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Mental health symptoms during imprisonment: a longitudinal study

Dirkzwager AJE, Nieuwbeerta P. Mental health symptoms during imprisonment: a longitudinal study.

Objective: Mental health problems are common in prison populations. Less is known about how mental health problems develop during imprisonment. The objective was to examine the longitudinal course of mental health symptoms during imprisonment and individual factors associated with the development of these symptoms.
Method: In a prospective cohort study, 1.664 Dutch male prisoners were questioned 3 weeks after their arrival in detention. Those still in custody were questioned again after 3, 9, and 18 months. Multilevel analyses were conducted to identify predictors of the course of mental health symptoms.
Results: Prisoners reported continued elevated symptom levels compared to the general population. Inmates who entered detention with pre-existing mental health problems and problematic alcohol/drugs use showed mental health improvements during detention.
Conclusion: The high levels of prisoners' mental health problems highlight the importance of addressing mental health issues in prison. Imprisonment does not have an overall negative effect on mental health.

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Key words: prisoners; mental health; cohort studies; predictors

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Significant Outcomes

- Imprisonment does not have an overall negative effect on mental health: some prisoners show a stable course of mental health problems during detention, while others show substantial mental health improvements during detention
- The improvements in mental health are especially observed among high-risk groups with pre-existing mental and substance-related problems

Limitations

- Use of a screening instrument instead of a clinician-administered interview to measure mental health
- Unclear to what extent the findings are generalizable to other correctional populations (e.g. females), settings and countries

Introduction

Individuals with mental health problems are largely overrepresented in the criminal justice system. This overrepresentation is particularly pronounced in prisons, showing an excess of mental health problems behind bars (1, 2). Empirical studies typically showed that compared with the general population, prisoners have an increased risk of psychiatric disorders and experience substantially elevated levels of psychological distress (1–5).

However, as most existing studies on prisoners' health have cross-sectional designs, far less is known about how mental health problems develop during imprisonment. Only a limited number of studies have described overall trends in the mental health of prisoners during detention. These descriptive longitudinal studies suggest that, in general, prisoners' mental health problems seem to stabilize or decrease during imprisonment (6–13).

Even less is known about whether or not changes in mental health symptoms during

imprisonment vary across prisoners, and how differences in changes are related to pre-existing characteristics of individuals entering detention. A review of the literature resulted in only six longitudinal studies that examined pre-existing predictors of changes in mental health during imprisonment (6, 8, 10, 14–16). These studies identified female gender (6, 9) and psychological characteristics (i.e. the belief that life is controlled by external factors) (14) as predictors of a continued poor mental health during imprisonment, while prior prison spells were linked to both an increased risk of depression at follow-up and to mental health improvements during imprisonment (6, 10). In a study among female prisoners, mental health improvements were observed in those who used drugs prior to imprisonment (10). Finally, a study among jail prisoners showed that those with a history of psychiatric hospitalization were more likely to show continued high levels of anxiety and psychotic symptoms, but no differences were observed for other symptom dimensions (16). Although informative, these existing longitudinal studies had some important limitations, such as relatively small sample sizes, inmates from a limited number of correctional facilities, and all examined predictors of mental health changes between two measurements during imprisonment only.

This study adds to the limited literature by examining a variety of pre-existing predictors of the development of prisoners' mental health problems measured across four moments during imprisonment among inmates from all correctional facilities in the Netherlands.

Aims of the study

The aims of this study were to (i) examine the development of prisoners' mental health symptoms during their detention and (ii) identify individual factors associated with the course of these mental health symptoms. More knowledge on this issue is important for healthcare professionals working with offenders because it may provide important clues for the targeting and timing of interventions aimed at preventing or reducing prisoners' mental health problems.

Material and methods

Sample and procedure

Data were used from the Prison Project, a nationwide, longitudinal and prospective cohort study examining the development of criminal behaviour and other life circumstances (including mental health) of male prisoners in the Netherlands (17–19). The study protocol was submitted to and reviewed positively by the Ethical Committee for Legal and Criminological Research of the VU University Amsterdam.

The target sample of this study consisted of adult male prisoners, who were born in the Netherlands, and who entered one of the 30 Dutch remand centers between October 2010 and April 2011. In total, 7.801 persons were put in pretrail detention during this period, of whom 3.981 matched our additional inclusion criteria (i.e. adult, male, and born in the Netherlands). Because the far majority of the 7.801 pretrail inmates were men (93%) and aged between 18 and 65 years (99.6%), the first two additional inclusion criteria did not substantially affect the number of respondents. However, about 40% of the eligible pretrail detainees were excluded because they were not born in the Netherlands. This inclusion criterion was implemented because collecting (administrative) information on participants' entire lives was essential to the Prison Project and it would have been difficult to collect such information for those not born in the Netherlands because they are known to be missing in official registration systems and are likely to return to their country of origin after detention. It is to be noted, though, that the target sample does include persons of whom one or both parents were born in other countries (i.e. second-generation immigrants).

Team members of the Prison Project tried to approach all eligible prisoners in their first weeks after entering pretrial detention. Of the 3.981 persons meeting the inclusion criteria of the Prison Project, 2.837 (71%) could be approached. Most of those who could not be approached had already been released from custody before they could be contacted (N = 865) (19). Of the approached persons, 1.904 (67%) agreed to participate in the Prison Project and signed an informed consent declaration. At the baseline measurement (T_1), held about 3 weeks after arrival in pretrial detention, these 1.904 prisoners participated in a computer-assisted structured interview with one of the employees of the Prison Project. Analyses using registered data showed that these 1.904 respondents were largely representative of the total target population of 3.981 prisoners who met the inclusion criteria of the Prison Project (i.e. they were similar on characteristics like age, marital status, employment situation, substance use, age of first conviction, prior convictions, prior detention spells, and offense type). Full information on the sampling procedures and the representativeness of

the sample is provided in the cohort profile of the Prison Project (19).

Of the full sample of respondents in the Prison Project, 1.664 prisoners (87%) also filled out a written questionnaire at the first measurement, including a section with questions on prisoners' mental health. Official data from the Dutch Prison Service could be used to compare these participants of the baseline measurement (N = 1.664) with those who did not fill out the written questionnaire (N = 240) on a number of background characteristics. These analyses show that the groups were similar with respect to most characteristics, like age upon entry in pretrial detention, their housing and employment situation prior to detention, being a heavy drinker or drug user prior to detention, experiencing problems in daily life prior to detention due to substance use, and offense type. Those who did not fill out the questionnaire were somewhat more likely to have one or two parents who were not born in the Netherlands, to have been convicted for the first time prior to age 18, and to have been convicted in the preceding 5 years (see Appendix S1).

Respondents who were still detained were approached and asked to fill out a written questionnaire again three (T_2), nine (T_3), and 18 months (T_4) after their arrival in detention. As prison sentences in the Netherlands are relatively short – more than 70% of all released prisoners are confined to a maximum of 3 months (20) – many respondents had already been released at the time of the three follow-up measurements. In total, 33% of the participants were already released at the first follow-up, 74% at the second follow-up, and 89% at the third follow-up. Eventually, 943 respondents could be contacted again at T_2, 359 were contacted at T_3, and 149 were contacted at T_4. A comparison of characteristics measured at baseline shows that, in general, those who had already been released and could not be contacted at one of the follow-up measurements did not differ substantially from those who were still incarcerated and contacted, with an obvious exception of offense type (T_2–T_4), and age at first conviction (T_2 only); see Appendix S2. Of interest, no significant differences were observed with respect to the level of mental health problems measured at baseline, suggesting that prisoners with higher levels of mental health problems at baseline were not more or less likely to leave prison sooner. About 80 per cent (n = 761) of those contacted at T_2 participated. At T_3, 63% (n = 225) participated and at T_4, 60% (n = 90) filled out the questionnaire. Again, comparisons of characteristics between respondents and non-respondents for all follow-ups show that, in general, the response was unrelated to their baseline characteristics (see Appendix S1).

Table 1 presents the baseline characteristics of the respondents for all four waves. In general,

Table 1. Respondents' individual characteristics and baseline mental health – at each measurement

	T1 N = 1664	T2 N = 761	T3 N = 225	T4 N = 90
Individual characteristics	%	%	%	%
Age upon arrival in correctional facility: 30 years or older	40.3	40.9	38.7	44.4
Highest education: Primary school/lower voc. Training	44.8	42.3	40.4	50.0
Second-generation immigrant: At least one parent born outside the Netherlands	37.8	35.6	38.7	32.2
Homeless at time of arrest	8.1	6.4	6.7	6.7
Employment situation prior to detention				
Employed	39.4	42.6	44.0	41.1
Unemployed	39.3	37.3	35.1	36.7
Non-participant (disabled, student, retired, housewife)	21.3	20.1	20.9	22.2
Partner at time of arrest	59.6	60.4	68.7	65.5
Children at time of arrest	41.8	42.1	43.8	48.3
Heavy drinker in 12 months prior to detention	39.2	38.5	37.3	43.3
Frequent drug user in 12 months prior to detention	43.3	42.7	41.3	36.7
Alcohol prior to detention causes problems in daily life	16.2	15.0	17.3	17.8
Drugs use prior to detention causes problems in daily life	26.0	27.2	26.7	23.3
Treatment for a mental health disorder in 12 months prior to detention	29.8	30.8	28.4	25.6
Did a doctor ever tell you that you have a chronic disease	35.9	38.4	36.4	42.2
Age at first conviction: Younger than 18 (registered data)	62.5	57.4	57.3	62.9
Conviction in preceding 5 years (registered data)	80.4	77.0	76.0	73.0
Prior prison spell since age 12 (registered data)	57.0	53.8	53.8	62.9
Type offense: Violence (registered data)	45.9	52.8	64.9	73.3
Type offense: Property (registered data)	30.3	21.8	10.7	8.9
Type offense: Drugs (registered data)	12.3	14.1	13.8	10.0
Type offense: Other (registered data)	11.5	11.3	10.7	7.8
Legal status: remand	66.0	52.4	25.3	17.8
Mental health symptoms (BSI scales) – measured at T1	M	M	M	M
Total	0.70	0.73	0.79	0.73
Anxiety	0.69	0.71	0.79	0.73
Hostility	0.61	0.61	0.64	0.58
Depression	0.83	0.86	0.94	0.87
Somatic complaints	0.53	0.55	0.59	0.56
Cognitive	0.80	0.85	0.89	0.83
Interpersonal sensitivity	0.58	0.59	0.62	0.57
Phobic anxiety	0.44	0.43	0.49	0.42
Paranoid ideation	1.05	1.10	1.22	1.17
Psychoticism	0.62	0.66	0.73	0.67

samples were proportionally similar across the four time points regarding demographic, health-related and crime-related characteristics measured. As prisoners who were arrested for more serious offenses typically have longer prison spells, the offense type differed across measurements. As a result, compared with those who were only assessed 3 weeks or 3 months after entry, those who were also questioned nine and 18 months after arrival in detention were more likely to have committed a violent crime and less likely to have committed a property crime.

Outcome measure

At all four waves, mental health symptoms were assessed with the Dutch version of the Brief Symptom Inventory (BSI) (21), a well-known screening instrument that has been used in prison samples before (9, 22). The BSI consists of 53 psychological symptoms and prisoners indicated on a five-point scale to what extent they experienced these symptoms in the last week, including today (0 = not experienced at all, 4 = experienced a lot). The items relate to nine subscales: depression, anxiety, hostility, somatic complaints, phobic anxiety, cognitive problems, interpersonal sensitivity, paranoid ideation, and psychoticism. The total BSI score – based on all 53 items – indicates the overall level of psychological distress. The Dutch BSI has been validated and showed good psychometric properties (23). In this study, both the overall BSI scale and all nine subscales proved reliable (respectively, Cronbach's alpha: 0.97 and 0.76 – 0.90). Additional analyses examining the psychometric characteristics of the BSI in this sample of prisoners showed that, in general, the observed factor structure was in line with the intended symptom dimensions but high intercorrelations were found between some BSI scales (e.g. between Depression and Anxiety; Depression and Psychoticism). Furthermore, the BSI could distinguish well between different groups (i.e. prisoners vs. the general population; prisoners vs. psychiatric patients; analyses available upon request).

Besides analyzing the average scores on the BSI scales, we will also examine the proportion of prisoners who experienced a very high score on the BSI scales. A very high level was defined based on the norm tables presented in the Dutch BSI manual (24). In these norm tables, seven levels are distinguished based on percentile scores (ranging from a very low score to a very high score). A very high score is achieved by five per cent of the males from the general population. Based on the 95% percentile scores of the men from the general population, the male prisoners were classified into having a 'very high score' on the BSI scales (coded as 1) or not (coded as 0).

Predictors

Based on prior empirical studies, several pre-existing predictors for (changes in) mental health symptoms were included in the analyses (see Table 1). First, the following variables were included as an indication for prisoners' pre-existing health: treatment for a mental health problem in the 12 months preceding detention (0 = no; 1 = yes); ever being told by a doctor to have a chronic disease (0 = no; 1 = yes); heavy drinking in the 12 months prior to arrest (i.e. at least once a week six or more glasses of alcohol on one day) (25); frequent drug using (i.e. three or more days a week); and whether or not their alcohol and drugs use negatively affected their daily life functioning (i.e. problems with family or friends; hindered activities at school, work or home; having such a strong urge for alcohol or drugs that respondent could not think of anything else; giving up important activities).

Second, based on official records the following crime-related variables were included offense type (violence, property crime, drugs, other), first conviction before age 18 (0 = no; 1 = yes), prior prison experience (0 = no; 1 = yes), having been convicted in the 5 years preceding this detention (0 = no; 1 = yes).

Third, several demographic characteristics were included, like age upon arrival in the correctional facility (0 = younger than 30 years; 1 = 30 years or older), ethnic background (0 = Dutch background; 1 = at least one parent born outside the Netherlands), having children and an intimate relationship at the time of arrest (0 = no; 1 = yes), educational level (0 = intermediate vocational training and above; 1 = primary school or lower vocational training), homelessness at the time of arrest (0 = no; 1 = yes), and the employment situation prior to detention (0 = employed; 1 = unemployed; 2 = non-participant labor market).

Finally, information was included on the prisoner's legal status (0 = sentenced; 1 = remand). This latter variable, of course, can vary across the four measurements.

Statistical analysis

Independent t-tests were conducted to compare the mean scores on the BSI scales between prisoners and men from the general population. Paired t-tests were used to examine whether changes in BSI

scores over time were significant. Furthermore, differences in the proportion of individuals with a very high score on the BSI between prisoners and men from the general population as well as changes in the proportion of prisoners with a very high score over time were examined with chi-square and McNemar tests respectively (see Appendix S3 and S4).

To examine the extent to which pre-existing predictors were related to prisoners' mental health after the first weeks of detention (T_1), multivariate regression analyses were carried out. In these analyses, information was used on all inmates who participated in the survey at the first measurement (n = 1.664). Linear regression analyses were conducted with the mean BSI scores (range: 0–4) as dependent variable and logistic regression analyses were carried out with the dichotomized BSI variable (1 = a very high level, 0 = not) as dependent variable. In both (linear and logistic) analyses, all variables presented in Table 1 were simultaneously included as independent variables. For the sake of clarity, these analyses were limited to the total score on the BSI. Independent variables that were significantly related to the total BSI score in these multivariate regression analyses (see Appendix S5) were included in the next step of the analyses, in which the longitudinal development of mental health symptoms was examined.

To examine the longitudinal course of the mental health symptoms during imprisonment, multivariate multilevel regression analyses were conducted. Multilevel analyses were employed in order to account for the hierarchical structure of the data (i.e. repeated measures nested within inmates). Ignoring the hierarchical structure and the dependence across observations from the same persons would lead to an underestimation of the standards errors, which may result in wrong conclusions about non-existent relations (26). Furthermore, this multilevel approach enabled the modeling of growth curves while taking account of varying numbers of measurements across individuals. In this way, the use of available information is maximized: we were able to use information from all inmates who participated in the first wave to estimate the intercept (n = 1.664), while information from all prisoners who participated at T_1, T_2, T_3 and/or T_4 was used to estimate the growth parameters, resulting in a total of 2.740 person*time observations. Linear multilevel regressions were performed with the score on the total BSI scale as dependent variable, and logistic multilevel regressions were carried out with the dichotomized total BSI variable (a very high level or not) as dependent variable.

Results

Levels of mental health symptoms during detention

In general, the level of mental health symptoms – both the mean scores and the proportion of prisoners with a very high score – decreased over time (see Table 2). For instance, 3 weeks after arrival in pretrial detention, prisoners scored on average 0.70 on the total BSI scale, after 3 months the mean score on the total BSI was significantly lower and decreased to 0.58, and after 18 months, it decreased to 0.47 (see Appendix S3 for paired t-tests). A similar pattern was observed for most BSI subscales. Feelings of hostility, somatic complaints and interpersonal sensitivity seemed to stabilize after 3 months in detention. Nevertheless, except for hostility and somatic complaints, after 18 months the scores on the mental health scales were significantly lower than at the beginning of the detention period (see Table 2 and Appendix S3).

Similarly, the proportion of prisoners with a very high score on the BSI scales measuring mental health symptoms decreased during imprisonment (Table 2). The percentage of prisoners with a very high level on all symptom dimensions – except for depressive symptoms – decreased significantly between T_1 and T_2 (See Appendix S3 for McNemar tests). Furthermore, while at T_1 the proportion of prisoners with a very high level of mental health symptoms ranged between 12.6 per cent (for interpersonal sensitivity) and 24.4 per cent (for the BSI Total), the percentages of prisoners with a very high level of mental health symptoms were about half or less at T_4. The percentage of prisoners with a very high level of somatic complaints remained relatively high during imprisonment.

Compared with males from the general population, prisoners reported on average significantly higher scores on the total BSI scale (see Table 2 and Appendix S4 for independent t-tests). This higher level of mental health problems (on the total BSI scale) was observed for all four time points. Therefore, even though prisoners' symptoms decreased during imprisonment, prisoners still reported significantly higher levels of mental health problems 18 months after their arrival in detention when compared with men from the general population. Except for interpersonal sensitivity, prisoners reported significantly higher scores on all other symptom dimensions after three and nine months as well. At the last measurement, depressive symptoms, somatic complaints, and paranoid ideations were still significantly elevated compared with the general population (see Appendix S4).

Table 2. Mental health symptoms during imprisonment

	Prison Project participants				
	T1	T2	T3	T4	General Dutch population
BSI scale	*N* = 1664	*N* = 761	*N* = 225	*N* = 90	*N* = 827
Mean scores (0–4)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)
BSI Total	0.70 (0.71)	0.58 (0.54)	0.53 (0.58)	0.47 (0.45)	0.35 (0.33)
Anxiety	0.69 (0.83)	0.56 (0.64)	0.49 (0.70)	0.37 (0.52)	0.31 (0.40)
Hostility	0.61 (0.77)	0.45 (0.59)	0.54 (0.75)	0.43 (0.49)	0.38 (0.43)
Depression	0.83 (0.96)	0.86 (0.84)	0.69 (0.76)	0.63 (0.65)	0.37 (0.46)
Somatic Complaints	0.53 (0.76)	0.46 (0.62)	0.45 (0.72)	0.43 (0.64)	0.29 (0.40)
Cognitive	0.80 (0.87)	0.64 (0.72)	0.64 (0.82)	0.54 (0.65)	0.51 (0.52)
Interpersonal sens.	0.58 (0.80)	0.39 (0.59)	0.39 (0.65)	0.27 (0.40)	0.36 (0.47)
Phobic Anxiety	0.44 (0.70)	0.27 (0.50)	0.26 (0.53)	0.21 (0.46)	0.15 (0.29)
Paranoid ideation	1.05 (0.89)	0.75 (0.71)	0.69 (0.77)	0.76 (0.69)	0.52 (0.56)
Psychoticism	0.62 (0.75)	0.54 (0.63)	0.44 (0.61)	0.38 (0.49)	0.30 (0.39)
% Very high score	%	%	%	%	%
BSI Total	24.4	17.5	13.8	10.0	5.0
Anxiety	20.1	13.1	12.9	6.7	5.0
Hostility	12.9	6.7	10.4	3.4	5.0
Depression	23.6	25.1	17.3	11.0	5.0
Somatic complaints	15.9	11.7	13.0	14.4	5.0
Cognitive	15.5	9.5	10.2	6.7	5.0
Interpersonal sens.	12.6	5.9	8.0	3.3	5.0
Phobic Anxiety	22.4	12.0	11.6	8.9	5.0
Paranoid ideation	22.0	11.3	8.9	11.1	5.0
Psychoticism	19.2	14.0	9.4	6.7	5.0

The 827 males from the general population in the final columns come from the LISS panel of Center Data, an a-select and representative sample from the general population (see De Beurs, 2011, pp. 27).

Compared with men from the general population, the percentage of prisoners reporting a very high level of mental health symptoms shortly after their arrival in detention is significantly higher for all symptom dimensions (see Table 2 and Appendix S4 for chi-square tests). Aside from hostility and interpersonal sensitivity, this pattern was observed after three and nine months as well. Remember that (by definition) five per cent of the men from the general Dutch population had a very high score (see Method section). Therefore, shortly after arrival in detention the percentage of prisoners with a very high score on the different scales of the BSI was about three to five times as large as among men in the general population. Nine months after arrival in detention, the percentage was about twice as high as in the general population for most of the symptom dimensions. After 18 months, the percentage of prisoners with a very high score had become similar to or even lower than in the general population for five of the symptom dimensions.

Factors associated with mental health problems shortly after arrival in detention

The second aim of this study was to identify individual factors that are associated with the course of mental health symptoms of prisoners during their detention. As a first step, multivariate regression analyses were conducted to examine to what extent prisoners' characteristics as presented in Table 1 were related to mental health symptoms (as measured with the total BSI scale) shortly after arrival in detention (at T_1). Linear regressions were carried out with the score on the total BSI scale as dependent variable and logistic regressions were carried out with the dichotomized total BSI variable as dependent variable. In these regression models, all variables presented in Table 1 were simultaneously included as independent variables.

The results of these regression analyses show that seven of the examined characteristics were statistically significantly associated with a higher level of mental health symptoms at T_1. As could be expected, those who had been treated for a mental disorder in the 12 months prior to their arrest as well as those whose substance use in the 12 months prior to arrest caused problems in their daily lives reported elevated levels of mental health problems 3 weeks after their arrival in detention. Moreover, prisoners who entered detention with a chronic disease also reported significantly higher levels of mental health symptoms shortly after their arrival in detention. Inmates aged 30 or older reported higher levels of mental health symptoms 3 weeks after their arrival in pretrial detention than their younger counterparts. Furthermore, compared

with individuals who had a job prior to detention, those who were unemployed and those who were not participating in the labor market reported a higher level of mental health symptoms shortly after their arrival in detention (see Appendix S5 for the trimmed regression analyses including only the seven characteristics that were significantly associated with the total BSI scale).

Factors associated with the course of mental health problems during detention

As a next step, multilevel linear and logistic regression analyses were conducted to identify individual factors associated with the course of prisoners' mental health symptoms during imprisonment (as measured with the total BSI score). Preferably, these analyses are carried out with all individual characteristics presented in Table 1, a time variable, as well as all interaction terms of the individual characteristics and the time variable. However, including all these variables and interaction terms would result in a model that is too complex and over fits the data, resulting in unreliable outcomes. Therefore, we restricted the analyses to those seven characteristics that were shown to be significantly related to the total BSI score at T_1 (see Appendix S5).

The resulting multivariate multilevel regression models include (i) all seven baseline characteristics that were shown to be significantly related to levels of mental health at T_1, (ii) a linear time variable (i.e. time is coded in months: 1, 3, 9 and 18 months) – in order to test whether or not there is a (linear) trend in mental health symptoms over time (i.e. for the reference group), (iii) interaction terms between the seven characteristics and the time variable in order to examine the extent to which trends in mental health symptoms differ significantly across persons with distinct baseline characteristics, and (iv) a time varying variable representing the legal status (see Table 3).

In line with the above-mentioned regression analyses, prisoners who had been treated for a mental health problem in the 12 months preceding their detention, persons older than 30 years of age, those who experienced problems due to alcohol or drugs use prior to detention, and those who had a chronic disease were at risk of elevated levels of mental health problems shortly after their arrival in detention. Only the employment situation prior to detention (unemployed or non-participant) in the multilevel model was no longer significantly related to the level of mental health symptoms at T_1 (as indicated by the score on the total BSI scale). Furthermore, the multilevel analyses do not show a statistically significant effect of prisoners' legal status on their mental health problems during imprisonment.

Table 3. Multilevel analyses on predictors of prisoners' mental health problems during detention

	Multilevel linear regression model BSI scale (0–4)		Multilevel logistic regression model BSI very high (0/1)	
	Coef.	SE	Coef.	SE
Intercept (within person)	0.370**	0.028	−4.422**	0.348
Time (in months)	−0.004	0.005	−0.022	0.048
Legal status: remand (time varying)	0.004	0.026	0.148	0.185
Effects on intercept				
Age at entry in correctional facility: 30 years or older	0.045	0.029	1.135**	0.210
Employment situation prior to detention: unemployed vs. employed	−0.000	0.018	0.380	0.228
Employment situation prior to detention: non-participant vs. employed	0.002	0.018	0.694*	0.264
Alcohol use prior to detention causes problems in daily life	0.193**	0.039	0.919**	0.260
Drug use prior to detention causes problems in daily life	0.207**	0.034	1.238**	0.235
Treatment for mental disorder in preceding 12 months	0.434**	0.031	1.829**	0.232
Chronic disease	0.202**	0.030	0.774**	0.208
Effects on slope: time X individual characteristic				
Age at entry in correctional facility: 30 years or older	0.005	0.005	−0.006	0.046
Employment situation prior to detention: unemployed	0.006	0.006	0.011	0.054
Employment situation prior to detention: non-participant	0.005	0.007	−0.002	0.063
Alcohol use prior to detention causes problems in daily life	−0.025**	0.007	−0.190*	0.077
Drug use prior to detention causes problems in daily life	−0.022**	0.006	−0.258**	0.065
Treatment for mental disorder in preceding 12 months	−0.023**	0.006	−0.019	0.052
Chronic disease	−0.011	0.006	−0.019	0.049

*$P < 0.01$; **$P < 0.001$. Number of observations: 2.740; Number of persons: 1.664.

The results of the multilevel regression analyses also provide insight in changes in mental health symptoms during detention and in individual factors associated with such changes. The effect of the time variable (in months) was not statistically significant suggesting no significant trend in mental health symptoms over time for the reference group in the analyses (i.e. those with scores equal to zero on the variables representing the seven individual characteristics). However, as we already observed that mental health symptoms decreased over time (see Table 2), this implies that the mental health symptoms decreased for certain specific groups of prisoners. Indeed, the multilevel regression analyses showed that three variables related to pre-existing health problems were significantly associated

with changes in the level of mental health symptoms during imprisonment. Inmates who entered detention with problematic alcohol use, problematic drug use, and/or a history of mental health treatment in the year preceding their detention reported a stronger decrease in mental health symptoms during imprisonment than their counterparts.

Figure 1 illustrates the patterns of change in the observed levels of mental health symptoms during imprisonment for prisoners with and without these pre-existing mental health problems. The reference group represents prisoners entering detention with no problematic alcohol or drug use or mental health treatment in the year preceding their detention ($N = 860$). This group showed relatively low levels of mental health symptoms during imprisonment and a rather stable pattern over time. The other three groups represent inmates who reported (i) problematic substance use (i.e. alcohol and/or drugs use) ($N = 309$), (ii) prior mental health treatment ($N = 249$), and (iii) both problematic substance use and mental health treatment in the 12 months preceding their detention ($N = 246$). Clearly these three groups showed high levels of mental health symptoms after the first weeks of their detention. Moreover, the levels of their problems decreased substantially over time.

Discussion

In this prospective cohort study among male prisoners from all correctional remand facilities in the Netherlands, we observed mental health improvements during detention. These improvements were observed for the total level of psychological distress as well as for a number of different symptom dimensions, such as depressive and anxiety symptoms, and cognitive problems. These findings are consistent with previous studies showing that in general psychiatric symptoms decreased or stabilized during detention (6–13). Moreover, although the level of mental health problems during detention decreased among the Dutch prisoners, the findings also highlight their continued poor mental health. In the first weeks after arrival in detention but also after nine and 18 months, prisoners

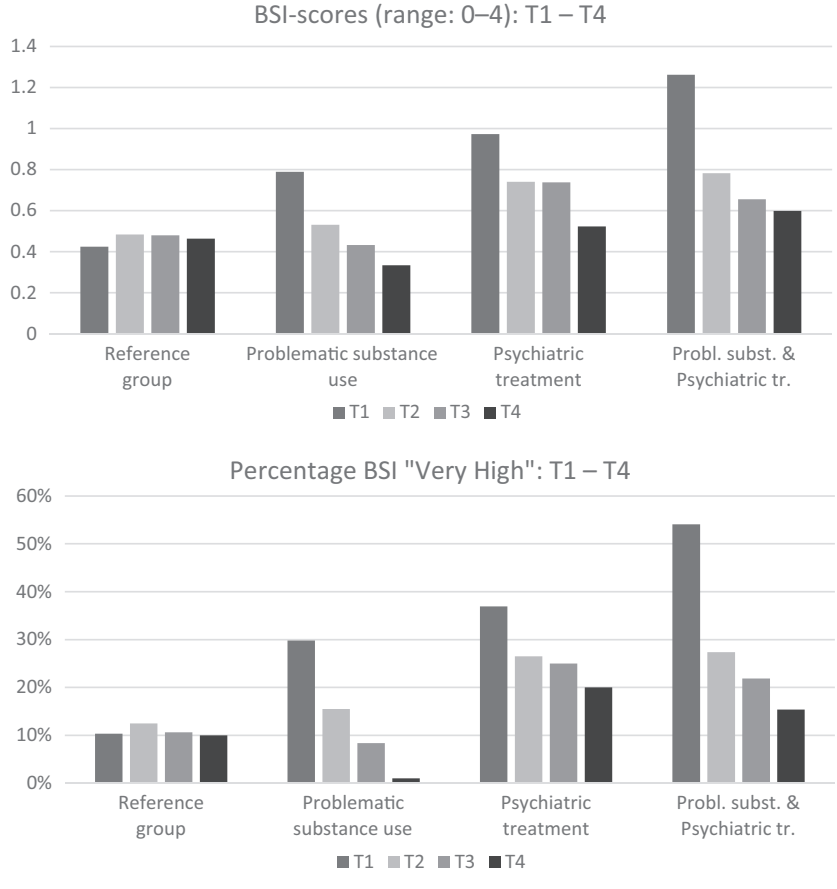

Fig. 1. The course of mental health symptoms during imprisonment for specific groups.

reported significantly higher levels of mental problems than men from the general population.

When exploring the course of mental health problems during imprisonment more thoroughly with multilevel regression analyses, we observed that the decrease in mental health symptoms seemed to be attributed to a decrease in symptoms for certain high-risk groups: Inmates who entered detention with pre-existing mental health problems, and problematic alcohol and drugs use showed stronger mental health improvements during detention than their counterparts. These findings are consistent with a previous study showing that female prisoners in the United Kingdom who used drugs prior to their arrival in prison reported mental health improvements during the first three months of their detention (10) and seem to contrast findings from another study among US jail prisoners showing that inmates with a history of psychiatric hospitalization showed an increase in (anxiety and psychotic) symptom levels during the first 5 days of their detention (16). In line with Hassan et al.'s study (2011) (8), our findings confirm that detention does not seem to have a universally adverse effect on mental health.

In the light of the restrictive characteristics of the correctional environment and its associated deprivations of prison life – like a lack of privacy and autonomy, and isolation from loved ones – it may seem surprising to observe health improvements during imprisonment. The finding that mainly prisoners with pre-existing mental health problems show improvements in their mental health can have several explanations. One explanation could be that especially for individuals with pre-existing problems, the high initial level of mental health problems and the subsequent health improvements are related to the specific stressors and insecurities of the initial weeks of detention. This stressful initial phase in detention – in which individuals need to cope with stressors like an unfamiliar and potentially unsafe new environment, financial concerns, concerns for loved ones, and insecurities about the future – may trigger more and new mental health problems, particular among those with pre-existing mental health problems. After settling down and getting adjusted to the new situation, the first stress reaction and the level of mental health problems may decline. Of course, this pattern could be expected for all prisoners, but our results showed that the low-risk group (i.e. those without a history of mental health treatment and substance use problems) showed quite a stable level of mental health problems across all measurements.

Another explanation for the observed mental health improvements among those who experienced severe health problems prior to detention may be related to their difficult life circumstances prior to detention. For some imprisoned individuals, their lives prior to detention are characterized by multiple hardships with, for instance, disadvantageous housing and financial situations, mental and physical health issues and substance dependency, and a lack of health care. For this group, a prison spell – with more daily structure, fewer opportunities to use alcohol and drugs, and access to medication and health care – may have health-improving aspects (8, 10).

Particularly, the availability of mental health care in prison may be related to the observed mental health improvements among those with pre-existing mental health and substance-related problems. Dutch prisons provide different treatment possibilities. In each prison, a Psycho-Medical-Consultation (PMO) – consisting of the institution's psychologist, the psychiatrist, the doctor and nurse – coordinates the basic health care for prisoners (i.e. screening, diagnostics, medication and short-term structuring treatment). Although the use of illicit drugs is not allowed in Dutch prisons, for those with pre-existing opioid dependency, methadone maintenance treatment is possible during detention. Each prison also has a special care unit – with a more quiet and structured environment – for more vulnerable prisoners (e.g. those with mental health problems). If the basic care is insufficient, prisoners can be referred to more specialized treatment in general forensic psychiatric or addiction clinics (for those agreeing to treatment) or to one of the penitentiary psychiatric centers (for those with severe mental health problems or refusing treatment).

Examining to what extent mental health improvements during imprisonment are indeed related to health care inside prison would be an important and relevant avenue for future research. Future research could also focus on the effects of specific prison circumstances on prisoners' mental health in general and on the mental health of specific groups of prisoners. More specific, the effects of being on remand vs. being sentenced deserve more attention. Contrary to prior research, in our study being on remand or sentenced was not significantly related to the level of mental health problems during imprisonment. Prior research showed elevated rates of psychiatric morbidity among remand prisoners (8, 15, 27) and speculated that the additional stressors of pretrial detention – such as insecurities about the trial and the future, more isolation and limited access to prison activities – may be related

to elevated or sustained mental health symptoms. At present, only very few studies examined legal status as a predictor of the level of mental health symptoms during imprisonment. Therefore, current knowledge on whether or not legal status actually predicts the level of mental health problems during imprisonment is too limited and far from inconclusive.

The present study has several important strengths. First, data were used from a nationwide and longitudinal study examining prisoners' mental health across four moments during their detention. Most prior longitudinal research on (predictors of) the longitudinal course of mental health in prison is based on relatively small sample sizes or has been limited to a single follow-up. Second, it is one of the very few longitudinal studies worldwide that examined predictors of changes in mental health problems during imprisonment. Therefore, the present study has generated important knowledge regarding the longitudinal course of mental health problems during imprisonment and predictors of changes in prisoners' mental health problems. A third asset of the present study was the availability of detailed information on prisoners' predetention characteristics, which could be used to (i) compare characteristics of respondents and non-respondents, (ii) be included as control variables in regression analyses, and (iii) test differences in developments of mental health symptoms for specific groups of prisoners. Using this baseline information, it was shown that respondents and non-respondents across all waves were quite similar regarding most baseline characteristics, including the level of their baseline mental health symptoms. This supports the representativeness of the sample and suggests that prisoners with higher levels of mental health problems at baseline were not more or less likely to leave prison sooner or more or less likely to participate.

Regardless of the strengths of our study, of course, some methodological limitations of the current study should also be considered. First, the present study was based on adult male prisoners, born in the Netherlands, who were held in Dutch correctional facilities. Although some changes occurred in recent years, the Netherlands is still known for having a relatively mild prison policy (28). Therefore, we cannot be certain that the findings are generalizable to other countries and other prisoner populations (e.g. women, first generation immigrants).

Second, in this study a screening instrument was used to assess prisoners' mental health problems instead of a clinician-administered interview. Therefore, the current study is not about the prevalence of psychiatric disorders but examines the prevalence of mental health symptoms. Prior international research and findings from our Prison Project did, however, show that the BSI is a reliable (good internal consistency and test–retest reliability) and valid screening instrument in the general population and in groups with relatively high risks of mental health problems, for example psychiatric patients and detained persons (9, 22, 23). Particularly, its brevity and plain language (written at sixth grade reading level) are helpful for prison populations that are often characterized by low educational levels. However, moderate to high intercorrelations have been found between some BSI scales and different factor structures have been observed, varying from one general factor to the nine intended factors (29).

Third, although it was possible to compare male prisoners with males from the general population regarding their mental health symptoms, it was not possible to account for other differences between these two groups. It is likely that other differences, like ethnicity and educational level, influence the level of mental health problems as well. The comparison should, therefore, be interpreted with caution.

Finally, due to the relatively short detention periods in the Netherlands, many respondents had already been released at the follow-ups. As a result, a relatively small sample participated in these follow-up measurements (particularly at the third and fourth follow-up). It is to be noted, however, that this is not due to non-response of the participants of the Prison Project, but that this situation reflects the current sentencing and prison policies in the Netherlands. Furthermore, fortunately most baseline characteristics of those who had already been released and those still incarcerated were quite similar. But an obvious exception pertains to respondents' offense type, that is persons with more severe offenses and a longer prison sentence are overrepresented in the later measurements. Nevertheless, weighting the strengths and limitations of this study, we feel confident that the present study has contributed substantially to current knowledge on the prevalence and development of mental health problems among prisoners.

Knowledge on the longitudinal course of mental health symptoms during imprisonment is important to psychiatrists and other health professionals working with offenders because it will contribute to an accurate estimate of the mental health needs of prisoners and is, therefore, essential for the delivery and timing of targeted interventions and care. Our findings confirm the poor mental health of prisoners and highlight the importance of

addressing mental health issues in prison. Understanding pre-existing individual predictors of the course of mental health symptoms during imprisonment will help to identify individuals at risk of an ongoing need for mental health services. Special attention should be paid to individuals entering detention with less favorable employment situations, an age of 30 or above, chronic diseases, problematic alcohol or drugs use and a history of mental health treatment, as they are at risk of elevated mental health problems shortly after their arrival in detention. Furthermore, imprisonment does not seem to have an overall negative effect on mental health. Mental health improvements during imprisonment were observed for prisoners with pre-existing health-related issues (e.g. problematic substance use and a history of mental health treatment).

As most prisoners leave prison at some time, their mental health is also relevant for health professionals working outside the walls. At present, it is unknown how the course of prisoners' mental health problems develops after their release. An unanswered but highly relevant question is to what extent the observed health improvements obtained in prison for certain high-risk groups will continue after they return to the community. More longitudinal research, following prisoners' after their release is, therefore, much needed. Till then, it seems justifiable to emphasize the importance of ensuring continuity of care to support prisoners with high levels of mental health problems with their transition into the community and to try to maintain potential health improvements obtained during imprisonment.

Declaration of interest

None.

References

1. Fazel S, Danesh J. Serious mental disorder in 23000 prisoners: a systematic review of 62 surveys. Lancet 2002;**359**:545–550.
2. Andersen HS. Mental health in prison populations: a review – with special emphasis on a study of Danish prisoners on remand. Acta Psychiatr Scand 2004;**110**:5–59.
3. Singleton N, Meltzer H, Gatward R. Psychiatric morbidity among prisoners in England and Wales. London, UK: Office for National Statistics; 1998.
4. Fazel S, Seewald K. Severe mental illness in 33588 prisoners worldwide: systematic review and meta-regression analysis. Br J Psychiatry 2012;**200**:364–373.
5. Harding T, Zimmermann E. Psychiatric symptoms, cognitive stress and vulnerability factors: a study in a remand prison. Br J Psychiatry 1989;**155**:36–43.
6. Baier A, Fritsch R, Ignatyev Y, Priebe S, Mundt AP. The course of major depression during imprisonment: a one-year cohort study. J Affect Disord 2016;**189**:207–213.
7. Dettbarn E. Effects of long-term incarceration: a statistical comparison of two expert assessments of two experts at the beginning and end of incarceration. Int J Law Psychiatry 2012;**35**:236–239.
8. Hassan L, Birmingham L, Harty MA et al. Prospective cohort study of mental health during imprisonment. Br J Psychiatry 2011;**98**:37–42.
9. Islam-Zwart KA, Vik PW, Rawlins KS. Short-term psychological adjustment of female prison inmates on a minimum security unit. Women Health Iss 2007;**17**:237–243.
10. Plugge E, Douglas N, Fitzpatrick R. Changes in health-related quality of life following imprisonment in 92 women in England: a three month follow-up study. Int J Equity Health 2011;**10**:1–7.
11. Taylor PJ, Walker J, Dunn E, Kissell A, Williams A, Amos T. Improving mental state in early imprisonment. Crim Behav Ment Health 2010;**20**:215–231.
12. Zamble E, Porporino F. Coping, imprisonment, and rehabilitation. Some data and their implications. Crim Justice Behav 1990;**17**:53–70.
13. Walker J, Illingworth C, Canning A et al. Changes in mental state associated with prison environments: a systematic review. Acta Psychiatr Scand 2014;**129**:427–436.
14. Reitzel LR, Harju BL. Influence of locus of control and custody level on intake and prison-adjustment depression. Crim Justice Behav 2000;**27**:625–644.
15. Gonçalves LC, Endrass J, Rossegger A, Dirkzwager AJE. A longitudinal study of mental health symptoms in young prisoners: exploring the influence of personal factors and the correctional climate. BMC Psychiatry 2016;**16**:91. https://doi.org/10.1186/s12888-016-0803-z.
16. Gibbs JJ. Symptoms of psychopathology among jail prisoners. The effects of exposure to the jail environment. Crim Justice Behav 1987;**14**:288–310.
17. Beijersbergen KA, Dirkzwager AJE, Nieuwbeerta P. Reoffending after release: does procedural justice during imprisonment matter? Crim Justice Behav 2016;**43**:63–82.
18. Ramakers AAT, Wilsem JA Van Nieuwbeerta P, Van Nieuwbeerta P, Van Nieuwbeerta P, Dirkzwager AJE. Down before they go in? Pre-prison labor market attachment in the Netherlands Eur J Crim Pol Res 2015;**21**:65–82.
19. Dirkzwager AJE, Nieuwbeerta P, Beijersbergen K et al. The Prison Project: a large-scale longitudinal study of criminal behavior and life circumstances before, during and after imprisonment in the Netherlands. J Dev Life-Course Criminol 2018;**4**:120–135.
20. Linckens P, de Looff J. Gevangeniswezen in getal 2008–2012. Den Haag: Dienst Justitiële Inrichtingen; 2012.
21. Derogatis LR. The brief symptom inventory. Baltimore: Clinical Psychometric Research; 1975.
22. Lindquist CH. Social integration and mental well-being among jail inmates. Sociol Forum 2000;**15**:431–455.
23. de Beurs E, Zitman F. De Brief Symptom Inventory (BSI): betrouwbaarheid en validiteit van een handzaam alternatief voor de SCL-90. Maandblad Geestelijke Volksgezondheid 2006;**61**:120–141.
24. de Beurs E. Brief symptom inventory (BSI) en BSI 18: Handleiding 2011. Leiden: PITS; 2011.
25. Statistics Netherlands. Definitions. Available at: https://www.cbs.nl/en-gb/our-services/methods/definitions?tab=h#id=heavy-drinker.
26. Snijders TAB, Bosker RJ. Multilevel analysis: an introduction to basic and advanced multilevel modeling. 2nd edn. London: Sage Publications; 2012.

27. Hurley W. DUNNE, MP. Psychological distress ad psychiatric morbidity in women prisoners. Aust N Z J Psychiatry 1991;**25**:461–470.
28. Dirkzwager AJE, Kruttschnitt C. Prisoners' perceptions of correctional officers' behavior in English and Dutch prisons. J Crim Justice 2012;**40**:404–412.
29. Rath JF, Fox LM. Brief symptom inventory. In: Kreutzer JS, DeLuca J, Caplan B, eds. Encyclopedia of clinical neuropsychology. New York: Springer, 2011. https://doi.org/10.1007/978-0-387-79948-3_1977.

Supporting Information

Additional Supporting Information may be found in the online version of this article:

Appendix S1. Baseline characteristics for: Persons who completed the questionnaire versus those who did not complete the questionnaire.
Appendix S2. Baseline characteristics for: Persons who could be contacted versus those who could not be contacted at follow-up.
Appendix S3. Differences in mental health symptoms between measurement waves: Paired t-tests and McNemar tests.
Appendix S4. Comparison of BSI-scores between Prison Project participants and men from the General Dutch Population.
Appendix S5. Trimmed regression models for predictors of mental health three weeks after arrival in detention (total BSI scale).