Nordic Journal of Criminology | Scandinavian University Press

RESEARCH PUBLICATION

Volume 26, No. 2, pp. 1–16
ISSN online: 2578-9821
DOI: https://doi.org/10.18261/njc.26.2.4
Received: 13 May 2024
Accepted: 17 January 2025

Development of mental health problems and crime involvement in a Swedish adolescent sample

Linn Persson
Doctoral student, Department of Criminology, Malmö University
linn-victoria.persson@mau.se

Anna-Karin Ivert
Associate Professor, Department of Criminology, Malmö University
anna-karin.ivert@mau.se

Abstract

Background: Mental health problems (MHPs) have been seen to be associated with crime involvement among adolescents, especially externalising problems. Previous studies have often been made internationally and less research has been conducted within the Nordic countries, especially using self-reported data. **Aims**: To explore how differences in MHPs are associated with differences in crime involvement between adolescents, and how an individual's change in mental health is associated with a change in crime involvement over time. **Methods**: Data were drawn from the research project Malmö Individual and Neighborhood Development study (MINDS) and include 386 adolescents (53% girls; 47% boys). Longitudinal multilevel analysis was applied to assess the association between MHP and crime involvement. **Result**: Overall, MHPs, particularly externalising problems, were associated with crime involvement. Also, changes in MHPs were related to changes in crime involvement over time. Fitting separate models for girls and boys yielded partly different results. **Conclusion**: The results support previous findings that externalising problems are associated with crime involvement and show that an increase in externalising MHPs over time is associated with increased crime involvement. This underscores the importance of identifying and addressing externalising MHPs at an early stage to prevent a negative development.

Keywords
criminality, development, longitudinal, mental health problems, the strength and difficulties questionnaire (SDQ)

Introduction

It is known within the field of criminology that a large number of adolescents commit criminal offences at some point in their teenage years (e.g., Moffitt, 1993; Moffitt, 2006; Wikstrom & Butterworth, 2006). Although the vast majority of these adolescents commit few, less severe crimes (e.g. Moffitt, 1993), a small portion commit a greater number of – or more serious – crimes, continuing into adulthood (Moffitt, 2006; Sivertsson, 2022). To prevent adolescent crime involvement, as well as later adult criminality, it is important to increase knowledge of the development of criminal behaviour during adolescence and into adulthood.

Adolescents' mental health has been shown to impact the risk of criminal behaviour (e.g., Fazel et al., 2008; Colins et al., 2010). Moreover, literature reviews have shown that

mental health problems (MHPs) are positively linked to adolescent crime involvement (Fazel et al., 2008). Indeed, Moffitt et al. (2001) have shown that many adolescents who continue committing crime into adulthood reported MHPs during their lives. In the current study, we will primarily focus on two dimensions of MHPs: internalising problems (such as depression and anxiety) and externalising problems (such as conduct problems, hyperactivity and impulsivity) (Dennis et al., 2006). Research has shown that MHPs involving externalising problems often develop in early childhood (Newman et al., 1996), and are especially associated with crime involvement (e.g., Loeber & Burke, 2011).

With this in mind, less is known about how development and changes in MHPs are associated with developments in crime involvement among adolescents, particularly in a Nordic context. Given the increase in MHPs in many of the Nordic countries over the past years (self-reported as well as in terms of help seeking) (e.g., Nordic Council of Ministers, 2022; Sundhetsstyrelsen, 2022; Socialstyrelsen, 2019; Region Skåne, 2024), there is a need to increase knowledge on adolescent MHPs' association with crime involvement in a Nordic context. Expanding our understanding of how MHPs and crime develop and co-vary over time will provide better preconditions to develop effective interventions targeting adolescent crime involvement.

With this background, the aim of the current study was to explore how differences in MHPs are associated with differences in crime involvement between adolescents in a Swedish adolescent sample over time. The concept of MHPs is discussed in generic terms and the focus is on broader dimensions and problem groups of MHPs (in this case, internalising and externalising problems) rather than on specific diagnoses. References to specific diagnoses will be made when needed. Data were drawn from the longitudinal research project Malmö Individual and Neighbourhood Development Study (MINDS) and comprise 386 adolescents with data from when the participants were between 16 and 19 years old. To address this aim, we examined absolute and relative stability. In addition, negative binomial longitudinal multilevel analysis was conducted to explore how (change in) MHPs were associated with (change in) crime involvement.

Previous research from outside the Nordic region

The vast majority of previous research examining the associations between adolescent MHPs and offending has been conducted within the juvenile justice systems in the United States and the United Kingdom. The prevalence of MHPs among adolescent offenders differs across these studies as a result of differences in methods and sampling (Cashman & Thomas, 2017); however, they have consistently shown that MHPs are associated with crime involvement among adolescents (e.g., Beaudry et al., 2021; Vincent et al., 2008). Findings show that as many as 52–70% of adolescents in the justice system suffer from some form of MHP (e.g. Underwood & Washington, 2016), with disorders classified as internalising problems occurring in up to 35%, and externalising problems occurring in up to approximately 59% of detained adolescents. Among this group, externalising MHPs, such as ADHD and conduct problems/disorders, have been implicated as among the most common diagnoses/disorders in both boys and girls in the juvenile justice system across several studies (Beaudry et al., 2021; Colins et al. (2010); Borschmann et al., 2020). Internalising problems have generally not been seen to be related to crime involvement among boys, whereas study results vary among girls (e.g., Jung et al., 2017). For example, depression has been shown to be common among girls in detention, with findings showing a prevalence of around 20–35% (Beaudry et al., 2021). Further, Wasserman et al. (2010)

found that repeat juvenile offenders, girls and boys, who have progressed further in the juvenile justice system reported higher rates of MHPs than those without repeated criminality in other sorts of detention and correction facilities.

Although the association between adolescent MHPs and offending in non-Nordic research has predominantly been studied in the juvenile justice system, there also exist important studies based on community samples, including register-based studies as well as self-reported studies. These studies (e.g. Moffitt, 1993; Moffitt et al., 2001; Loeber et al., 2012) are important given the possibility that MHPs and criminal behaviour perhaps differ between high-risk adolescents in the juvenile justice system and adolescents in the general community. The development of MHPs and criminal behaviour among children and adolescents has been addressed in some longitudinal studies (e.g., Moffitt, 1993; Loeber et al., 2012). These studies (as well as others) primarily show that, in the community, problems and disorders that can be classified within the group of externalising problems may especially increase the risk of offending among adolescents (Moffitt et al., 1994; Moffitt et al., 2001; Loeber et al., 2012). Additionally, these studies indicate that both MHPs and crime involvement often develop over time, and that adolescents who experience a higher degree of MHPs (particularly neuropsychological deficits linked to externalising problems and other antisocial behaviour) are likely to continue to commit crime in their adulthood (e.g., Moffitt, 2006). Further, Newman et al. (1996) found that adults with MHPs often have a history of problems starting in childhood or teenage years. Moreover, in a literature review, Hofvander et al. (2009) found that at least one-third of children diagnosed with hyperactivity problems developed a pre-adult aggressive antisocial problem, and one-fifth developed an antisocial personality disorder in adulthood.

Nordic research on MHPs and adolescent offending

Despite the general lack of research regarding adolescent MHPs and criminal offence in the Nordic countries, some literature does exist. Existing research has focused on a more general concept of MHPs (e.g., Källmen et al., 2023), groups of problems (e.g., Ivert et al., 2017), and more specific diagnoses and disorders (e.g., Hildebrand et al., 2020; Mohr-Jensen et al., 2019; Dalsgaard et al., 2014).

Some research has shown associations between adolescent MHPs and offending in a Nordic context. In a cross-sectional study, Källmen et al. (2023) stated that MHPs were shown to be a strong explanation for criminal behaviour among adolescents when they examined the association between MHPs (without examining specific disorders or diagnoses, but instead using a scale of seven different symptoms and problems) and criminal behaviour among Swedish adolescent students in Stockholm. Further, Engqvist & Rydelius (2007) used register data to follow former Swedish Child and Adolescent Psychiatry patients and examined the association between MHPs (without focusing on specific diagnoses) and offending. Findings showed that, among former Swedish patients in Child and Adolescent Psychiatry, 50% of men and 20% of women had later been convicted of crime (a significantly higher rate than the general population at the time) (Engqvist & Rydelius, 2007).

Regarding studies using groups of problems when examining MHPs and offending, Ivert et al. (2017) examined externalising and internalising problems and crime involvement with register data from former patients at Swedish Child and Adolescent Psychiatry. Results showed that twice as many young adults that had previously been patients had committed crimes compared to controls that had not had psychiatric care (with an overrepresentation of externalising problems and violent crimes) (Ivert et al., 2017).

Further, Siponen et al. (2023) used population-based registers to examine the role of externalising and internalising problems (as well as specific disorders) in crime among Swedish adolescents. Results showed that a comorbidity of either externalising or internalising problems heightened the risk of crime compared to single diagnoses. Miettunen et al. (2014) also examined internalising and externalising problem groups in a Finnish study based on the Northern Finland birth cohort 1986 (with both self-reported data from participating children and information from teachers and parents) and found that externalising problems (but not internalising problems) among boys at age eight predicted later substance abuse, which in turn predicted later criminality. A study by Sourander et al. (2007) (based on both self-reported and register data) found that children with combined conduct problems and internalising problems at age eight had the highest risk of subsequent psychiatric disorders and criminal offenses. These children only included 4% of the sample but were responsible for 26% of all crimes at the follow-up (Sourander et al., 2007).

Studies from the Nordic countries have identified specific problems and disorders related to crime, particularly the association between externalising problems and offending. (e.g., Hildebrand et al., 2020; Mordre et al., 2011; Gosden et al., 2003). For example, register-based studies from several Nordic countries have focused on ADHD/hyperactivity problems and/or conduct disorder and offending, with results showing that adolescents with a combination of ADHD and conduct disorders, as well as early onset of substance abuse, have a more diverse history of violence and aggressive behaviour compared to adolescents without these problems (Hildebrand et al., 2020); that children and adolescents with ADHD were convicted of crimes to a higher degree both in adolescence and later adulthood compared to those without (Mohr-Jensen et al., 2019; Dalsgaard et al., 2014); and that conduct disorder and hyperkinetic conduct disorder significantly increased the risk of future criminal behaviour among former child psychiatric patients (Mordre et al. (2011).

Studies using other methods (for example, self-reported data) have found similar results. For example, it has been found that adolescent male offenders have higher levels of overall scores of mental health difficulties – especially regarding conduct problems (Ginner Hau, 2010), and that hyperactivity/inattention and ADHD symptoms at the age of nine or 12 are the most significant risk factors for antisocial behaviour at the age of 15 (Selinus et al., 2015). In one of a few Nordic studies conducted in juvenile detention, Ankarsäter et al. (2007) found that 39% of youth met the criteria for ADHD. In regard to other diagnoses, a Finnish population-based study found that boys that had at least one psychiatric disorder, with antisocial personality disorder being the most common, accounted for almost half of all measured crimes (Elonheimo et al., 2007), and a Danish study found that, among adolescent remand prisoners, 69% had some sort of mental disorder, with the most common being conduct disorder (Gosden et al., 2003).

It can be concluded that, overall, Nordic research shows similar results to international studies outside of the Nordic region, with mainly externalising MHPs being associated with adolescent offending (e.g., Selinus et al., 2015; Gosden et al., 2003; Ivert et al., 2017; Siponen et al., 2023). Moreover, in the Nordic countries' studies based on juvenile justice, samples appear to be scarcer (e.g., Ankarsäter et al., 2007), with most studies using community samples, often in the form of register studies (e.g., Mohr-Jensen et al., 2019). Fewer Nordic studies have used self-reported data in the examination of adolescent MHPs and offending (e.g., Källmen et al., 2023). Although there are a number of studies that have examined the relationship between MHP and criminality over time, few of them have

focused on the development and stability of these phenomena over time and what that entails.

Aim of the current study

The current study will contribute to the knowledge base by using self-reported data to examine how differences in MHPs were associated with differences in crime involvement between adolescents in a Swedish adolescent sample, as well as by examining how individual changes in mental health were associated with change in crime involvement over time. Based on knowledge from previous research, we hypothesise that there will be an association between MHPs and crime involvement. We also hypothesise that individual changes in MHPs will be associated with individual changes in crime involvement, e.g., if MHPs increase, this will be associated with an increase in crime involvement. However, we anticipate the possibility of finding differences due to differences in method and sample as well as due to differences in what kind of MPHs have been examined and how this has been done.

Method

Sample

Data were drawn from the longitudinal research project Malmö Individual and Neighbourhood Development Study (MINDS), which comprises a random sample of 525 adolescents (approximately 20%) born in 1995 and living in Malmö, Sweden, in 2007 (for a description of the project, see e.g., Ivert et al. (2017); Ivert (2013); Chrysoulakis, 2022; Ivert, 2013). Malmö is the third largest city in Sweden, with approximately 360,000 inhabitants (Malmö Stad, 2024), and the population is relatively young, with about 20% being younger than 18 years. The percentage of inhabitants with higher education is above the national average; however, unemployment rates are also above the national average. About one-third of the population in Malmö is born abroad, compared to 25% in the other two large cities and 20% in Sweden in total (Malmö Stad, 2024). Like other large cities, Malmö has both affluent areas and disadvantaged neighbourhoods with lower socioeconomic status. It can therefore be assumed that we would get similar results with data from another comparable Swedish city. Three waves of data collection (not counting a pilot study with a smaller subsample) were completed when the adolescents were approximately 16, 17 and 19 years old. About 515 adolescents participated in the data collection at age 16 and 17, and 411 at age 19. The current study includes only the 386 adolescents (53% girls and 47% boys) who participated across all three waves. Overall, adolescents from more disadvantaged neighbourhoods and with a foreign background were somewhat underrepresented in the sample. Data were collected using a self-reported questionnaire, primarily in small groups at the schools attended by the adolescents. In a few cases, mainly during the final data collection, a postal survey was sent to those who could not be reached through the school.

The study was approved by the Swedish Regional Ethical Review Board in Lund (Dnr. 201/2007, Dnr. 2014/802, and Dnr 2021-05120).

Measures

Adolescent MHPs were measured using the Swedish version (Svedin & Priebe, 2008) of the self-reported version of the Strength and Difficulties Questionnaire (SDQ) (Goodman et al., 1998). SDQ is widely used and has shown good validity in previous studies

(Vugteveen et al., 2021; Goodman et al., 1998). SDQ consists of 25 items, divided into five subscales (representing different dimensions of mental health) with five items each (see www.sdqinfo.org). As recommended by Goodman et al. (2010), in low-risk community samples we used two subscales measuring internalising behaviour (age 16 α = 0.65; age 17 α = 0.67; age 19 α = 0.64) and externalising behaviour (age 16 α = 0.74; age 17 α =71; age 19 α = 0.73). Both scales range from 0 to 20, and a high score on SDQ indicates higher levels of mental health problems. Overall, there were few missing values on SDQ items (< 3%). As recommended, missing values were imputed with a subscale mean if no more than two of the items were unanswered in each subscale (Sdqinfo, 2023).

In addition to the SDQ, we included eight questions about the past months (e.g., difficulties with sleep, high stress) aiming to measure the present level of *state negative affect*. This measure might, in contrast to trait negative affect measured by SDQ, be seen as a reaction to stressful events in the adolescent's life (Schmukle et al., 2002). The few cases of missing values (< 3%) were imputed with a subscale mean if no more than two of the items were unanswered. Internal consistency was satisfactory (age 16 α = 0.83; age 17 α = 0.83; age 19 α = 0.86) and there were significant correlations between all items across all waves

Crime involvement covers nine different crime items covering both property crime (shoplifting, theft from a person, residential burglary, non-residential burglary, theft from/of a car, vandalism, arson) and violence (assault, robbery). Adolescents were asked if they had committed each type of crime during the previous 12 months. The items were added into a variety scale (Sweeten, 2012) by counting the number of crime types the adolescent had committed over the 12 months preceding the data collection. Property crimes were more common than violent crime across all waves of data collection.

Adolescents who participated in all three waves of data collection diverged substantially in relation to sex, as fewer boys participated over all three years (51% at age 16; 47% at age 19). In relation to study variables, adolescents included in the current study reported higher levels of internalising problems, state negative affect, and lower levels of externalising problems at age 16, compared to those who dropped out. Examining girls and boys separately shows that the difference in state negative affect only applies to boys, and the difference in externalising problems only applies to girls. No difference was found in relation to crime involvement.

Statistical analysis

First, to study how mental health as well as offending change over time, we examined the absolute and relative stability (Forehand & Jones, 2002). We examined absolute stability using paired-sample t-tests, comparing the mean value of each variable at age 16 with the mean value of the same variable at age 17 and at age 19. We then examined relative stability by calculating stability coefficients (Spearman's correlation), which refers to the consistency of an individual's rank order over time which, in this case, was the extent to which an individual maintained their position on a specific variable over time relative to other individuals in the sample.

Next, due to the characteristics of the outcome variable (discrete counts which were skewed and over-dispersed) we applied negative binomial longitudinal multilevel analysis (Hilbe, 2011). This allowed us to estimate within-person (level 1) change as well as between-person (level 2) differences. By nesting time within individuals in level 1, we were able to examine whether change in externalising problems over time for one individual is associated with change in crime involvement for the same individual, regardless of

the initial level of externalising problems or crime involvement. In addition, the fixed effect regression controls for all individual, time-stable variables (e.g., gender or country of birth), implying that any observed effect of a dynamic variable is independent of time-stable variables. Level 2 examined time stable differences between adolescents; for example, whether adolescents who reported higher levels of externalising problems also reported more crime involvement compared to other adolescents.

We estimated two different multilevel models. The first model tested the effects of externalising and internalising problems on crime involvement. Given that the state of mental health at the time of data collection might affect the association between externalising and internalising problems and crime involvement, the measure of state negative affect was added in the second model. Both models were adjusted for sex and time and were also estimated separately for girls and boys.

To estimate the effect of the different measures of mental health on offending, the incidence rate ratio (IRR) and corresponding confidence intervals (CI) were calculated. The IRR is the exponentiated value of the coefficients (Hilbe, 2011), and can be interpreted similarly to odds ratios. An IRR greater than 1 indicates a higher rate among those with a higher value on the exposure variable (e.g., internalising problems).

Analyses were conducted using SPSS 27 and Stata 17.

Results

Table 1 presents descriptive statistics of study variables and the absolute stability. Comparing mean scores to examine absolute stability showed that, on average, externalising problems appear to be stable over time, while internalising problems, as well as negative affect, increase with age. Crime involvement increases from age 16 to age 17, and then decreases again at age 19. Girls reported higher levels of internalising problems and state negative affect compared to boys across all thee waves of data collection ($p < .001$). No sex difference was identified in relation to externalising problems. Compared to girls, boys reported higher levels of crime involvement at ages 17 and 19 ($p < .001$).

Table 1 Descriptive statistics and differences over time. Mean values (standard deviations in parentheses) if nothing else indicated. N=386

	Age 16	**Age 17**	**Age 19**
Externalising problems (0–20)	5.75 (3.41)	5.73 (3.31)	5.63 (3.17)
Internalising problems (0–20)	4.75 (2.96)	5.00 (3.11)	5.33 (3.00)[b]
State negative affect (0–32)	11.38 (5.52)	12.41 (5.73)[a]	13.16 (5.46)[b]
Crime involvement (0–9)	0.44 (0.99)	0.72 (1.14)[a]	0.29 (0.73)[b]
Any crime (%)	23.6	39.9	17.4
Girls (n = 206)			
Externalising problems (0–20)	5.58 (3.27)	5.56 (3.16)	5.54 (2.94)
Internalising problems (0–20)	5.40 (3.00)	5.55 (3.06)	6.11 (2.90)[b]
State negative affect (0–32)	13.37 (5.32)	14.36 (5.35)[a]	14.60 (4.81)[b]
Crime involvement (0–9)	0.37 (0.85)	0.44 (0.82)	0.16 (0.49)[b]
Any crime (%)	22.3	29.1	15.5
Boys (n=180)			

(continued)

Table 1 (*Continued*)

	Age 16	**Age 17**	**Age 19**
Externalising problems (0–20)	5.96 (3.57)	5.92 (3.47)	5.74 (3.42)
Internalising problems (0–20)	3.99 (2.73)	4.36 (3.05)	4.43 (2.86)[b]
State negative affect (0–32)	9.08 (4.81)	10.17 (5.32)[a]	11.52 (5.71)[b]
Crime involvement (0–9)	0.52 (1.41)	1.03 (1.36)[a]	0.44 (0.92)
Any crime (%)	25	52.2	28.3

Between year difference based on paired samples T-test (Externalising, Internalising & State negative affect) and Wilcoxon signed ranks test (Crime involvement) for comparison of mean values.
[a]Significant difference between age 16 and age 17
[b]Significant difference between age 16 and age 19

The correlations presented in Table 2 indicate relative stability over time for all variables ($p < 0.01$). The correlation with the highest magnitude (i.e. the most stable over time) was externalising problems ($r > 0.564$), followed by state negative affect ($r > 0.531$) and internalising problems ($r > 0.517$). Correlations for crime involvement were lower, with the lowest correlation for age 16 and 19 ($r>0.267$). Overall, the magnitude of the correlations was higher for the next closest assessments. These findings indicate that participants reporting higher levels of externalising problems, internalising problems, or offending, continued to report relatively higher levels over time.

Table 2 Stability coefficients (Spearman's correlations at age 16, 17, and 19)

Externalising	**Internalising**	**State negative affect**
0.690**	0.593**	0.670**
0.564**	0.517**	0.531**
0.637**	0.581**	0.537**

All correlations are significant at $p < 0.01$.

The between-participant analysis (Table 3) shows that adolescents were more likely to report crime involvement if they also experienced higher levels of externalising problems (IRR = 1.34, CI = 1.27-1.41). The inclusion of state negative affect in the second model did not have any substantial influence on the association between externalising problems and crime involvement. However, in this second model, adolescents who experienced higher levels of internalising problems were less likely to report crime involvement (IRR = 0.89, CI = 0.83-0.96), indicating that when state negative effect is held constant, adolescents with higher levels of externalising problems still report higher levels of crime involvement, but adolescents with higher levels of internalising problems report less crime involvement. Model 2 also indicates a positive association between state negative affect and crime involvement when externalising and internalising problems are held constant.

The within-participant analysis (Table 3) shows that changes in externalising problems were related to changes in crime involvement, such that an individual increase in externalising problems was associated with an individual increase in crime involvement (IRR =1.16/1.06, CI = 1.10-1.22. /1.00-1.12). The association between internalising problems and crime involvement is barely conclusive (IRR = 1.06, CI = 1.00-1.12). Moreover, as two models were estimated, adjusting the alpha level indicated that the association was not significant. The association between change in externalising problems and change in crime involvement remained even after adjustment for state negative effect.

Table 3 Negative binomial multilevel regression predicting overall crime involvement

	Model 1			**Model 2**		
Total sample	Estimate	SE	IRR (CI)	Estimate	SE	IRR (CI)
Between-person						
Externalising problems	0.290***	0.027	1.34 (1.27–1.41)	0.265***	0.027	1.30 (1.24–1.37)
Internalising problems	-0.042	0.030	0.96 (0.90–1.02)	-0.112**	0.038	0.89 (0.83–0.96)
State negative affect				0.066**	0.023	1.07 (1.02–1.12)
Within-person						
Externalising problems	0.144***	0.026	1.16 (1.10–1.22)	0.132***	0.026	1.14 (1.08–1.20)
Internalising problems	0.056*	0.027	1.06 (1.00–1.12)	0.025	0.030	1.06 (0.97–1.09)
State negative affect				0.050**	0.016	
Girls	Estimate	SE	IRR	Estimate	SE	IRR
Between-person						
Externalising problems	0.343***	0.049	1.41 (1.28–1.55)	0.287***	0.048	1.33 (1.21–1.46)
Internalising problems	0.056	0.047	1.06 (0.96–1.16)	.-0.070	0.059	0.93 (0.83–1.05)
State negative affect				0.121**	0.039	1.13 (1.05–1.22)
Within-person						
Externalising problems	0.238***	0.044	1.27 (1.16–1.38)	0.197***	0.047	1.22 (1.11–1.33)
Internalising problems	0.027	0.043	1.03 (0.94–1.12)	-0.027	0.048	0.97 (0.89–1.07)
State negative affect				0.075**	0.027	1.08 (1.02–1.14)
Boys	Estimate	SE	IRR	Estimate	SE	IRR
Between-person						
Externalising problems	0.269***	0.031	1.31 (1.23–1.39)	0.258***	0.032	1.29 (1.03–1.16)
Internalizing problems	-0.123**	0.041	0.88 (0.82–0.96)	-0.160**	0.050	0.85 (0.77–0.94)
State negative affect				0.035	.028	1.04 (0.98–1.09)
Within-person						
Externalizing problems	0.091**	0.032	1.10 (1.03–1.17)	0.089*	.032	1.09 (1.03–1.16)
Internalizing problems	0.077*	0.036	1.08 (1.01–1.16)	0.064	.038	1.07 (0.99–1.15)
State negative affect				0.024	.020	1.02 (0.99–1.06)

*p < 0 .05; **p < .01; ***p < 0.001
Model 1 adjusted for sex and time
Modell 2 adjusted for sex, time and state negative effect

Fitting separate models for girls and boys yielded partially different results. The between-participant analysis (model 2) showed that girls were more likely to report crime involvement if they also experienced higher levels of externalising problems (IRR = 1.33, CI = 1.21-1.46) even after adjustment for level of state negative affect. Internalising problems were not associated with crime involvement among girls; however, we found an association between higher levels of state negative affect and higher levels of crime involvement when girls' externalising and internalising problems were held constant. Among boys, there was a conclusive association between crime involvement and both externalising problems (IRR = 1.29, CI = 1.03-1.16) and internalising problems (IRR = 0.85, CI = 0.77-0.94), such that those with higher levels of both types of MHPs were more likely to report crime involvement.

Findings from the within-participant analysis showed that change in externalising problems over time was associated with a change in crime involvement over time for both girls (IRR =1.22/1.08, CI = 1.11–1.33/1.02-1.14) and boys (IRR = 1.09, CI = 1.03-1.16). Among boys, however, a change in internalising problems was initially positively associated with a change in crime involvement (IRR = 1.08, CI = 0.82-0.96) but, after adjustment for change in state negative affect in the second model, this association disappeared.

Discussion

As hypothesised, findings from the present study are in line with both research from countries outside of the Nordic region and research from the Nordic countries (e.g., Beaudry et al., 2021; Colins et al., 2010; Moffitt, 1993; Ivert et al., 2017; Miettunen et al., 2014). Firstly, the result shows that many adolescents offend at some point during their adolescence and, as Moffitt (2006) stated, that number drops after a certain age (in this study, 17 years of age) and only a smaller number of adolescents continue their crime involvement as they become older. Further, results show that individual change in externalising problems was associated with change in crime involvement, with similar patterns for girls and boys. This thus supports findings from research outside of the Nordic region from the juvenile justice system and communities, as well as research from the Nordic countries, that has found associations between problems and diagnoses associated with externalising problems and offending, such as ADHD (e.g., Beaudry et al., 2021; Colins et al., 2020; Moffitt et al., 2001; Loeber et al., 2012; Ivert et al., 2017; Miettunen et al., 2014; Mohr-Jensen et al., 2019; Dalsgaard et al., 2014).

Generally, we found no association between internalising problems and crime involvement. That is, the level of internalising problems did not differentiate between adolescents involved in crime and those who were not, nor was individual level of internalising behaviour associated with individual level in crime involvement. Findings from previous research are inconclusive; there are studies reporting findings similar to ours, showing no increased risk for crime involvement among adolescents with internalising problems (e.g., Miettunen et al., 2014), but there are also studies reporting opposite results, i.e., an increased risk for crime involvement among adolescents with internalising problems (e.g., Sourander et al., 2007). However, when conducting separate analysis for girls and boys, the results indicate that internalising problems were associated with less crime involvement among boys. Additional research is therefore needed to fully understand the association between internalising problems and adolescent offending, particularly by examining potential gender differences and various populations.

The study findings therefore suggest that externalising problems (which, as mentioned, reflect some neuropsychiatric problems) may be an especially important variable for understanding why some individuals continue their crime involvement in adulthood (cf. Moffitt et al., 1994; Moffitt et al., 2001). It can be hypothesised that the strong and stable association between externalising problems and offending in research is due to the fact that some externalising problems reflect phenomena that have been theoretically and empirically linked to crime, such as self-control (e.g., Gottfredson & Hirschi, 1990) and morality (e.g., Wikström, 2006). For example, impulsivity and hyperactivity are linked to problems with self-control (e.g., Barkley, 1997), while antisocial and conduct problems have been associated with deviant moral values (e.g., Stams et al., 2006). In contrast, internalising problems may reflect MHPs linked to introverted behaviour (e.g., Nikstat &

Riemann, 2020) that are not as strongly associated with problems of self-control or deviant moral values (e.g., Moffitt et al., 2002).

However, even though findings are in line with previous research, this study also contributes with important, new evidence owing to its longitudinal, community-based, self-reported data design, of which there is a current lack in research from the Nordic countries. Moreover, although the role of state negative affect was not the focus of the study, this is a variable that should be further explored in future research. Indeed, the stability coefficient was rather high ($r > 0.531$) in the current sample, indicating that this measure does not fluctuate as much over time as we expected and therefore might be an indication of something other than a reaction to stressful events. In addition, this measure appears to affect girls and boys differently, and this is something that should be addressed in future studies.

There are some methodological considerations that need to be mentioned in relation to the present study. First, the sample is rather small, and this might be associated with some uncertainty regarding the generalisability of the findings, especially since many of the adolescents had committed few or no crimes at all. However, findings are overall in line with previous research, which reflects its relevance and reliability. Further, there are some methodological considerations associated with the SDQ. Although SDQ is widely used and has been suggested to be useful for screening for MHPs (Vugteveen et al., 2021), it has been argued that SDQ may not be optimised for use in community samples and more research is needed to understand how different items are related to each other and differentially contribute to the subscales and overall score (Vaz et al., 2016). However, in the present study we used the broader externalising and internalising subscales as suggested for community samples (Goodman et al., 2010). In addition, the alpha value for the internalising subscale was below the recommended 0.7 level and therefore the results should be interpreted with caution. The externalising subscale does include conduct problems, which by itself includes some antisocial and criminal behaviours. However, conduct disorder is a diagnosis in the *DSM-5* American Psychiatric Association (2022) and it is important to address conduct problems as MHPs when, for example, guiding intervention and preventive measures. A potential limitation is the use of self-reported data, which can implicate problems with both over- and under-reporting, as well as internal and external dropouts. However, this type of data also enables access to information that might not be found in, for example, official registers, and which can provide an insight into MHPS and crime involvement among community-based adolescents that have not been in contact with, for example, a psychiatrist or the police. Furthermore, there was an inability to check for confounding effects and reverse causality regarding state negative affect and crime involvement; thus, the results should be interpreted carefully, and future research is suggested to consider these possibilities. Finally, the choice of statistical approach might have affected the findings and alternative methods, e.g., zero inflated models or lagged analyses, could have yielded somewhat different results. Even though findings from the present study overall align with previous research, we encourage future studies to try additional statistical approaches.

To guide future research further and to reduce stigmatisation of adolescents with MHPs (both in the Nordic countries and internationally), it must be highlighted that MHPs cannot on their own explain adolescent crime involvement. Further research is needed to explore how the association between externalising behaviour and crime involvement is affected by other factors, such as criminal attitudes or moral values. More research is also needed to explore gender differences; while externalising problems appear to affect both

girls' and boys' criminality in similar ways, state negative affect was only associated with crime involvement among girls.

Conclusion

To conclude, from what we now know about the association between adolescent MHPs and crime involvement, both from previous research from outside the Nordic region and the Nordic countries, as well as from the results of the current study, it is of importance to address and fully understand the relationship between MHPs and crime involvement, not only for the health of adolescents, but also to minimise the risk of increasing criminality and other adverse outcomes. The study results highlight the importance of addressing externalising problems comprehensively and developing preventive measures targeting externalising problems broadly, as a negative development appears to increase the risk of crime involvement, regardless of the initial level of problems. Combined with the knowledge that MHPs often start in childhood/adolescence (Newman et al., 1996), and that more children and adolescents are having problems with mental health and seeking help for MHPs (e.g., Nordic Council of Ministers, 2022; Socialstyrelsen, 2019; Region Skåne, 2024), it can be suggested that it is important to detect both boys and girls with MHPs (especially externalising problems) as early as possible in the community. The study is further an important complement to previously existing research due to its unique design, using longitudinal self-reported data from a community-based sample (which gave the ability to capture MHPS and offending that has not been actualised within, for example, healthcare or police registers) as well as due to it being able to follow the development of MHPS and offending over time, as well as to study differences in development in MHPS in relation to differences in development in offending among adolescents in the community.

Data availability statement

The data that supports the findings of this study are not publicly available due to privacy, ethical, and legal restrictions. The data can be available upon request to the corresponding author with the guarantee that privacy, ethical, and legal restrictions are maintained.

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