participants belonging to the group classified as Externalizing were more likely to offend with no obvious differences between the other groups.

4. Discussion

In accordance with our hypotheses, after treatment enrolment, the EP6 was associated with later offending, and the IP6 was associated with later psychiatric care. None of these associations varied by gender, indicating that they may be useful in young adults of both genders seeking treatment for drug use disorders. These findings indicate that the EP6 in the YouthMap12 is useful in identifying young adults entering substance use treatment who are at risk of offending during treatment, and that the IP6 is useful in identifying youth who are likely to need future psychiatric care.

Our findings add to the literature by including real-world outcomes associated with costs to society and, in the case of crime, harms to others. The limited research that exists on externalizing and internalizing symptoms in clinical samples is mainly focused on self-report and associations with other self-report measures, such as motives for drinking (Savage & Dick, 2023), or on criminal justice populations (Wojciechowski, 2021).

Unexpectedly, EP6 was associated with longer time to psychiatric care. This finding may reflect that young adults with drug use and high levels of externalizing problems are less likely to experience any psychiatric difficulties, but it may also reflect that they are less likely to receive care even if they need it. Further, the IP6 was associated with longer time to criminal conviction, even after adjusting for covariates. As of now, we can only speculate why someone with more internalizing psychiatric symptoms would be less prone to commit a crime after enrolling in treatment than their peers with fewer of these symptoms.

Another unexpected finding was that none of the interactions were significant, and, thus, we did not find any evidence that the combination

of internalizing and externalizing problems was worse than either problem alone.

It is important to note that the aim of the IP6 and EP6 is not to predict psychiatric care and offending, respectively, but to provide information about a client's level of severity on the two dimensions of internalizing and externalizing difficulties in the HiTop model (Krueger et al., 2021). The two outcomes that we used for this study should be considered indicators of high severity of the two dimensions.

Our analyses of cut-points for the two scales indicated that most of the young adults in this study would be considered at high risk of offending behavior, needing psychiatric care, or both. Given that these findings are based on relevant real-world outcomes, it does not make sense to classify the two measures as over-inclusive. Some young adults who offend will not be arrested or convicted, and some young adults who need psychiatric care will not receive it, or will receive it in the primary healthcare sector.

As a result, young adults who score above the suggested cutoffs in the YouthMap12 can be considered at high risk of problematic outcomes, and adequate steps should be taken to ensure that substance use disorder treatment is delivered with this risk in mind. Such steps may include assessing the client's own perspective on experiences with internalizing and/or externalizing problems when providing feedback on assessment results and utilizing these experiences to determine the goals of treatment in collaboration with the client. It is important, however, to note that a substantial proportion of clients who scored below the cutoff on the EP6 in this study did go on to offend, so the EP6 does not identify all those in need of interventions to prevent offending. It is possible that adding more information about offending risk from other instruments or from the client's history, such as previous offending, involvement with others involved in offending, or lack of non-criminal support, could improve identification of those who need assistance to prevent offending. Similarly, nearly half of those who went on to enter psychiatric care were not identified by the IP6. Some may have entered care for disorders that are not internalizing, including psychotic disorders (Kotov et al., 2020). Again, adding other information such as client history or even

family history could improve prediction, ensuring that more clients in need of support would receive this support. For both the EP6 and the IP6, adding more information would require work, and it is possible that standard intake forms for treatment involvement already include such information (as does the full YouthMap form).

Some limitations of this study must be acknowledged. Having several competing models of assessment could provide additional information about the relative usefulness of the brief YouthMap12 screener in terms of predicting the outcomes chosen for this study. Future studies could address differences in the predictive validity of competing measures. That said, the present study also had a number of strengths: a relatively long follow-up time, the use of outcome measures that are not subject to common methods variance with the predictors, and a reasonably large sample size for a clinical study of this type.

We did not have detailed information about primary substance of abuse, and we did not include a diagnostic interview to assess substance use disorders. The purpose of the YouthMap in general is to provide an overview of current challenges and resources in the life of the individual client, and future studies could include validated measures of substance use severity more specifically. In addition, the present cohort comprised mainly young adults with frequent cannabis use and excluded those using opioids. Thus, the findings may not generalize to young adults who use other types of substances, including opioids, benzodiazepines, or alcohol.

In terms of clinical implications, the EP6 and IP6 identify young adults who may benefit from tailored interventions or add-ons, including from psycho-education (Del Palacio-Gonzalez et al., 2021), pharmacotherapy, psychotherapy, or specialized care.

In conclusion, the EP6 and the IP6 in the YouthMap12 screener are clinically relevant measures that can predict poor outcomes after

treatment in clinical samples of young adults. The instrument adheres to the guidelines for screening assessments described by Glover and Albers; it is compatible with local service delivery needs, aligns with the constructs of interest, has theoretical and empirical support, and is a good population fit (Glover & Albers, 2007).

CRedit authorship contribution statement

Morten Hesse: Conceptualization, Methodology, Formal analysis, Writing – original draft, Visualization. **Sheila Jones:** Investigation, Writing – review & editing. **Michael Mulbjerg Pedersen:** Investigation, Data curation, Writing – review & editing. **Karina Berthu Ellegaard Skov:** Investigation, Writing – review & editing. **Birgitte Thylstrup:** Writing – review & editing. **Mads Uffe Pedersen:** Project administration, Funding acquisition, Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The authors do not have permission to share data.

Acknowledgements

We wish to thank Julie Brummer for her useful input on the manuscript.

Appendix A. Youthmap12 scales (clinical version)

Exter6					
Think about your time in school					
1. To what extent were/are you and your friends troublemakers?	1	2	3	4	5
2. To what extent have you had/do you have conflicts with your teachers?	1	2	3	4	5
3. To what extent were/are you disruptive in class?	1	2	3	4	5
4. To what extent did you/do you skip classes in primary and lower secondary school?	1	2	3	4	5
5. Have you ever been expelled from school due to your behavior?	No		Yes		
6. Have you ever directly physically harmed other people in the past 30 days, e.g. been in a fight, assaulted other people, or similar acts? (play or accidents do not count)	No		Yes		
Inter6					
1. How affected have you been by depressive symptoms in the past 30 days?	1	2	3	4	5
2. How affected have you been by anxiety in the past 30 days?	1	2	3	4	5
3. How affected have you been by suicidal thoughts in the past 30 days?	1	2	3	4	5
4. Have you been affected by loneliness in the past 30 days?	1	2	3	4	5
5. How many times have you purposefully hurt yourself, e.g. cut or burned yourself or the like, in the past 30 days?	1	2	3	4	5
6. How affected have you been by an eating disorder in the past 30 days?	1	2	3	4	5

1 = Not at all, 2 = To a lesser degree, 3 = To some degree, 4 = To a high degree, 5 = To a very high degree. Dichotomization: All white cells = 0 point, all black cells = 1 point.

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