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Psychological, social, and role functioning as predictors of psychosis in
an adolescent psychiatric sample.

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Psychological, social, and role functioning as predictors of psychosis in an adolescent psychiatric sample.

Abstract

Aim: Recent evidence from psychosis-risk studies of preselected samples suggests that early functional impairment may be a vulnerability marker for psychosis. We investigated whether functional impairment predicted later risk of psychotic disorder and psychiatric hospitalizations in adolescents at entry to general psychiatric services.

Methods: 154 adolescents, aged 15–18 years, were recruited to the study at entry to general adolescent psychiatric services in Helsinki, Finland. SIPS and SCID interviews were used to assess psychotic-like symptoms, psychosis risk, and psychiatric diagnoses. Of the adolescents, 46 met the criteria for Clinical High Risk status. The level of functioning was assessed with Global Functioning Social, Role, and Psychological scales. The adolescents were followed for 3–9 (median=5) years via a hospital discharge register. Cox regression analyses were used to examine whether baseline functioning predicted psychotic disorders and psychiatric hospitalizations when controlling for the effect of psychosis risk symptoms.

Results: Impairments in social, role or psychological functioning did not predict psychotic disorders beyond risk symptoms. Impairment in psychological functioning was the only significant predictor of any psychiatric hospitalization after adjusting for positive psychosis-risk symptom severity and level of social and role functioning.

Conclusions: Psychosis was predicted by psychotic-like experiences at entry to psychiatric services. No aspect of functioning predicted psychosis in adolescents, which is likely to be explained by the low incidence of psychosis transitions. Severe mental disorders as assessed by psychiatric hospitalizations were predicted by more severe symptomatology as assessed by the psychological functioning scale.

Key words: adolescents, followup studies, functioning, psychosis risk, psychosis

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3 **Introduction**
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5
6 A psychosis-risk state is characterized by changes in mental state and functioning that are similar
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8 to, but do not yet meet the criteria for a psychotic disorder diagnosis¹. The operationalized
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10 definition of clinical high risk (CHR) comprises an attenuated psychotic symptoms syndrome, a
11
12 brief intermittent psychotic episode syndrome, and a genetic risk with functional deterioration
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14 syndrome^{2,3}. However, the risk of psychosis in individuals fulfilling the criteria for a psychosis-
15
16 risk state – even in preselected samples – is only about 26% over a 3-year follow-up,^{4,5} and the
17
18 majority of CHR individuals never develop psychosis. Therefore research on additional features
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20 that could improve the accuracy of psychosis risk criteria is important.
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26 In individuals with psychosis, a marked impairment in general functioning is present⁶ and the first
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28 alterations in functioning can be detected before the disorder onset⁷. A similar functional
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30 impairment has also been detected in CHR individuals⁶, among whom a greater impairment in
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32 general functioning has been associated with a higher risk of psychosis transition^{6,8–10}. In addition,
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34 a large subgroup of CHR individuals not transitioning to psychosis often continue to have a
35
36 marked impairment in functioning^{11,12}.
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41 The World Health Organization defines functioning broadly as consisting of bodily functions and
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43 several areas of life activities and participation¹³. In psychosis-risk research the focus has been in
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45 the areas of social functioning (such as the quantity and quality of relationships and interactions)
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47 and role functioning (such as school or work performance)¹. Functional impairments in both areas
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49 have been indicated in both individuals with psychosis and CHR individuals⁷. In CHR studies,
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51 impairment in social functioning has predicted transition to psychosis within 1-2 years^{14–16}. Even
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53 childhood alterations in social functioning have been detected in those transitioning to psychosis
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55 in adulthood^{17,18}. Role functioning results are less conclusive: impairments have been found in
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3 CHR individuals⁷, but it is not clear whether they predict psychosis. Findings from the large
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5 NAPLS study do not support poor role functioning predicting psychosis¹⁴, but there are conflicting
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7 results from other samples^{8,19}. However the measures used for assessing role functioning varied a
8
9 lot between these studies.
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14 While functional impairments are informative regarding current need for treatment, they may also
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16 represent a marker of vulnerability to severe psychopathology. Individuals who later develop
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18 psychosis have cognitive impairments early before the disorder onset²⁰, and functional
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20 impairments associated with psychosis and psychosis risk status have been linked to cognitive
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22 impairments²¹. Impairments in functioning are also associated with symptoms. In CHR
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24 individuals impairment in social functioning has been associated with a higher level of negative,
25
26 positive²², and disorganized symptoms²³. Impairment in role functioning has been associated
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28 especially with the severity of negative symptoms^{22,24}.
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34 Since previous studies with preselected psychosis risk samples have found early functional
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36 impairment to be a significant predictor of psychotic disorders, our aim was to examine whether
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38 the same is true in a general adolescent psychiatric sample where adolescents have not sought help
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40 specifically for psychosis risk symptoms. We also investigated psychiatric hospitalizations as an
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42 additional outcome to determine whether early functional impairment is a more general antecedent
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44 for severe mental disorders. Areas of role, social, and psychological functioning were taken into
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46 consideration, with a new measure for psychological functioning covering symptom severity and
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48 symptom interference with normal functioning. We hypothesized that all functioning areas would
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50 be impaired in CHR individuals, but social functioning would be the only predictor of psychosis.
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52 In addition, we hypothesized that all areas of functioning would predict all-causes psychiatric
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54 hospitalization.
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Methods

Participants and study protocol

This study is a part of the Helsinki Prodromal Study, a prospective psychosis-risk study of adolescents in general psychiatric services conducted in Helsinki, Finland²⁵. The sample was gathered during the years 2003–2004 and 2007–2008 in public adolescent psychiatric clinics in Helsinki and included all new patients aged 15–18 years. The only exclusion criterion was a psychiatric treatment contact during the past 24 months. 683 patients were screened with the Prodromal Questionnaire (PQ)²⁶. After excluding those with a previous psychiatric treatment contact, all adolescents with a minimum of 18 positive symptoms on the PQ²⁷ (n=145) and a randomized sample of screen-negatives (n=87) were invited to the study. The study procedure is presented in Figure 1.

The final sample consisted of 154 adolescents who completed the baseline measures: Structured Interview for Prodromal Syndromes (SIPS)²⁸, Structured Clinical Interview for the Diagnostic and Statistical Manual of Mental Disorder for DSM-IV, Clinical version (SCID)²⁹, and a large neurocognitive test battery. The research staff, consisting of psychologists, was trained to high standards on the SCID by Professor Jaana Suvisaari and a high inter-rater agreement on SIPS was achieved through a workshop by Rachel Loewy. The participants were followed through the Finnish hospital discharge register (Care Register for Health Care). Hospitalization for psychosis was analysed for those 148 (96 %) adolescents who did not have any previous psychotic disorder at baseline. Any psychiatric hospitalization outcome was analysed for those 133 (86 %) adolescents who did not have any previous psychiatric hospitalization at baseline³⁰.

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3 Parents of the participants were informed about the study and all adolescents gave written
4 informed consent to participate. The study protocol was reviewed and approved by the
5 institutional review boards of the National Institute for Health and Welfare and the Hospital
6 District of Helsinki and Uusimaa. The study was carried out in accordance with the declaration of
7 Helsinki.
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16 *Baseline assessment*

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18 Information about age, age of treatment onset, age of symptom onset, use of psychiatric
19 medication, GAF and family structure (two-parent nuclear family without any child welfare
20 intervention, yes/no) was gathered from interviews and medical records. Psychosis risk symptoms
21 and psychosis risk status were obtained from the SIPS. A previously found factorial model of the
22 SIPS symptoms in this population was used, dividing the risk symptoms into positive, negative,
23 and general symptoms²⁵.
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34 Functioning was assessed with Global Functioning scales: Social³¹, Role³², and Psychological.
35 The lowest level of functioning during the past month was assessed based on all available data,
36 interviews and medical records on a scale from 1 (extreme dysfunction) to 10 (superior
37 functioning) (see Table 1). Both the social and role scales have been shown to have good construct
38 validity and inter-rater reliability³³. The psychological functioning scale is an unpublished
39 measure for assessing severity of symptoms and symptom interference with normal functioning,
40 and was created in the NAPLS study³⁴ to accompany the role and social functioning scales
41 (Barbara Cornblatt, February 11th 2016, personal communication).
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54 *Follow-up assessment*

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Information on psychiatric hospital admissions was extracted from the Finnish hospital discharge register from the initial interview until the end of year 2011 resulting in a mean of 5.6 years of follow-up (median=4.5, SD=2.25, range=2.8–8.9 years). The main outcomes were hospital treatment for psychotic disorder (ICD-10 codes F20, F22–29, F30.2, F31.2, F31.5, F32.3, or F33.3) and any psychiatric hospital treatment (ICD-10 codes F00–F99, X60–X85, or Y87.0).

Statistical analyses

Group differences on nominal variables were analysed with Chi-square test and on continuous variables with the Mann-Whitney U test. All analyses were conducted with IBM SPSS Statistics version 21.

Hazard ratios for hospitalization for psychosis (n=148) and any psychiatric hospitalization (n=133) were assessed in a Cox regression survival analysis. All functioning scales were inverted for these analyses, higher scores thereby indicating lower functioning. First, for both outcomes, each functioning scale was separately entered in a Cox regression model as the sole independent variable. In a previous study of the same population, psychoses were predicted by the SIPS positive symptoms factor, and any psychiatric hospitalizations by psychosis risk status and the SIPS positive and general symptom factors³⁰. To investigate hospitalization for psychosis, we therefore included all functioning scales and the SIPS positive symptoms factor as covariates. Similarly, to investigate predictors of any psychiatric hospitalization, the model included all functioning scales, with psychosis risk status, the SIPS positive symptom factor, and the SIPS general symptom factor as covariates. Multicollinearity diagnostics indicated no problems in any of the analyses (all intercorrelations 0.44 or less and all VIF scores 1.5 or less).

Results

Sample characteristics

Table 2 presents the demographic and clinical characteristics of the sample at baseline. CHR criteria were met by 46 (31 %) participants without previous psychosis. The majority of the adolescents entering psychiatric health care had at least one mental disorder diagnosis at baseline, the most common diagnoses being mood disorders (75%) and anxiety disorders (32%). Psychiatric medication and positive status on the PQ screen were more common among CHR adolescents than non-CHR adolescents. The most common psychiatric medications prescribed were antidepressants to 47 individuals, sedative-hypnotic medications to 16 individuals, and antipsychotics to 14 individuals. Positive, negative, disorganized and general symptoms were more common among CHR adolescents than non-CHR adolescents.

Functioning of adolescents at entry to mental health services

The mean score for social functioning was 7.0 (SD=1.2, median=7, range=3–9), for role functioning 6.6 (SD=1.4, median=7, range=3–9) and for psychological functioning 6.0 (SD=0.9, median=6, range=3–8). The levels of social, role, and psychological functioning were significantly lower in CHR adolescents (see Table 3). Impairment in psychological functioning was also associated with use of psychiatric medication and a positive PQ screening result. Role functioning was significantly lower for those not living in a two-parent nuclear family. Psychiatric hospitalization for psychosis or any psychiatric hospitalization were not associated with social or role functioning, but any psychiatric hospitalization was associated with lower psychological functioning.

Predictors of hospitalization for psychosis

Seven (5 %) psychosis transitions occurred during the follow-up. The mean interval between time of inclusion and hospital treatment for psychotic disorder was 275 days (SD=258, median=234,

range=13–671 days). None of the functioning scales predicted transition to psychosis (Table 4, separate models). In a model including all functioning scales and the SIPS positive symptom factor, positive symptoms remained as the only predictor of increased risk of psychosis (Table 4, model 1).

Predictors of any psychiatric hospitalization

Of the 133 participants with no previous psychiatric hospitalizations 26 (20 %) were hospitalized during the follow-up and the mean time between inclusion and hospital admission was 514 days (SD=527, median=349, range=12–2226 days). Analysed separately, poor psychological functioning predicted a higher risk of psychiatric hospitalizations while the other functioning scales did not show significant effects (Table 5, separate models). When combining all functioning scales, CHR status and SIPS positive and general symptom factors, psychological functioning remained as the only significant predictor of psychiatric hospitalizations (Table 5, model 1).

Discussion

The aim of our longitudinal study was to examine whether the previous findings of an association between early functional impairment and later transition to psychosis replicate in a general adolescent psychiatric sample. Even though social, role, and psychological functioning were more impaired in CHR individuals, these were not significant predictors of transition to psychosis. A higher intensity of positive symptoms remained as the only predictor of psychosis transition in a multivariate model. This association between early positive symptoms and later transition to psychosis has been widely established in previous birth cohort studies^{35–38} as well as in the majority of clinical psychosis-risk studies^{8,9,14}.

Functional impairments overall were less severe in our sample than in previous studies: on average the functioning of adolescents at entry to psychiatric services was only mildly impaired. The less severe impairment in functioning may be related to the lower age of the individuals in the current sample compared to previous research. It may also reflect the easy access to adolescent mental services: early detection and treatment of adolescent mental difficulties has been the first priority in developing adolescent psychiatric services in Finland³⁹. Finland is one of the few countries where adolescent psychiatry is an independent medical specialty, and a national strategy for specialized adolescent psychiatric services was published already in 1987³⁹. Public health services are financed by local authorities, and outpatient psychiatric services are free for all patients³⁹. However, even though the public strategy has facilitated access to treatment, the gap between the onset of symptoms and onset of treatment is still approximately one year, reflecting a delay in treatment seeking.

Impairment in social functioning did not predict transition to psychosis as in previous studies with CHR adolescents^{14,15}. This is likely to be attributable to the less selective and less impaired sample in the current study, including treatment-seeking adolescents both at psychosis risk and not at psychosis risk. In addition, in the current sample the adolescents sought treatment from general psychiatric services whereas in previous studies the participants have sought help specifically for psychotic-like symptoms and the referring clinician's impression of possible psychosis risk may often have been important. Therefore the transition rate to psychosis in the current sample remained low compared to previous studies. However it should be noted that impairment in social functioning has been associated with psychosis in a few birth cohort studies as well¹⁷.

Our aim was also to investigate whether functional impairment in treatment-seeking adolescents predicted severe psychopathology in general. Psychosis is not the only relevant outcome since it

can be seen as a somewhat arbitrary agreement on certain criteria and includes only a restricted number of symptoms⁴⁰. Thus, we used all psychiatric hospitalizations as an additional outcome to capture less specific severe symptoms, functional impairment, and poor prognosis. This outcome was also more common in our sample, giving the analysis better statistical power.

We found that poorer psychological functioning was the only significant predictor of psychiatric hospitalizations. The psychological functioning scale is a new unpublished measure that assesses the severity of symptoms as well as the level of symptom interference with normal functioning. As this simple measure was able to predict hospitalizations, it might be a valuable addition to the assessment of functioning in clinical high-risk studies. Early severe symptoms predicting later severe mental health outcomes is in accordance with the existing evidence of a symptomatic prodrome preceding severe mental disorders^{1,41–43} and research on the continuity of severe symptomatology from early adolescence to adulthood^{44–46}. However, it should be noted that there is little research using psychiatric hospitalization itself as an outcome measure.

The strengths of the current study include the prospective study design with follow-up up to nine years allowing calculation of predictive power. The global functioning scales provided information on separate functioning domains in age-appropriate measures designed specifically for psychosis risk assessments, although the scale for psychological functioning has not been previously used in research or validated. The current sample was not pre-selected in psychosis risk allowing greater generalizability of the results. At the same time, psychoses were rare in this general psychiatric sample, and the small number of transitions limited the statistical power and the reliability in psychosis prediction analyses. The SIPS and SCID interviews as well as global functioning scales: role and social are commonly used and show good psychometric

properties^{28,33,47}. The hospital discharge register as the outcome measure is considered a reliable, valid, and conservative measure for mental disorders⁴⁸.

In the present study, we found that severe psychiatric outcomes are predicted by severe positive symptoms at early stage. We did not find impairment in functioning to predict psychosis, which is likely to be attributable to the low rate of psychosis transitions in this sample, which restricted statistical power. In the future, it would be important to replicate the results concerning early functioning in another independent general psychiatric sample.

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Table 1. Levels of functioning in Global functioning scales.

Score	Level of functioning
10	Superior functioning
9	Good functioning
8	Adequate functioning
7	Mild impairment in functioning
6	Moderate impairment in functioning
5	Serious impairment in functioning
4	Major impairment in functioning
3	Marginal ability to function
2	Inability to function
1	Extreme dysfunction

Table 2. Demographic and clinical characteristics at baseline, including both SIPS symptom sum scores and SIPS symptom factor scores.

	Total, n=148 Frequency (%) or mean (SD), range	CHR, n=46 Frequency (%) or mean (SD), range	Non-CHR, n=102 Frequency (%) or mean (SD), range	Group difference p
Female	118 (80%)	39 (85%)	79 (78%)	.30
Age	16.6 (0.9), 15–18	16.6 (0.8), 15–18	16.6 (0.9), 15–18	.56
Two-parent nuclear family	64 (43%)	17 (37%)	47 (46%)	.30
Age of symptom onset	14.1 (2.3), 7–18	13.9 (2.4), 7–17	14.2 (2.3), 7–18	.47
Age of treatment onset	15.3 (2.1), 7–18	14.9 (2.4), 7–18	15.4 (1.9), 7–18	.34
Any psychiatric medication	58 (39%)	25 (54%)	33 (32%)	.01
PQ screen positive	101 (68%)	39 (85%)	62 (61%)	.004
GAF	48.4 (13.1), 10–80	40.2 (10.9), 10–58	50.1 (12.4), 18–80	<.001
SIPS positive symptoms (P1-P5)	6.7 (4.5), 0–20	11.3 (3.0), 3–20	4.6 (3.4), 0–15	<.001
SIPS negative symptoms (N1-N6)	10.5 (5.8), 0–29	14.5 (5.7), 4–29	8.6 (4.8), 0–22	<.001
SIPS disorganized symptoms (D1-D4)	4.6 (2.8), 0–12	6.3 (2.7), 2–12	3.8 (2.5), 0–12	<.001
SIPS general symptoms (G1-G4)	8.9 (3.9), 0–17	11.1 (3.4), 4–17	8.0 (3.7), 0–14	<.001
SIPS positive symptom factor	0.05 (0.9), -1.6–2.2	0.8 (0.8), -1.4–2.2	-0.3 (0.8), -1.6–1.9	<.001

SIPS negative symptom factor	0.1 (0.9), -1.3–3.6	0.3 (1.0), -1.3–2.8	-0.02 (0.8), -1.1–3.6	.02
SIPS general symptom factor	0.1 (0.8), -2.3–1.7	0.5 (0.7), -1.4–1.7	0.02 (0.8), -2.3–1.7	<.001

P values represent the test results of Chi-square test for nominal variables and Mann-Whitney U test for continuous variables.
Group differences with $p \leq .05$ are marked in bold.
GAF refers to Global Assessment of Functioning score.

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Table 3. Associations between functioning, demographic characteristics and psychiatric outcome.

		<u>Social functioning</u>					<u>Role functioning</u>				<u>Psychological functioning</u>			
		n	mean	SD	U	p	mean	SD	U	p	mean	SD	U	p
Gender	Female	118	7.1	1.0	1736.5	0.87	6.6	1.3	1654.5	0.57	5.9	0.9	1485.0	0.15
	Male	30	6.9	1.7			6.7	1.5			6.2	1.0		
PQ-status	Positive	101	7.0	1.0	2181.5	0.41	6.7	1.3	2413.5	0.87	5.8	0.8	1863.0	0.03
	Negative	47	7.1	1.4			6.6	1.5			6.2	1.1		
Family structure	Two-parent nuclear family	64	6.8	1.2	2226.0	0.06	6.9	1.3	3247.5	0.03	5.9	1.0	2622.0	0.79
	Other	84	7.2	1.1			6.4	1.4			6.0	0.9		
Medication	Yes	58	7.0	1.3	2566.0	0.86	6.5	1.6	2728.5	0.63	5.7	0.9	3294.0	0.005
	No	90	7.1	1.1			6.7	1.2			6.1	0.9		
Psychosis risk status	CHR	46	6.5	1.4	1618.5	0.002	6.3	1.3	1894.0	0.05	5.6	0.8	1600.0	0.001
	Non-CHR	102	7.3	1.0			6.8	1.4			6.1	1.0		
Psychosis at follow-up	Yes	7	6.7	1.6	462.0	0.77	6.3	1.4	419.5	0.49	5.4	1.1	355.0	0.19
	No	141	7.1	1.2			6.6	1.4			6.0	0.9		
Psychiatric hospitalization at follow-up	Yes	26	7.0	1.2	1336.5	0.75	6.5	1.4	1310.0	0.64	5.6	0.9	967.0	0.01
	No	107	7.1	1.2			6.7	1.3			6.2	0.8		

Mann-Whitney U test.

Group differences with $p \leq .05$ are marked in bold.

Table 4. Cox regression models predicting psychosis.

	Social functioning	Role functioning	Psychological functioning	SIPS positive symptom factor
Separate models				
HR	1.24	1.20	1.76	
95 % CI for HR	0.70–2.19	0.71–2.01	0.85–3.67	
p	0.46	0.50	0.13	
Model 1				
HR	0.80	1.08	1.65	2.73
95 % CI for HR	0.39–1.67	0.61–1.91	0.67–4.08	1.09–6.83
p	0.56	0.79	0.28	0.03

Separate models represent the results of each functioning scale separately analysed.
Model 1 includes all functioning scales and SIPS positive symptom factor as covariates.
HR= Hazard ratio reflecting the change in hazard of transition to psychosis for every additional increase in predictor variables.
95% CI = 95 % confidence interval.
P ≤ .05 are marked in bold.

Table 5. Cox regression models predicting psychiatric hospitalization.

	Social functioning	Role functioning	Psychological functioning	SIPS positive symptom factor	SIPS general symptom factor	CHR status
Separate models						
HR	1.10	1.07	1.95			
95 % CI for HR	0.79–1.52	0.80–1.42	1.24–3.07			
p	0.58	0.65	0.004			
Model 1						
HR	0.86	0.90	1.91	1.34	1.79	0.79
95 % CI for HR	0.58–1.28	0.66–1.24	1.11–3.28	0.77–2.33	0.91–3.52	0.26–2.37
p	0.45	0.53	0.02	0.30	0.09	0.68

Separate models represent the results of each functioning scale separately analysed.
Model 1 includes all functioning scales and CHR status, SIPS positive and SIPS gene symptoms factors as covariates.
HR= Hazard ratio reflecting the change in hazard of psychiatric hospitalization for every additional increase in predictor variables.
95 % CI = 95 % confidence interval.
P ≤ .05 are marked in bold.

Figure 1. Study procedure.

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Figure 1. Study procedure.

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