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CHAPTER 5

Mental health problems predicting persistent offending in childhood arrestees

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Abstract

Aims: To study the predictive value of mental health problems for the course of both registered and self-reported offending in childhood first-time arrestees, and to compare the predictive value of mental health problems based on single assessment to multiple assessments over time.

Methods: Childhood first-time arrestees (n=308, baseline age 10.7 ± 1.5 years) were followed up for two years. Using generalized estimating equations, the predictive value of mental health problems assessed at baseline and one-year follow-up for offending at one-year and two-year follow-up was analyzed. Yearly, mental health problems were assessed using the Strengths and Difficulties Questionnaire (SDQ). Data on offending were collected from police records and self-report (Observed Antisocial Behavior questionnaire, OAB).

Results: The majority of childhood arrestees re-offended during follow-up. Mental health problems were positively associated with future offending; child- and parent-reported behavioral problems and hyperactivity/impulsivity (RR range 1.09-1.39) and parent-reported emotional and peer relationship problems (RR range 1.07-1.23) were predictive. The strength of these associations increased when multiple assessments were used.

Conclusions: As mental health problems predict future offending, interventions targeting such problems may help to reduce offending and improve children's well-being. Furthermore, since the predictive value increases with multiple assessments over time, multiple assessments of mental health problems may be relevant to recognize both re-offending risk and children's treatment needs over time.

Introduction

A police arrest in childhood is considered a robust predictor of a persistent pattern of offending (Snyder, 2001; Krohn et al., 2001). As not all childhood offenders develop along such a deviant pathway (Odgers et al., 2007; Stouthamer-Loeber et al., 2008; van Domburgh et al., 2009b), early recognition of those children most at risk of future offending is warranted. In adolescence and adulthood, future offending is considered to be best predicted by a history of offending (McReynolds et al., 2010). In contrast to findings in older delinquents, offence characteristics of first-time offenders were shown to have little predictive value for persistent offending in childhood offenders (van Domburgh et al., 2009b). As they may simply not have offended before or their misbehavior has gone unnoticed or was not registered by the police, information on offending is often unavailable for these children. Given that offending in childhood is often considered rare and relatively benign, those explanations are not unlikely. Identifying predictive factors not related to offending is thus particularly important in childhood offenders. In this respect, as they were found to be predictive of persistent offending in the general population (Loeber et al., 2008b), mental health problems, often seen in childhood offenders (Vermeiren et al., 2002; Cohn et al., 2012), are of interest. Furthermore, because of their malleable nature, mental health problems may respond to adequate treatment. Therefore, in addition to improving children's well-being, intervention may also reduce children's risk of re-offending. Since little is known on the association between mental health problems and offending in childhood arrestees, this study aims to further clarify the predictive value of mental health problems for the course of offending in this specific group.

High rates of common mental disorders, both externalizing and internalizing, have been found among juvenile offenders (for reviews, see Vermeiren et al., 2006; Fazel et al., 2008). The association between such problems and re-offending is, however, ambiguous. Although mental health problems in general predict re-offending in juvenile offenders (Cottle et al., 2001), findings differ with regard to predictive values of specific disorders, as well as the relevance of comorbidity. Disruptive behavior disorders were most consistently related to re-offending (Vermeiren et al., 2002; McReynolds et al., 2010). Further to this, while some studies found internalizing disorders not to be predictive of re-offending (Wiersma & Forehand, 1995; Vermeiren et al., 2002; Plattner et al., 2009), others found inter-

nalizing problems to predict re-offending only when co-occurring with externalizing disorders (McReynolds et al., 2010). This combination of externalizing and internalizing problems may, furthermore, pose a greater risk of re-offending for girls than for boys (McReynolds et al., 2010). Interestingly, Colins et al. (2011) demonstrated comorbidity rather than single specific disorders, to be associated with re-offending in incarcerated adolescents. In previous research in the present sample of childhood first-time arrestees, persistent offenders were found to be characterized by higher levels of ADHD and disruptive behavior disorders (Cohn et al., 2012). Taken together, although most knowledge on mental health problems in relation to re-offending comes from studies in older, more severe offender populations, mental health problems, and in particular externalizing mental health problems, are also expected to predict the course of offending among childhood arrestees.

So far, re-offending is mostly predicted based on mental health problems assessed at a single time point. Although mental health problems have been found to be relatively stable in youth, both presence and severity were found to change over time (Hofstra et al., 2002; Kim-Cohen et al., 2003; Copeland et al., 2013). Considering changes in mental health problems could thus potentially improve their predictive value. This is supported by the finding that concurrent mental health problems follow the course of disruptive behavior over time (Barker et al., 2010). While behavioral, emotional and social problems were continuously present over time in children showing persistent disruptive behavior, these problems decreased in children with decreasing levels of disruptive behavior when reaching adolescence. Persistence of mental health problems may, therefore, be more strongly associated with future offending than temporary mental health problems. From the perspective of adequate intervention and prevention, effective recognition of children at risk of a deviant development bears substantial clinical relevance. It is, therefore, important to clarify whether recognition of at risk children can be improved when using repeated assessment of predictors over time.

For the above mentioned reasons, this paper aims to investigate the predictive value of mental health problems for future offending in childhood first-time arrestees. In addition, the predictive value of mental health problems based on single assessment compared to multiple assessments for future offending is assessed. This will enhance knowledge on the association between mental health

problems and offending in very young offenders, a subject that to date has received only little attention. In addition, addressing these children's mental health problems is relevant in improving their general well-being.

Methods

Participants and procedures

Participants were 308 children registered by the police in the period from 2003 to 2005 because of committing a first offence under the age of 12. In this study, children are called arrestees, although not all children were taken to the police station because they were reprimanded on the spot. In order to assure sufficient variability in socio-economic status (SES) and levels of urbanization of the neighborhoods the children resided in, participants were selected from local police registration systems from three police districts in The Netherlands. Offending was defined as behavior that could be prosecuted if displayed by someone older than twelve years, i.e. the age of criminal responsibility for Dutch law, excluding status offences. Not eligible for participation were immigrant children not legally admitted to the Netherlands, children who offended by order of their parents, and children for whom participation might interfere with ongoing police procedures. Eligible participants and their parents who consented to have their contact details forwarded to the research team by the police were contacted by the research team and were given extensive oral and written information about the aims and procedures of the study. Out of 422 potential participants and their parents who were contacted by the research team, 27.0% ($n=114$) did not participate in the study. Children who refused participation did not differ from participants on age and seriousness of first arrest according to the Seriousness of Early Police Registration classification (SEPR, range 1 - minor delinquency at home, rule breaking to 5 - very serious delinquency, van Domburgh et al., 2009b), but were more often female (21.1% versus 12.7%; $\chi^2=4.554$, $df=1$, $p=.033$), of non-Dutch origin (65.8% versus 51.0%; $\chi^2=7.174$, $df=1$, $p=.007$) and more often lived in low SES neighborhoods (68.4% versus 52.6%; $\chi^2=8.494$, $df=1$, $p=.004$).

Participants were followed up for two years after their first registered offence. Follow-up data were available for 79.7% ($n=246$) of the initial sample. Mean age was 10.7 ($SD=1.5$) years at baseline and mean time between baseline and follow-up assessments was 1.1 ($SD=0.3$) and 2.2 ($SD=0.4$) years, respectively. Of the baseline sample 86.3% ($n=266$) was male and 54.4% ($n=167$) was of non-Dutch

origin, with either they or (one of) their parents being born in a country other than the Netherlands (Heeten & Verweij, 1993). Mean seriousness of the first registered offence was $2.3 \pm .9$ on the SEPR. Of all participants, 23.9% ($n=73$) was registered for mischief/rule breaking, 24.8% ($n=76$) for theft, 10.1% ($n=31$) for violence and 41.2% ($n=126$) for property damage. Participants who completed all assessments did not differ from participants who dropped out during follow-up on age, sex, ethnicity and socio-economic status (SES) of their neighborhoods. Seriousness of first arrest was slightly higher for participants who completed the study compared to participants who dropped out ($\chi^2(4)=10.463, p=.033$). Data from self-report questionnaires from children younger than 8 years or having a verbal IQ (measured by the vocabulary subtest of the Wechsler Intelligence Scale for Children-Revised, Wechsler, 1974) below 4 ($n=35, n=17, n=14$ at the consecutive assessments, respectively) were excluded from the dataset, because of potential problems with comprehensibility of the questionnaires.

All participating children and parents gave written informed consent. Children received a small present at every assessment while parents received a 20 euro gift voucher once during follow-up. This study was approved by the Medical Ethical Committee of the VU University Medical Center, and the Dutch Justice Department.

Offending

Both self-reported offending and official re-arrest rates were used to determine future offending.

Self-reported offending was measured using the child-report and parent-report version of the Observed Antisocial Behavior Questionnaire (OAB, Slot et al., 1998), a Dutch revision of the Self-Report of Antisocial Behavior Scale (Loeber et al., 1989). It contains 17 items on delinquent behavior, regarding violence (hitting or fighting outside the home or use of a weapon; six items), theft (stealing outside the home; five items), vandalism (property damage or arson; four items) and rule breaking (nuisance or fare dodging; two items). Delinquent behavior was reported over the past six months at baseline and over the past 12 months at follow-up. In accordance with procedures applied by the authors of the questionnaire parent and child report were combined into a single score, with an item being present if reported by either one of the informants (Loeber et al., 1998). Scores on all items were then summed into a total score reflecting the extent of offending (range 0 -

17). As this questionnaire is an inventory and does not have a uniform underlying concept, internal reliability could not be determined.

Additionally, data on official re-arrest rates were used. Re-arrest was defined as offending registered by the police in the three years following the first registered offence. Offences were registered regardless of conviction. Consequently, some offences were included for which the specific role of the subject was less clear (e.g. as a member of a group that offended) or based on registered reports by third parties (e.g. school reports on violent thefts that were dealt with by the school).

The seriousness of first registered offence was determined using the Seriousness of Early Police Registration classification (SEPR, van Domburgh et al., 2009b), a Dutch revision of the General Level of Seriousness Classification (Loeber et al., 2008a). Seriousness was scored on a 5-point scale: 1 - minor delinquency at home, minor verbal aggression, and rule breaking; 2 - minor delinquency outside the home, e.g. shoplifting and minor vandalism; 3 - moderate delinquency, e.g. fighting without bodily harm, vandalism and theft; 4 - serious delinquency, e.g. breaking and entering, serious arson and vehicle theft; 5 - very serious delinquency, e.g. sex offences, aggravated assault, and robbery. When involving behaviors of multiple levels of seriousness, offence seriousness was determined by the behavior with the highest SEPR classification. Inter-rater reliability of the SEPR was high (ICC=0.84 in a two way mixed effect model with absolute agreement, van Domburgh et al., 2009b).

Mental health problems

Mental health problems were measured using the emotional problems, behavioral problems, hyperactivity/impulsivity and peer relationship problems subscales (five items per subscale) of both the parent and child version of the Dutch version of the Strengths and Difficulties Questionnaire (SDQ, Goodman, 1997; van Widenfelt et al., 2003). This behavioral screening questionnaire can be administered to children aged eight years and older (Muris et al., 2004) and has satisfactory to good psychometric properties (Muris et al., 2003). Items can be rated on a three-point scale (0=no, 1=a little, 2=yes). The summed scores on the used subscales make up the total problem score. Scores on the SDQ in the clinical range, correlate well with psychiatric diagnoses (Goodman, 2001). Additionally, the SDQ can be regarded a dimensional measurement of children's mental health problems (Goodman &

Goodman, 2009). Internal reliability for the SDQ in our sample was $\alpha=.75$ and $\alpha=.67$ for the parent and child version, respectively.

Statistical analyses

Generalized estimating equations (GEE) were used to investigate the predictive value of mental health problems for the course of offending over time. This procedure is suitable for analyzing irregularly spaced longitudinal data and makes use of all available data of subjects (Zeger & Liang, 1986), also in case of incomplete follow-up. Dependence of repeated assessments within one person is accounted for by using a working exchangeable correlation structure. GEE analyses were performed in Stata 11.0.

To describe the course of offending, the linear (time) and quadratic (time²) relationships with time were analyzed for both self-reported and registered offending. In these analyses, repeated assessments of self-reported offending at T0, T1 and T2 and of registered offending at 1, 2 and 3 years following first arrest were included as dependent variables and time (in years) as independent variable. Models were adjusted for age at first arrest by including this as time-independent covariate. In addition, an age at first arrest by time interaction was analyzed to investigate whether the relationship with time differed across age. Due to the Poisson distribution and overdispersion of the offending data, negative binomial GEE were used.

To assess the predictive value of mental health problems, unadjusted analyses were performed with repeated assessments of self-reported offending at one- (T1) and two- (T2) year follow-up as the dependent variable and baseline scores of mental health problems as the independent variable. Next, the predictive value of scores of mental health problems at two consecutive assessments was assessed with the mean scores of both assessments as indicator of level of problems and the difference between scores at both assessments as indicator of change as independent variables. In the analyses, age at baseline, sex, ethnicity and seriousness of first arrest were controlled for by adding them to the model as time-independent covariates. The same analyses were also run with registered offending rate at two and three years after first arrest as dependent variable. P values <.05 were considered statistically significant in all analyses.

Results

Table 5.1 describes offending among our group of childhood arrestees. The majority of children (72.8%) committed at least one offence during six months prior to baseline assessment according to self- and parent reports. At follow-up assessments, the number of children who reported at least one offence over the previous 12 months, decreased. GEE analyses showed that levels of reported offending in the total group, corrected for age of first registered offence, did not change over time (time RR 1.00; 95% CI .92-1.09). Given the decrease in the number of children who offended over time, this indicates an increase in the number of offences reported by the smaller group of offenders. Registered offending rate significantly increased over time (time RR 1.28; 95% CI 1.11-1.47). In addition, a significant interaction was found with age of first registered offence, indicating a stronger increase in offending rate with increasing age of first registered offence.

Table 5.1 self-reported and registered offending over time

Self-reported offending	Overall n=226	Per assessment		
		T0 (n=305)	T1 (n=254)	T2 (n=244)
<i>Children reporting ≥ 1 offence</i>				
n (%)	201 (88.9)	222 (72.8)	153 (60.2)	130 (53.3)
Range	1-35	1-12	1-13	1-13
Median	4	2	2	2
Interquartile range	2-7	1-3	1-3	1-4
Registered offending	Overall n=308	Per year following first-time offence		
		1 (n=308)	2 (n=308)	3 (n=308)
<i>Children re-registered ≥ 1 offence</i>				
n (%)	191 (62.0)	103 (33.4)	102 (33.1)	117 (38.0)
Range	1-34	1-11	1-15	1-17
Median	2	1	1	2
Interquartile range	1-4	1-2	1-2	1-3

In Table 5.2, the mean scores for the various types of mental health problems at baseline and at one-year follow-up are presented for both parent and child report.

In Tables 5.3 and 5.4, the results of the GEE analyses for self-reported offending and registered offending, respectively, are presented. The rate ratios (RR) are the exponents of the regression coefficients and represent the magnitude and direction of the association between mental health problem scores and offending at follow-up. The interpretation of the RR is the factor with which offending rate at follow-up changes with an increase of one unit in mental health problems score. Thus, a one point increase in emotional problems score leads to a 1.07-time, or 7%, increase in self-report offending rate at follow-up.

Table 5.2 Mean scores mental health problems at baseline and one-year follow-up

	T0		T1	
	n	(mean ± sd)	n	(mean ± sd)
Parent				
Emotional problems	289	2.46 ± 2.18	257	2.08 ± 2.02
Behavioral problems	290	2.36 ± 2.26	257	2.18 ± 2.17
Hyperactivity/impulsivity	289	4.37 ± 2.89	257	4.55 ± 2.73
Peer relationship problems	289	2.00 ± 1.88	257	1.82 ± 1.99
<i>Total problem score</i>	<i>289</i>	<i>11.19 ± 6.94</i>	<i>257</i>	<i>10.62 ± 6.67</i>
Child				
Emotional problems	255	2.73 ± 2.19	223	2.18 ± 2.07
Behavioral problems	255	2.90 ± 1.81	223	2.64 ± 1.71
Hyperactivity/impulsivity	255	4.44 ± 2.42	223	4.22 ± 2.55
Peer relationship problems	255	2.41 ± 1.83	223	2.13 ± 1.70
<i>Total problem score</i>	<i>254</i>	<i>12.51 ± 5.74</i>	<i>223</i>	<i>11.18 ± 5.49</i>

Based on parent-report, all types of mental health problems as measured at baseline significantly predicted future self-reported offending. Except for emotional problems, prediction improved when using the mean level of mental health problems across multiple assessments, e.g. baseline and one-year follow-up. More mental health problems over this one-year period, indicated more offences during follow-up. Change in mental health problems between the assessments across time was not related to future offending.

Based on self-report, the subscales behavioral problems, hyperactivity / impulsivity and total problems based on single assessment at baseline predicted future offending. The predictive value of the mean level of those problems over a one-year period for future offending was higher compared to the predictive value of problems based on single assessment. Change in behavioral problems, hyperactivity/impulsivity and total problems over a one-year period significantly predicted an increase in future offending, but the predictive value did not improve compared to the predictive value of baseline problems.

Similar to the results for self-report offending, baseline mental health problems as reported by parents from single assessment significantly predicted future registered offending. While the positive predictive associations with registered offending became stronger when mean level of mental health problems from multiple assessments across baseline and one-year follow-up were used, an increase in problems over one year did not improve the predictive value of mental health problems.

Based on self-report, only total mental health problems as measured at baseline predicted offending. Using multiple assessments, behavioral problems and hyperactivity/impulsivity were predictive of registered offending. More specific, for behavioral problems and total problems only the mean level across one year predicted future offending, while both mean level and an increase of hyperactivity/impulsivity over one year were related to future offending.

Table 5.3 Predictive value of mental health problems for *self-report* offending at follow-up

	Offending predicted by parent-reported problems		Offending predicted by child-reported problems	
	RR	95% CI	RR	95% CI
<i>Emotional problems</i>				
Baseline	1.07*	1.01 – 1.14	1.01	0.94 – 1.09
Mean across baseline and 1-year follow-up	1.07	0.99 – 1.16	1.04	0.94 – 1.15
Change between baseline and 1-year follow-up	0.96	0.89 – 1.04	1.04	0.98 – 1.10
<i>Behavioral problems</i>				
Baseline	1.17*	1.11 – 1.23	1.16*	1.07 – 1.25
Mean across baseline and 1-year follow-up	1.23*	1.16 – 1.30	1.39*	1.28 – 1.51
Change between baseline and 1-year follow-up	1.05	0.95 – 1.15	1.08*	1.01 – 1.17
<i>Hyperactivity/impulsivity</i>				
Baseline	1.13*	1.08 – 1.19	1.09*	1.02 – 1.17
Mean across baseline and 1-year follow-up	1.18*	1.12 – 1.25	1.18*	1.09 – 1.28
Change between baseline and 1-year follow-up	1.02	0.96 – 1.08	1.09*	1.02 – 1.15
<i>Peer relationship problems</i>				
Baseline	1.10*	1.03 – 1.18	0.99	0.91 – 1.08
Mean across baseline and 1-year follow-up	1.13*	1.05 – 1.22	0.97	0.86 – 1.10
Change between baseline and 1-year follow-up	1.01	0.92 – 1.11	1.02	0.95 – 1.09
<i>Total problem score</i>				
Baseline	1.05*	1.03 – 1.07	1.03*	1.01 – 1.06
Mean across baseline and 1-year follow-up	1.07*	1.04 – 1.09	1.08*	1.04 – 1.11
Change between baseline and 1-year follow-up	1.01	0.98 – 1.04	1.04*	1.02 – 1.06

* $p < .05$

Table 5.4 Predictive value of mental health problems for *registered* offending at follow-up

	Offending predicted by parent-reported problems		Offending predicted by child-reported problems	
	RR	95% CI	RR	95% CI
<i>Emotional problems</i>				
Baseline	1.11*	1.02 – 1.21	1.09	0.97 – 1.22
Mean across baseline and 1-year follow-up	1.20*	1.08 – 1.34	1.12	0.98 – 1.28
Change between baseline and 1-year follow-up	1.01	0.91 – 1.12	0.98	0.84 – 1.14
<i>Behavioral problems</i>				
Baseline	1.14*	1.07 – 1.20	1.06	0.94 – 1.19
Mean across baseline and 1-year follow-up	1.23*	1.14 – 1.33	1.28*	1.09 – 1.50
Change between baseline and 1-year follow-up	1.11	0.96 – 1.28	1.05	0.97 – 1.15
<i>Hyperactivity/impulsivity</i>				
Baseline	1.09*	1.02 – 1.16	1.05	0.99 – 1.11
Mean across baseline and 1-year follow-up	1.20*	1.11 – 1.30	1.15*	1.06 – 1.25
Change between baseline and 1-year follow-up	1.00	0.91 – 1.09	1.10*	1.01 – 1.20
<i>Peer relationship problems</i>				
Baseline	1.17*	1.06 – 1.30	1.03	0.92 – 1.14
Mean across baseline and 1-year follow-up	1.23*	1.10 – 1.38	0.95	0.83 – 1.09
Change between baseline and 1-year follow-up	0.91	0.79 – 1.04	0.97	0.87 – 1.08
<i>Total problem score</i>				
Baseline	1.05*	1.03 – 1.08	1.03*	1.00 – 1.07
Mean across baseline and 1-year follow-up	1.08*	1.05 – 1.12	1.07*	1.03 – 1.11
Change between baseline and 1-year follow-up	1.01	0.95 – 1.06	1.02	0.98 – 1.06

* $p < .05$

Discussion

The present study aimed to clarify the predictive value of mental health problems for the course of both self-reported and registered offending in childhood first-time arrestees, and to compare the predictive value of mental health problems based on single assessment and based on multiple assessments. The high frequency of offending found in our group of childhood arrestees is in line with earlier findings that a first police arrest at a young age constitutes a risk for persistent offending (Snyder, 2001). In our group, offending was predicted by mental health problems, while the strength of the association varied by type of mental health problems and informants. While externalizing problems were predictive of future offending when based on child report, externalizing, internalizing and peer relationship problems were predictive when based on parent report. Overall, behavioral problems were most strongly associated with future offending. The predictive value increased when mental health problem scores were based on multiple assessments over time as compared to single assessment.

The predictive association of mental health problems with offending, in particular externalizing problems, is in accordance with previous findings and knowledge on risk factors of persistent offending (Loeber & Farrington, 2000; Cottle et al., 2001; Vermeiren et al., 2002). Although not always established in earlier studies (Harrington et al., 2005; Colins et al., 2011), the association between behavioral problems and offending is not unexpected due to the potential overlap between these problems and offending. Furthermore, escalation of anti-social behavior over time, from disruptive non-delinquent behaviors into more serious conduct problems, delinquency included, has repeatedly been demonstrated (Loeber & Farrington, 2000). So far, findings on the association between ADHD-related problems and offending have largely been inconclusive. While it has been suggested that ADHD is only associated with offending when co-occurring with conduct problems (Loeber et al., 2000), findings from a recent study in a referred sample indicate that ADHD predicts offending irrespective of the presence of disruptive behavior disorders (Sibley et al., 2011). Our finding that both parent- and child-reported hyperactivity/impulsivity predict future offending, further specify that ADHD-related problems are also associated with re-offending in offender populations. This is in line with previous findings in the present sample of childhood arrestees showing ADHD to be related to persistent offending (Cohn et al.,

2012) and developmental theory hypothesizing that early onset persistent antisocial behavior arises from neurodevelopmental problems expressed as impulsivity and hyperactivity (Moffitt, 1993).

Contrary to the earlier observed lack of association between internalizing problems and re-offending (Vermeiren et al., 2002; Colins et al., 2011), emotional problems were found to be related to re-offending in the present study, but only when reported by parents. This inconsistency in findings may partly be explained by differences in assessment of mental health problems and in informants. While in the present study emotional problems were assessed with a dimensional measurement, other studies used a diagnostic interview with adolescents as informants (Colins et al., 2011) and clinical diagnoses based on child and parent reports (Vermeiren et al., 2002). Although there were no apparent differences between self-reported or parent-reported emotional problem scores, only parent-reported emotional problems were predictive of future offending. This finding may indicate that parents reported emotional problems for children who did not report these problems themselves, while the emotional problems reported by children were not recognized to the same extent by their parents. As this was beyond the scope of the present study, the exact association between emotional problems and re-offending, including the potential role of co-occurring externalizing problems (McReynolds et al., 2010), should be further elucidated in future studies. In this respect, further investigation of the observed differences in predictive value of mental health problems between informants is also relevant.

Differences in populations and used measurements complicate comparison of our results with previous findings. In the present study, the association between mental health problems and re-offending was investigated in childhood arrestees, which is likely to be a much more diverse population than the often studied incarcerated populations. The group of childhood arrestees does not only include frequent offenders and children with mental health problems, but also a substantial group of healthy developing children who do not persist in offending (van Domburgh et al., 2009b). Furthermore, the association between externalizing mental health problems and offending may be more easily detectable in children than in adolescents. While such problems may be underreported by adolescents (Frick et al., 2010), parents may well be able to report on children's externalizing mental health problems due to more parental supervision in childhood

(Achenbach et al., 1987; Salbach-Andrae et al., 2009). Finally, in the present study, mental health problems were not diagnosed based on (semi-)structured interviews, but measured using a dimensional measurement. As it is not affected by loss of information due to dichotomization, the use of a dimensional measurement of mental health problems may provide a better understanding of this association.

The predictive association between mental health problem scores and future offending became stronger when based on multiple assessments as compared to single assessment. This is in line with Barker et al. (2010) who demonstrated that the course of mental health problems parallels the course of conduct problems. Furthermore, predictive accuracy of assessment strategies to identify children at risk of persistent offending has been shown to improve when using a stepwise procedure with increasing extensiveness of risk assessment (Loeber et al., 1984). The present findings indicate that, in addition to stability across different settings (Charlebois et al., 1994), stability of behavioral predictors over time may also be useful for such stepwise approaches.

Some limitations should be taken into account when interpreting the findings from this study. In the present study, mental health problems were determined using a dimensional measurement. No inferences can, therefore, be made on associations between actual disorders and re-offending in childhood arrestees. However, in view of cost-effectiveness, short dimensional instruments such as the SDQ may be preferred over extensive diagnostic interviews for the purpose of screening and risk assessment in offender populations.

The study population was too small to investigate the predictive association between mental health problems and persistent offending in subgroups defined by, for instance, sex, age or ethnicity. However, analyses were controlled for age at baseline, sex, ethnicity and seriousness of first arrest.

There may be a slight underrepresentation of girls, children of non-Dutch origin and children from low SES neighborhoods in our study population compared to the total population of childhood arrestees. Moreover, childhood arrestees are a highly specific group and offending as registered by the police may not be representative of children's actual offending behavior. Future studies will, therefore, be informative to determine the generalizability and external validity of the present findings.

Despite these limitations, our findings have important implications. The observation that mental health problems predict re-offending is highly relevant in the population of very young offenders, for whom often limited or no information on offending history is available. Besides the potential to identify problems that may respond to adequate intervention, screening for mental health problems may thus provide valuable information for risk assessment in this specific group. The observed improvement of the predictive value of mental health problems based on multiple assessments as compared to single assessment differed by informant. While marginal improvement was observed for mental health problems as reported by parents, a more meaningful improvement was mainly apparent when problems were reported by children. However, as both informants provided valuable complementary information, information from both parents and children should preferably be used in risk assessment in childhood arrestees. Furthermore, in accordance with the relative stability of mental health problems over time (Hofstra et al., 2002; Kim-Cohen et al., 2003; Copeland et al., 2013), the increase in predictive value of mental health problems for future offending when using multiple assessments was relatively small. In some cases, for instance when severe mental health problems are present, regular monitoring of these problems may, therefore, have limited additional value and is not required to decide on the need for intervention. Moreover, in those cases, using multiple assessments of mental health problems for more accurate re-offending risk prediction would imply withholding intervention for children's problems. The potential benefit of multiple assessments as part of stepwise screening or risk-assessment procedures should be further studied. In such stepwise procedure, children may, for example, be offered intervention in case of an SDQ score above a certain threshold. For children for whom a 'wait-and-see' approach is considered appropriate, multiple assessments will be informative to monitor the development of potential mental health problems and re-offending risk.