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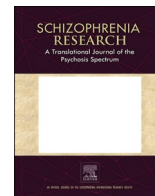
Changes in social functioning over the course of psychotic disorders–A meta-analysis

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ARTICLE INFO

ABSTRACT

In this meta-analysis we investigated changes in social functioning and its moderators in patients with a psychotic disorder but different durations of illness at baseline.

We included longitudinal studies assessing the course of five domains of social functioning in patients with a psychotic disorder. Effect sizes of change between baseline and follow-up within these domains were analyzed in four subgroups based on durations of psychotic disorder at baseline: less than 2 years, between 2 and 5 years, between 5 and 10 years, and more than 10 years. The influence of baseline confounders was analyzed using meta-regression and sensitivity analysis.

We included 84 studies analyzing 33,456 participants. We found a medium improvement ($d = 0.60$) in overall social functioning over time, with a greater improvement for studies investigating patients with a duration of illness of less than 5 years. We found minor improvement in specific domains of social functioning, such as vocational functioning ($d = 0.31$), prosocial behavior ($d = 0.36$), activities ($d = 0.15$), and independence ($d = 0.25$). Improvement in social functioning was associated with lower baseline levels of negative symptoms, higher baseline levels of quality of life, and, specifically, improved vocational functioning, with rehabilitation and combined treatment.

Social functioning in patients with psychotic disorders improves over time, especially for patients with shorter illness durations. Reduction of negative symptoms and improving quality of life might reinforce improvement of social functioning.

1. Introduction

Psychotic disorders often lead to functional limitations and substantially impact individuals, their loved ones and society (Linscott and Van Os, 2013; Van Os and Reininghaus, 2016; Sullivan et al., 2020). The majority of patients with psychotic disorders have difficulties maintaining their societal roles, such as being employed or maintaining relationships, also after symptomatic remission (Bellack et al., 2016; Madeira et al., 2016). This often leads to a more chronic course of psychotic disorders (Linscott and Van Os, 2013; Santesteban-Echarri et al., 2017). Therefore, improving social functioning, which is defined as regaining societal roles (Mueser and Tarrier, 1998), is a major aim in

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recovery-oriented treatment and research.

Changes in social functioning are associated with a wide variety of factors, such as symptomatic remission, duration of untreated psychosis, neurocognition and social cognition, hope, optimism, and quality of life (Coşkun and Altun, 2018; Górna et al., 2014; Hasson-Ohayon et al., 2009; Heeramun-Aubeeluck et al., 2015; Javed and Charles, 2018). These changes could also be associated with duration of illness and follow-up durations. Previous reports indicated that levels of social functioning are lower for patients with longer illness durations (Frascarelli et al., 2015; Preston, 2000) and that social impairments persist over time (Wiersma et al., 2000). However, it is unknown to what extent long-term changes in social functioning depend on baseline illness duration, duration of follow-up or other factors. This information is crucial to identify optimal windows of opportunity to enhance improvement in social functioning.

We investigated changes in social functioning between baseline and follow-up assessments in longitudinal studies investigating patients with different durations after onset of a psychotic disorder at baseline (duration of illness) and follow-up periods (duration of follow-up). Furthermore, we investigated which factors are associated with any changes. We included studies that investigated patients with any type of psychotic disorder (including other psychiatric disorders with psychotic features), because patients with different types of psychotic disorders show comparable changes in social functioning over time (Bottlender et al., 2010; Rymaszewska et al., 2007; Möller et al., 2000). A previous meta-analysis (Santesteban-Echarri et al., 2017) has already explored the impact of factors influencing social recovery. However, this is the first meta-analysis evaluating both changes in social functioning over time in patients with different durations of illness at baseline and different follow-up periods and which factors contribute to these changes. We aimed to answer the following questions: 1) To what extent do different domains of social functioning change over the course of psychotic disorders? 2) Which factors at baseline are associated with changes in social functioning over time?

2. Methods

The meta-analysis followed PRISMA guidelines (Moher et al., 2009). Our protocol was preregistered in PROSPERO (CRD42019139814).

2.1. Search strategy

Records were identified through searches in PubMed, PsycInfo, CINAHL, and Cochrane of peer-reviewed journals until July 2018. The search was based on terms related to psychotic disorders, chronicity, course, recovery, and remission (see Supplementary Material A). Additional references were traced through reference lists of identified studies and systematic reviews.

2.2. Eligibility criteria

Two authors (LdW & KK) independently executed study selection. Disagreements were resolved by consensus. The included studies meet the following criteria:

1) Patient population: Adults (age ≥ 18) meeting a DSM or ICD diagnosis of what is currently indicated as schizophrenia spectrum and other psychotic disorders (American Psychiatric Association, 1980; American Psychiatric Association, 2000; American Psychiatric Association, 2013), or other psychiatric disorders with psychotic features (i.e., the presence of delusions, hallucinations, and/or thought interferences without insight [Linscott and Van Os, 2013]).
2) Study design: Longitudinal cohort study or randomized controlled trial, with at least 1 year follow-up, assuring long-term follow-up evaluations.

3) Outcomes: Studies reporting uncorrected quantitative measurements of social functioning for at least two time points. In case of multiple follow-up assessments, all measurements were analyzed.
4) Publication: Published in English in peer-reviewed journals.

2.3. Outcome domains

After study selection, we categorized the study outcomes into five separate outcome domains: 1) overall social functioning: overall functioning in any domain; 2) prosocial behavior: level of social skills, relationships, and social adaptive behavior; 3) independence: level of independent functioning; 4) activities: level of engagement in prosocial and leisure activities; 5) vocational functioning: involvement in employment or education.

The selection of outcome domains was based on primary or secondary outcomes used in the included studies, frequently used functional outcome assessment instruments (e.g. Birchwood et al., 1990; Morosini et al., 2000; De Wolf et al., 2012), and categorizations used in previous studies (Lloyd et al., 2008). Supplementary Material B provides a complete overview of assessments of each outcome domain.

2.4. Assessment of duration of illness and follow-up subgroups

The included studies investigated patients with different durations of illness at baseline, and assessed outcomes over different follow-up periods. Previous studies attempted to stratify patients with psychotic disorders into different stages of illness (Lieberman et al., 2001; McGorry et al., 2010; Tandon et al., 2009). However, included studies lacked detailed information to follow this stratification process. Therefore, we categorized studies according to the patients' duration of illness at baseline, partly based on categorizations of early and chronic stages of psycho in previous studies (e.g. Breitborde et al., 2009; Frascarelli et al., 2015; Preston, 2000), as follows: 1) duration of illness <2 years; 2) duration of illness between 2 and 5 years; 3) duration of illness between 5 and 10 years; 4) duration of illness >10 years. Studies of which duration of illness was unknown, were analyzed separately. Within each baseline duration of illness subgroup we also divided the included studies into separate subgroups based on their follow-up periods: 1) follow-up duration <2 years; 2) follow-up duration between 2 and 5 years; 3) follow-up duration between 5 and 8 years; 4) follow-up duration >8 years.

All subgroups are presented in Text Box 1. This overview shows that combinations of illness duration and duration of follow-up do not lead to mutually exclusive categories of study data. However, given the nature of the studies we selected, we considered clustering studies in these separate duration of illness and follow-up subgroups the optimal classification for this study.

2.5. Selection and assessment of moderators of outcome

First, we investigated the influence of study design (RCT's versus cohort studies) and diagnosis (studies only including schizophrenia patients versus studies also including other psychotic disorders) on the outcomes.

Other potential moderators of social functioning were selected following a two-step procedure. First we identified 52 significant moderators in included studies and comparable meta-analyses (Santesteban-Echarri et al., 2017; Fusar-Poli et al., 2015; Świtaj et al., 2012). Second, we applied the following three criteria reported in the Cochrane Handbook 5.1 (Higgins and Green, 2011): 1) reported by at least 10 of the selected studies; 2) ability to be clustered in separate multivariate models; 3) Not closely related to each other to prevent multicollinearity. This resulted in 19 moderators, which we clustered in seven multivariate regression models: 1) treatment variables: implementation of rehabilitation, psychotherapy, antipsychotic use, and combined treatment to (a subsample of) the participants; 2) symptoms: positive symptoms,

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Text Box 1
Assessment of subgroups based on duration of illness at baseline and follow-up duration.

Duration of illness at baseline	Duration of follow-up	Duration of illness at follow-up
1. Duration of illness <2 years	1. Follow-up <2 years	1.1 Duration of illness 1–4 years
	2. Follow-up 2–5 years	1.2 Duration of illness 2–7 years
	3. Follow-up 5–8 years	1.3 Duration of illness 5–10 years
	4. Follow-up >8 years	1.4 Duration of illness >8 years
2. Duration of illness 2–5 years	1. Follow-up <2 years	2.1 Duration of illness 3–7 years
	2. Follow-up 2–5 years	2.2 Duration of illness 4–10 years
	3. Follow-up 5–8 years	2.3 Duration of illness 7–13 years
	4. Follow-up >8 years	2.4 Duration of illness >10 years
3. Duration of illness 5–10 years	1. Follow-up <2 years	3.1 Duration of illness 6–12 years
	2. Follow-up 2–5 years	3.2 Duration of illness 7–15 years
	3. Follow-up 5–8 years	3.3 Duration of illness 10–18 years
	4. Follow-up >8 years	3.4 Duration of illness >13 years
4. Duration of illness >10 years	1. Follow-up <2 years	4.1 Duration of illness >11 years
	2. Follow-up 2–5 years	4.2 Duration of illness >12 years
	3. Follow-up 5–8 years	4.3 Duration of illness >15 years
	4. Follow-up >8 years	4.4 Duration of illness >18 years

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negative symptoms, depression, and substance use at baseline; 3) demographic variables: years of education and gender; 4) study characteristics: publication year, and attrition rate; 5) overall neurocognition at baseline; 6) illness related variables: clinical stabilization at baseline, age at onset, DUP, and setting in which the study is executed (i.e., naturalistic or healthcare); 7) subjective quality of life and level of social functioning at baseline.

From continuous moderators that were evaluated by different assessment instruments (i.e., assessments of symptoms, neurocognition, subjective quality of life, and social functioning) we calculated percentile scores based on normative data to ensure that each moderator was assessed in the same scale range. Operationalizations of each moderator are reported in Supplementary Material E.

2.6. Quality assessment

Quality assessment was conducted using the Quality in Prognostic Studies (QUIPS) tool (Hayden et al., 2013) and was based on six criteria: participation, attrition, prognostic factor measurement, handling confounders, outcome measurement, and analysis and reporting. Based on these criteria a high, moderate or low risk of bias score was assigned for each study.

Two authors (LdW & MO) independently conducted quality assessment of 10% of the studies. The level of agreement was fair to good ($\kappa = 0.56$). Disagreements were resolved by consensus. We investigated the influence of study quality on outcomes by sensitivity analysis.

2.7. Statistical analysis

2.7.1. Meta-analytic procedure

Meta-analyses were conducted using RevMan 5.3 (The Nordic Cochrane Centre, 2014). Effect sizes were calculated by comparing study outcomes between baseline and follow-up assessment. For clinical trials the total study sample, clustering both treatment and control groups, was analyzed. Overall effect sizes of categorical outcomes were converted into Cohen's *d* (Chinn, 2000) to show homogeneous and consistent patterns for both continuous and categorical outcomes. Magnitude of effect was considered marginal and clinically not relevant when $d < 0.2$, small when $d \geq 0.2$ and <0.5, medium when $d \geq 0.5$ and <0.8, and large when $d \geq 0.8$ (Chinn, 2000). All outcomes were reported with 95% confidence intervals (CIs). We used random effects models,

weighted by the method of inverse variance (Higgins, 2008). Statistical heterogeneity was assessed by calculating the I^2 statistic (including 95% CI), describing the percentage of observed heterogeneity not expected by chance (Higgins and Thompson, 2002).

2.7.2. Subgroup analyses

We analyzed differences in effect sizes of change between subgroups regarding the baseline duration of illness and duration of follow-up (Borenstein and Higgins, 2013). Because of the large number of subgroups, there is a high chance of finding type-I errors in one of our subgroup analyses. Therefore, we controlled for multiple testing effects through a Benjamini-Hochberg correction, with the false discovery rate set on 0.3 (Benjamini and Hochberg, 1995).

2.7.3. Calculation of moderating effects

We investigated the influence of potential moderators on the five outcome domains through a meta-regression analysis using Stata version 12 (StataCorp, 2011). We conducted meta-regression analyses for all study outcomes and further investigated the influence of significant moderators within different duration of illness subgroups using a sensitivity analysis, comparing study outcomes of studies with high levels or presence versus low levels or absence of the respective moderator. Because of the large number of moderators and subgroups, we controlled for multiple testing effects in all analyses through a Benjamini-Hochberg correction (Benjamini and Hochberg, 1995).

2.7.4. Handling outliers and publication bias

Potential influence of outliers (i.e. confidence interval [CI] of study outcomes exceeded overall CI) was handled by re-analyzing the meta-analysis after removing the outliers. Potential publication bias was detected by visual inspection of funnel plots.

3. Results

3.1. Study flow

Of the 6741 records retrieved through database search and reference tracking, 6159 records were excluded after title and abstract screening. Of the remaining 583 records, 480 records were excluded after full-text selection (see Fig. 1 for study flow and reasons of exclusion). The remaining 103 articles reported results of 84 studies.
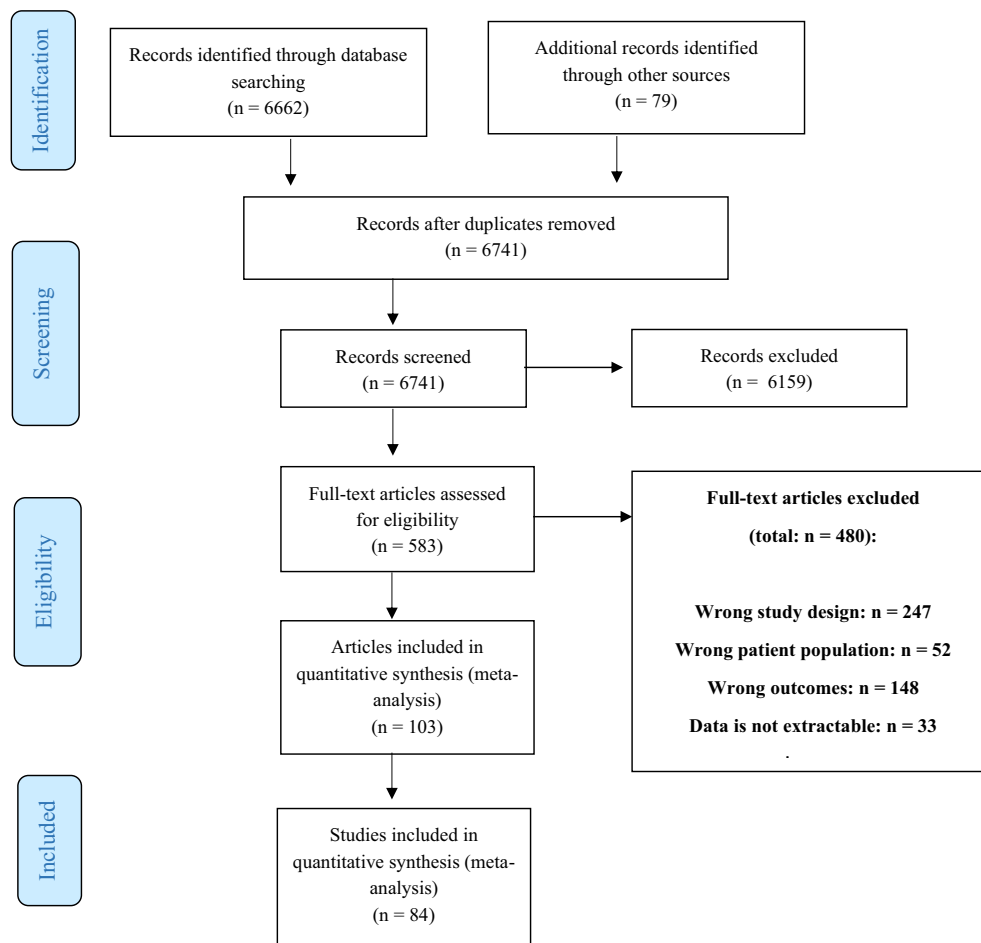
Fig. 1. Flow Chart selection studies conform Prisma Guidelines.

3.2. Study characteristics

We selected 84 studies describing the course of social functioning of 33,456 participants. The mean age of participants was 33.4 years ($SD =$ 11.5), and 39.3% were female (see Table 1).

Thirty-seven studies (44.0%) also included participants with other psychiatric conditions with psychotic features (see Table 1). Thirty-four studies (40.5%) were clinical trials, and 50 (59.6%) were cohort studies. In 38 studies (53.5%) at least 80% of the participants received antipsychotic medication, in 22 studies (31.0%) participants received any kind of rehabilitation intervention, in 33 studies (46.5%) participants received psychotherapy, and in 25 studies (35.2%) participants received combined treatment with at least two of the aforementioned treatment components.

The average drop-out rate was 27.7% ($SD =$ 17.4%). The drop-out rate was low in 32 studies (38.6%) (i.e., <20%), moderate in 32 (38.6%) (i.e., 20–40%), and high in 19 studies (22.9%) (i.e., >40%).

Differences in baseline study and patient characteristics between the baseline duration of illness subgroups are presented in Supplementary material C. The subgroups did not significantly differ in most characteristics. However, we found that study samples with a longer duration of illness were older, had more severe substance abuse, used antipsychotics more often and were more frequently diagnosed with schizophrenia than subgroups with a shorter duration of illness.

3.3. Meta-analysis of study outcomes with different durations of psychosis

A general overview of the outcomes, within each duration of illness and follow-up subgroup is presented in Fig. 2 and Table 2. We also added

forest plots of study outcomes in Supplementary materials D.

3.3.1. Overall social functioning

In general, we found a medium improvement in overall social functioning ($d = 0.60$). For the studies with a shorter baseline duration of illness (i.e., < 2 years and 2–5 years). Specifically for the subgroup with a baseline duration of illness <2 years, we found a large improvement in overall social functioning after a longer follow-up duration ($\chi^2 = 50.83$; $df = 2$; $p < 0.01$). For the subgroup with a baseline duration of illness between 5 and 10 years we found no improvement and for the subgroup with a baseline duration of illness >10 years we found a small improvement in overall social functioning. Both subgroups with <2 years and 2–5 years of illness at baseline showed larger improvement over time than the subgroup with a baseline duration of illness > 10 years ($\chi^2 = 15.30$; $df = 1$; $p < 0.01$ and $\chi^2 = 7.71$; $df = 1$; $p < 0.01$).

3.3.2. Prosocial behavior

Overall, we found a small improvement in prosocial behavior ($d = 0.36$). We observed a large improvement in prosocial behavior for the subgroup with a baseline duration of illness 5–10 years after a short follow-up duration. For the subgroup with a duration of illness >10 years at baseline we found small improvement in prosocial behavior, with no differences between short and long follow-up outcomes. The subgroup with a baseline duration of illness between 5 and 10 years showed a greater improvement after short follow-up than the other subgroups ($\chi^2 = 13.28$; $df = 1$; $p < 0.01$; $\chi^2 = 11.61$; $df = 1$; $p < 0.01$; $\chi^2 = 13.28$; $df = 1$; $p < 0.01$).

Table 1
Descriptive statistics of included studies.

Study name[b]	N (baseline-FU)	Age (SD)	% female	Primary diagnosis[a]	Comorbidity[a]	Treatment[a]	Baseline DOI[a]	FU duration	Attrition rate	Outcome categories reported
Aas 2016[51]	163–91	27.4 (8.3)	43.8%	Schizophrenia (31.3%); schizophreniform disorder (3.1%); schizoaffective disorder (7.3%); bipolar disorder (38.5%); MDD with psychotic features (2.1%); other types of psychosis (17.7%)	bipolar disorder (38.5%); MDD with psychotic features (2.1%)	antipsychotics (76.0%); antidepressants (26.0%); mood stabilizers (22.9%)	2.99	1	41.1%	Overall social functioning
Addington 2000[52]	80–65	33.2 (8.9)	21.1%	Schizophrenia (100%)	NA	Antipsychotics (100%); routine care (100%)	11.2	2.5	18.8%	Overall social functioning; Prosocial behavior
Baker 2015[53,54]	235–139	41.6 (11.1)	41.3%	Schizophrenia spectrum disorder (58.7%); bipolar disorder (22.1%); Nonorganic psychotic syndrome (19.2%)	tobacco dependence (100%)	Health promotion intervention (51.9%); antipsychotics (100%)	18.6	1	40.9%	Overall social functioning
Bergé 2016[55]	140–62	25.5 (5.3)	42.1%	Psychosis NOS (45.0%); schizophreniform disorder (27.1%); Brief psychotic disorder (10.7%); bipolar disorder with psychotic symptoms (3.6%); schizoaffective disorder (5.0%); Drug induced psychosis (2.9%); Delusional disorder (0.7%)	Cannabis abuse (11.0%); alcohol abuse (8.0%); cocaine abuse (5.0%); amphetamine abuse (6.0%)	antipsychotics (91.4%)	≤ 2 y	2	59.3%	Overall social functioning
Bjornestad 2017[56]	363–168	26.9 (10.7)	46.1%	Schizophrenia (32.0%); Other psychotic disorder (68.0%)	Substance abuse (24.7%)	antipsychotic medication, supportive psychotherapy, and multifamily psycho-education (100%)	0	1-feb	51.0%	Overall social functioning
Bodén 2009[57]	124–76	28.5 (9.4)	36.8%	Schizophrenia (81.6%); schizoaffective disorder (7.9%); schizophreniform disorder (11.8%)	NR	NR	0.29	5	38.7%	Independence; Vocational functioning
Calvocoressi 1998[58]	17-aug	30.4 (9.3)	47.1%	Schizophrenia (100%)	NR	NR	NR	1	52.9%	Overall social functioning
Carlsson 2006[59]	253–175	28.2 (7.1)	45.0%	Schizophrenia syndromes (schizophrenia, schizophreniform psychosis and schizoaffective psychosis; 40.8%); non-schizophrenia syndromes (delusional disorder, brief psychosis and psychotic disorder not otherwise specified (NOS); 59.2%)	NR	Need adapted treatment (100%); antipsychotics (41.8%); benzodiazepines (70.6%); antidepressants or lithium (44.7%)	0	1-3-2005	30.8%	Overall social functioning
Cechnicki 2017[60]	80–67	26.6 (5.8)	56.7%	Schizophrenia (100%)	NR	Community treatment program (50%); Individual treatment program (50%)	0.79	3-dec	16.3%	Overall social functioning
Chan 2003[61]	25–21	40.4 (7.8)	44.0%	Schizophrenia (100%)	NR	NR	15.4	0.33/ 0.67/1	16.0%	Independence; Overall social functioning
Chang 2011[62]	153–93	31.7 (9.2)	54.8%	Schizophrenia (80.7%); schizophreniform disorder (14.0%); schizoaffective disorder (5.4%)	NR	antipsychotics (48.4%); antidepressants (12.9%); benzodiazepines (12.9%)	1.5	1-2-2003	39.2%	Vocational functioning
Ciudad 2009[63]	452–376	37.7 (10.5)	35.6%	Schizophrenia (100%)	substance/alcohol abuse (34.3%)	NR	13.7	1	16.8%	Overall social functioning
Conley 2007[64]	2327–2228	41.8 (11.2)	38.5%	Schizophrenia (57.2%); schizoaffective disorder (33.6%); other psychotic disorder (9.3%)	substance use disorder (28.0%); personality disorder (14.5%); depressive disorder (39.4%)	antidepressants (38.8%); Anti-anxiety agents (11.3%); Mood stabilizers (31.2%); Hypnotics (1.7%); Antiparkinsonian	21.6	3	4.3%	Activities; Independence; Overall social functioning; Prosocial behavior;

Table 1 (*continued*)

Study name[b]	N (baseline-FU)	Age (SD)	% female	Primary diagnosis[a]	Comorbidity[a]	Treatment[a]	Baseline DOI[a]	FU duration	Attrition rate	Outcome categories reported
						agents (44.8%); atypical antipsychotics (59.8%); Typical antipsychotics (58.2%)				Vocational functioning
Coryell 1987[65,66]	144–98	37.3 (14.4)	64.6%	Psychotic major depressive disorder (72.2%); schizoaffective disorder (27.8%)	major depression (100%)	ECT (23.6%); antipsychotics (64.3%); antidepressants (100%)	10.3	1/2 5/10	31.9%	Activities; Overall social functioning; Prosocial behavior; Vocational functioning
DeLisi 1998[67]	50–43	27.4 (7.0)	36.0%	Schizophrenia (66.0%); schizoaffective disorder (16.0%); psychosis NOS (4.0%); bipolar disorder (2.0%); major depressive disorder (4.0%)	Substance abuse (48.0%)	lithium (30%), antidepressants (35%), minor tranquilizers (50%)	1.02	4/4.7/5	14.0%	Overall social functioning
Dickerson 1999[68]	88–72	40.1 (9.6)	30.6%	Schizophrenia (63.9%); schizoaffective disorder (36.1%)	NR	outpatient treatment; Community rehabilitation day program (54.5%); antipsychotics (64.8%)	19.2	2	18.2%	Overall social functioning
Dixon 2015[69,70]	65–20	22.2 (4.2)	36.9%	Schizophrenia (66.2%); schizoaffective disorder (13.9%); schizophreniform disorder (6.2%); Psychosis NOS (4.6%); Brief psychotic disorder (1.5%); no diagnosis (3.1%); unknown (4.6%)	Bipolar disorder NOS (3.1%); Depressive disorder NOS (23.1%); Panic disorder (4.6%); Social phobia (3.1%); obsessive compulsive disorder (1.5%); PTSD (7.7%); anxiety disorder NOS (4.6%); alcohol use disorder (18.5%); sedative-hypnotic-anxiolytic use disorder (1.5%); Cannabis use disorder (33.9%); Stimulant use disorder (1.5%); Opioid use disorder (3.1%); Cocaine use disorder (4.6%); Hallucinogen use disorder (4.6%)	Treatment connection program (100%)	≤ 2 y	0.5/1/ 1.5/2	69.2%	Prosocial behavior; Vocational functioning
Eack 2008[71]	59–49	25.9 (6.3)	31.0%	Schizophrenia (65.5%); Schizoaffective disorder (34.5%)	NR	cognitive enhancement therapy (100%)	3.39	1	17.0%	Overall social functioning
Economou 2011[72]	60–60	35.4 (6.9)	51.7%	Schizophrenia (78.3%); Schizoaffective disorder (21.7%)	NR	Optimal Treatment Project (100%)	14.3	1/2/3/4	0.0%	Overall social functioning; Prosocial behavior; Vocational functioning
Edwards 1998[73]	227–107	23.7 (5.9)	35.7%	Schizophrenia (36.1%); schizophreniform disorder (22.5%); delusional disorder (2.2%); schizoaffective disorder (11.0%); bipolar disorder (12.8%); depression with psychotic features (8.4%); brief reactive psychosis (0.4%); psychotic disorder NOS (6.6%)	bipolar disorder (12.8%); depression with psychotic features (8.4%)	NR	0.6	0.5/1	52.9%	Overall social functioning
Ekerholm 2012[74]	71–36	41.1 (7.9)	13.9%	Schizophrenia (100%)	NR	Antipsychotics (95.8%)	17.6	4.6	49.3%	Overall social functioning
Friedman 2002[75]	308–124	72.4 (6.3)	54.8%	Schizophrenia (100%)	NR	Neuroleptics (74.1%); anticholinergics (13.0%)	NR	1.2/4	59.7%	Independence
Gaughran 2017[76]	406–301	44.2 (10.1)	42.4%	Psychotic disorder (100%)	NR	Health promotion intervention (52.5%)	NR	1/1.25	25.9%	Overall social functioning
Gmür 1991[77]	92–83	22.9 (22.6)	43.5%	Schizophrenia (100%)	NR		0	7/11/ 17.15	9.8%	Vocational functioning

Table 1 (*continued*)

Study name[b]	N (baseline-FU)	Age (SD)	% female	Primary diagnosis[a]	Comorbidity[a]	Treatment[a]	Baseline DOI[a]	FU duration	Attrition rate	Outcome categories reported
						outpatient treatment (15.2%); inpatient treatment (45.7%)				
González-Blanch 2010[78]	141–131	26.6 (6.8)	38.2%	Schizophrenia (73.3%); schizophreniform disorder (26.0%)	NR	PAFIP; atypical antipsychotics (63.4%)	2.37	1	7.1%	Vocational functioning
Hill 2012[79]	171–123	29.1 (12.0)	42.1%	Schizophrenia/ schizophreniform disorder (59.1%); other psychosis (40.9%)	Substance abuse (25.5%)	NR	1.94	12	28.1%	Overall social functioning
Horan 2012[80]	81–55	22.3 (4.3)	23.6%	Schizophrenia (56.8%); schizoaffective disorder (12.4%); schizophreniform disorder (30.9%)	NR	Risperidone (100%)	0.7	1	32.1%	Independence; Prosocial behavior; Vocational functioning
Harrow 1997[81–87]	157–120	22.9 (NR)	56.0%	Schizophrenia (40.8%); schizophreniform disorder (7.6%); Bipolar disorder (23.6%); Depressive disorder (17.8%); paranoid disorder (3.2%); other psychotic disorder (7.0%)	Bipolar disorder (23.6%); Depressive disorder (17.8%)	NR	NR	2/4.5/ 7.5/10/ 15/20	23.4%	Overall social functioning; Prosocial behavior; Vocational functioning
Harvey 1999[88]	57–55	77.8 (8.2)	56.1%	Schizophrenia (100%)	NR	antipsychotics; anticholinergics (8.8%); Benzodiazepines (14.0%); Anticonvulsants (5.3%)	47.1	2.6	3.5%	Overall social functioning
Harvey 2010[89]	111–61	57.0 (9.0)	27.0%	Schizophrenia (100%)	NR	second generation antipsychotics (100%)	33.34	3.75	45.1%	Overall social functioning; Prosocial behavior
Heeramun-Aubeeluck 2015[90]	101–38	25.9 (7.3)	51.5%	Schizophrenia (100%)	NR	Aripiprazole (33.7%); Olanzapine (32.7%); Risperidone (32.7%)	NR	0.5/1	62.4%	Prosocial behavior
Hodgekins 2015[91,92]	1027–923	23.0 (5.0)	31.0%	Unspecified psychosis (71.8%); Schizophrenia (14.3%); Bipolar disorder (5.2%); Schizoaffective disorder (1.7%); Substance induced psychosis (7.0%)	Bipolar disorder (5.2%); Substance use (67.0%)	early intervention service treatment (100%)	1.7	0.5/1	10.1%	Activities; Overall social functioning
Hovington 2013[93]	136–122	22.6 (4.0)	28.7%	Schizophrenia spectrum disorder (62.5%); affective psychosis (27.2%); psychosis NOS (10.3%)	affective disorder (27.2%)	Risperidone (33,1%); Olanzapine (48,5%); quetiapine (5.2%); haloperidol (0,74%); paliperidone (1,47%); ziprasidone (1,47%)	5.46	1	10.3%	Overall social functioning
Ito 2015[94]	156–72	30.6 (10.1)	53.2%	Schizophrenia spectrum disorder (100%)	NR	Antipsychotics (100%)	1.99	0.5/1/ 1.5	53.9%	Overall social functioning
Jäger 2014[95]	374–300	38.8 (12.4)	41.8%	Schizophrenia (71.7%); Schizoaffective disorder (28.3%)	NR	antipsychotics; antidepressants (16.3%); benzodiazepines (16.0%); mood stabilizers (11.5%)	NR	0.5/1/ 1.5/2	19.8%	Overall social functioning
Jordan 2014[96]	318–208	22.9 (4.0)	29.6%	Schizophrenia spectrum disorder (70.7%); affective disorder (23.3%)	affective disorder (23.3%); Substance dependence (53.5%)	Early intervention program; antipsychotics (100%)	0.71	2	34.6%	Prosocial behavior
Kalla 2011[97]	86–68	27.5 (6.6)	52.9%	Schizophrenia (45.6%); Schizophreniform disorder (23.5%); Schizoaffective disorder (11.8%); Brief reactive psychosis (13.2%); Delusional disorder (2.9%); Psychotic disorder NOS (2.9%)	NR	inpatient treatment; neuroleptics (64.7%); tranquilizers (67.7%); Individual therapy (32.4%); Family therapy (73.5%); Group therapy (51.5%); occupational therapy (39.7%); Rehabilitation (29.4%)	0.5	1	20.9%	Overall social functioning
Kam 2015[98]	163–163	22.4 (NR)	25.8%	Schizophrenia, schizotypal and delusional disorders (82.8%)	NR	Early intervention services treatment (100%)	3.8	3.6	NR	Vocational functioning

Table 1 (*continued*)

Study name[b]	N (baseline-FU)	Age (SD)	% female	Primary diagnosis[a]	Comorbidity[a]	Treatment[a]	Baseline DOI[a]	FU duration	Attrition rate	Outcome categories reported
Kasai 2003[99]	51–26	24.3 (6.6)	14.3%	Schizophrenia (46.4%); bipolar disorder (46.4%); Major depressive disorder (7.1%)	bipolar disorder (46.4%); Major depressive disorder (7.1%)	Typical neuroleptics (64.3%); atypical neuroleptics (35.7%); lithium (21.4%); sodium valproate (28.6%)	0.56	1.5	49.0%	Overall social functioning
Katsanis 1992[100,101]	134–107	23.9 (6.6)	28.7%	Schizophrenia (34.3%); schizophreniform disorder (20.2%); major depressive disorder (17.9%); Bipolar disorder (27.6%)	Major depressive disorder (17.9%); Bipolar disorder (27.6%)	antipsychotics (69.4%); anti-anxiety drugs (7.5%); antidepressants (14.2%); Lithium (14.2%); antiparkinsonian agents (43.3%)	0.25	0.75/1.5	20.2%	Overall social functioning; Vocational functioning
Kelly 2009[102]	56–43	44.1 (8.3)	27.9%	Schizophrenia (100%)	NR	haloperidol (58,1%); olanzapine (41.9%)	22.11	1	23.2%	Overall social functioning
Killaspy 2016[103]	362–329	39.0 (13.0)	35.1%	Schizophrenia (65.8%); schizoaffective disorder (9.9%); bipolar disorder (7.2%); other diagnoses (13.5%)	bipolar disorder (7,18%)	clozapine (37%); family interventions (7%); CBT (13%)	12	1	9.1%	Activities; Overall social functioning
Kurihara 2005[104]	59–46	26.7 (7.8)	41.3%	schizophrenia (100%)	NR	inpatient treatment; psychotropic medication (50%)	2.4	1/3/5/11	22.0%	Prosocial behavior
Laks 2006[105]	25–13	66.1 (11.0)	61.5%	schizophrenia (75%); bipolar disorder (10%); frontotemporal dementia (15%)	bipolar disorder (10%); frontotemporal dementia (15%)	NR	6.69	1	48.0%	Activities
Lystad 2017[106]	131–122	32.7 (7.9)	29.8%	Schizophrenia (88.6%); Schizoaffective disorder (7.6%); Psychosis NOS (1.5%); Delusional disorder (2.3%)	NR	CBT (51.9%); Cognitive remediation (48.1%)	6.94	0.83/2	6.9%	Vocational functioning
Mason 1995[107,108]	67–58	29.0 (9.8)	32.8%	Schizophrenia (100%)	NR	NR	NR	1-2-2013	13.4%	Prosocial behavior; Vocational functioning
McGurk 2000[109]	168–168	74.2 (6.6)	51.8%	Schizophrenia (100%)	NR	NR	NR	1.25	0.0%	Overall social functioning
Melle 2010[110]	301–201	30.0 (10.0)	44.3%	schizophrenia spectrum disorder (72.1%)	Alcohol use problems (7.5%); Drug use problems (10.0%)	first-episode treatment programs (100%).	≤2 y	0.25/1/2	33.2%	Activities; Independence; Prosocial behavior
Mihaljevic-Peles 2016[111]	362–258	37.0 (4.5)	36.5%	Schizophrenia (64.4%); Persistent delusional disorder (6.1%); Acute and transient psychotic disorder (14.9%); Schizoaffective disorder (9.8%); Other psychotic disorder (5.0%)	NR	Risperidone (100%)	7	1	28.7%	Vocational functioning
Mojtabai 2005[112]	674–479	30.4 (10.0)	42.3%	Schizophrenia (27.6%); bipolar disorder (20.1%); major depression (16.6%); psychotic disorder NOS (12.4%); other diagnosis (23.4%)	bipolar disorder (20.1%); major depression (16.6%); substance use disorder (52.2%)	inpatient treatment; antipsychotics (19.6%)	1.84	4	28.9%	Overall social functioning
Montero 1998[113]	70–60	26.8 (7.1)	46.7%	Schizophrenia (100%)	NR	antipsychotics (70.0%)	4.7	0.75/2	14.3%	Activities; Independence; Prosocial behavior
Morgan 2014[114,115]	557–387	30.8 (10.7)	45.9%	Non-affective psychosis (72.4%); manic psychosis (13.4%); depressive psychosis (14.3%)	Mania (13.4%); depression (14.3%)	Antipsychotics (100%)	0.2	6.2/10/10.7	30.5%	Prosocial behavior; Vocational functioning
Munk-Jørgensen 1991[116]	53–36	28.5 (13.6)	37.7%	Schizophrenia (30.2%); unspecified psychosis (18.9%); reactive psychosis (13.2%); alcoholism (3.8%); paranoid state (7.6%); personality disorder (11.3%); neurosis (1.9%); manic depression (1.9%); drug or substance abuse	alcoholism (3.8%); personality disorder (11.3%); neurosis (1.9%); manic depression (1.9%); drug or substance abuse (9.4%); anorexia nervosa (1.9%)	inpatient treatment (100%)	≤2 y	12	32.1%	Vocational functioning

Table 1 (*continued*)

Study name[b]	N (baseline-FU)	Age (SD)	% female	Primary diagnosis[a]	Comorbidity[a]	Treatment[a]	Baseline DOI[a]	FU duration	Attrition rate	Outcome categories reported
				(9.4%); anorexia nervosa (1.9%)						
Na 2016[117]	25–24	28.2 (6.4)	48.0%	Schizophrenia (60.0%); Schizoaffective disorder (12.0%); Psychotic disorder NOS (28.0%)	NR	Antipsychotics (100%); Mind flower program (100%)	NR	0.5/1	4.0%	Overall social functioning; Prosocial behavior; Vocational functioning
Novick 2016[118,119]	16,380–10,698	38.5 (12.9)	43.6%	Schizophrenia (100%)	alcohol or substance use (3.8%)	outpatient treatment; antipsychotics (100%)	0.6[119]; 10.69[118]	1.5/2/ 2.5/3	34.7%	Overall social functioning
O'Connor 2013[120]	152–127	29.8 (9.0)	69.1%	Schizophrenia (23.6%), schizophreniform disorder (30.0%), schizoaffective-depressed (4.7%), schizoaffective-bipolar (6.3%), major depression with psychosis (10.2%), manic episode with psychosis (12.5%), psychosis NOS (12.6%).	NR	antipsychotics (86.0%); antidepressants (19.7%); Tranquilizers (19.1%)	0.37	1	16.5%	Overall social functioning; Prosocial behavior; Vocational functioning
Okin 1995[121]	37–37	37.6 (14.2)	41.5%	Schizophrenia (100%)	NR	community residential treatment (100%)	11.5	7.5	0.0%	Activities; Independence; Prosocial behavior; Vocational functioning
Oribe 2015[122]	18–18	21.7 (4.6)	27.8%	Schizophrenia (100%)	NR	atypical antipsychotics (72.2%); mood stabilizers (5.6%); antidepressants (33.3%); anxiolytics (16.7%)	1.15	1	0.0%	Overall social functioning
Petersen 2008[123]	547–369	26.8 (6.2)	41.7%	Schizophrenia (66.2%); schizotypal disorder (13.0%); delusional disorder (2.0%); brief psychosis (6.0%); schizoaffective disorder (7.0%); unspecified nonorganic psychosis (1.0%); affective disorder (1.0%)	substance abuse (26.7%); affective disorder (1.0%)	OPUS treatment (100%)	NR	2	32.5%	Independence; Overall social functioning; Vocational functioning
Richard 2013[124]	110–52	23.2 (7.9)	27.4%	Schizophrenia (43.6%); schizoaffective disorder (13.6%); delusional disorder (2.8%); major depressive disorder (10.9%); psychotic disorder NOS (18.2%); schizopphreniform disorder (1.8%); bipolar disorder (3.7%)	major depression (10.9%); bipolar disorder (3.6%)	NR	< 0.5 y	0.15/ 0.5/1	58.2%	Overall social functioning
Ritsner 2003[125]	339–220	38.9 (10.1)	25.1%	Schizophrenia (74.4%); schizoaffective disorder (16.6%); major depressive disorder (4.5%); bipolar disorder (4.5%)	major depressive disorder (4.5%); bipolar disorder (4.5%)	antipsychotics (78.0%); benzodazepines (32.0%); antidepressants (21.0%); mood stabilizers (30.0%)	14.1	1.37	35.1%	Activities; Prosocial behavior
Rosenheck2017[126]	404–227	23.1 (5.1)	27.5%	Schizophrenia (53.0%); Schizoaffective disorder, bipolar (5.9%); Schizoaffective disorder, depressive (14.1%); schizophreniform disorder (16.6%); Brief psychotic disorder (0.5%); Psychotic disorder NOS (9.9%)	alcohol abuse/dependence (36.4%); Cannabis abuse/dependence (35.6%)	antipsychotics (83.4%); personalized medication management, family psychoeducation, resilience-focused individual therapy and supported employment (100%)	3.72	0.5/1/ 1.5/2	43.8%	Vocational functioning
Rossi 2009[127]	347–243	44.2 (11.4)	38.0%	schizophrenia (74.9%); schizoaffective disorder (25.1%)	NR	and education (55.2%); Community care (44.8%)	17.3	1	30.0%	Overall social functioning
Ryu 2006[128–130]	78–56	54.6 (7.2)	34.6%	Schizophrenia (100%)	NR	Optimal Treatment Project (100%); antipsychotics (100%)	31.5	1/2/3/4/ 5	28.2%	Activities; Independence; Overall social

Table 1 (*continued*)

Study name[b]	N (baseline-FU)	Age (SD)	% female	Primary diagnosis[a]	Comorbidity[a]	Treatment[a]	Baseline DOI[a]	FU duration	Attrition rate	Outcome categories reported
										functioning; Prosocial behavior
Scanlon 2014[131]	46–28	28.4 (8.8)	30.4%	Schizophrenia (32.6%); schizoaffective disorder (8.7%); schizophreniform disorder (10.9%); delusional disorder (6.5%); mania (19.6%); psychotic depression (13.0%); psychosis NOS (8.7%)	mania (19.6%); psychotic depression (13.0%)	antipsychotics (84.8%)	3.5	3.5/4.65	39.1%	Overall social functioning
Schwartz 1997[132]	23–23	40.1 (8.1)	39.1%	Schizophrenia (100%)	NR	inpatient residential treatment program (100%); neuroleptics (100%)	17.7	1	0.0%	Independence; Overall social functioning; Prosocial behavior
Scottish Schizophrenia Research Group 1988[133,134]	49–41	30.6 (NR)	53.1%	Schizophrenia (100%)	NR	antipsychotics (100%)	0.23	1-2-2005	16.3%	Independence; Prosocial behavior; Vocational functioning
She 2017[135]	170–108	32.4 (8.3)	37.1%	Schizophrenia (100%)	NR	Integrated group treatment (50.6%); antipsychotics (100%)	7.24	0.25/ 0.5/1	36.5%	Activities; Independence; Prosocial behavior
Siegel 2006[136]	208–98	28.6 (7.4)	40.8%	Schizophrenia (100%)	NR	antipsychotics (85.9%)	6.1	3	52.9%	Overall social functioning
Simonsen 2007[137]	301–184	27.8 (9.6)	41.5%	Schizophrenia (27.9%); schizophreniform disorder (21.6%); schizoaffective disorder (13.0%); affective psychosis (14.0%); delusional disorder (5.3%); brief psychosis (6.6%); psychosis NOS (11.6%)	affective disorder (13.5%); alcohol abuse (16.0%); drug abuse (23.6%)	antipsychotic medication (97.3%); TIPS treatment program (98.6%)	0.45	0.25/1/ 2/5/10	38.9%	Overall social functioning
Smith 2002[138]	56–35	37.0 (9.0)	41.3%	Schizophrenia (60.9%); schizoaffective disorder (39.1%)	NR	outpatient treatment program (100%); antipsychotics (100%)	19	0.25/ 0.5/ 0.75/1	37.5%	Prosocial behavior
Stainsby 2010[139]	50–31	41.0 (13.2)	28.0%	Schizophrenia (90.0%); schizoaffective disorder (6.0%); depression with psychosis (4.0%)	depression (4.0%)	NR	16.8	2	38.0%	Overall social functioning
Stouten 2014[140]	153–153	27.8 (NR)	27.5%	Schizophrenia (51.92%); brief psychotic disorder (5.77%); delusional disorder (3.21%); shared psychotic disorder (1.28%); psychotic disorder NOS (36.60%)	NR	NR	0.15	1	0.0%	Independence; Overall social functioning; Prosocial behavior; Vocational functioning
Tabares Seisdesos 2008[141]	52–47	33.4 (8.2)	21.3%	Schizophrenia (100%)	NR	antipsychotics; antidepressants (12.8%); benzodiazepines (31.9%); psychosocial rehabilitation (19.2%)	8.7	1-mrt	9.6%	Activities; Independence; Overall social functioning; Prosocial behavior
Test 1990[142]	122–105	23.1 (3.6)	32.8%	Schizophrenia (73.8%); schizoaffective disorder (23.0%); schizotypal personality disorder (3.3%)	NR	Training in community living (60%); usual psychiatric care (40%)	4.07	0.5/1/ 1.5/2	13.9%	Independence; Prosocial behavior
Tohen 2000[143,144]	219–199	34.1 (15.3)	43.8%	Bipolar disorder (72.6%); major depressive disorder (27.4%)	bipolar disorder (72.6%); MDD (27.4%); substance use disorder (14.2%); medical disorder (33.8%)	psychotropic medication (89.5%)	0.4	0.5/1/2	9.1%	Overall social functioning
Tsang 2016[145]	90–70	36.1 (9.3)	36.7%	Schizophrenia (57.8%); schizoaffective disorder (42.2%)	NR	Supported employment (100%); cognitive remediation (50%)	11.21	0.58/ 0.92/ 1.25	22.2%	Vocational functioning
Van Os 1999[146]	706–608	38.3 (11.7)	42.9%	Schizophrenia (38.1%); schizoaffective disorder	major depressive disorder (2.3%);	antipsychotics (96.3%); intensive case	10	1-feb	13.8%	Independence; Prosocial

Table 1 (*continued*)

Study name[b]	N (baseline-FU)	Age (SD)	% female	Primary diagnosis[a]	Comorbidity[a]	Treatment[a]	Baseline DOI[a]	FU duration	Attrition rate	Outcome categories reported
				(48.7%); unspecified or functional psychosis (5.9%); major depressive disorder (2.3%); bipolar disorder (4.8%)	bipolar disorder (4.8%)	management (49.9%); standard case management (50.2%)				behavior; Vocational functioning
Veijola 2014[147]	61–33	34.0 (0.6)	42.4%	Schizophrenia (100%)	NR	Antipsychotics (100%)	11.1	9	45.9%	Overall social functioning
Whitehorn 2002[148]	103–49	21.9 (5.7)	33.1%	Schizophrenia spectrum disorder (100%)	NR	second generation antipsychotic use (100%); multidisciplinary treatment (100%); psychoeducation (100%)	≤ 2 y	0.5/1	52.4%	Overall social functioning
Wittorf 2008[149]	151–96	33.9 (9.7)	49.0%	Schizophrenia (88.5%); schizoaffective disorder (11.5%)	personality disorder (33.3%)	Antipsychotics (100%); cognitive behaviorally oriented service (51.0%); treatment as usual (49.0%)	8.1	1.25	36.4%	Overall social functioning
Wunderink 2009[150]	125–107	26.4 (6.4)	31.2%	Schizophrenia (45.6%); other nonaffective psychosis (54.4%)	canabis dependence (24.0%)	Antipsychotics (100%)	0.7	0.5/ 1.25/2	14.4%	Prosocial behavior
Xie 2005[151,152]	169–130	32.4 (7.2)	22.4%	Schizophrenia (70.4%); schizoaffective disorder (29.6%)	substance use disorder (100%); alcohol use disorder (81.6%); cannabis use disorder (44.7%); cocaine use disorder (15.1%); bipolar disorder (100%)	Dual disorder treatment (100%)	12	0.5/1/ 1.5/2/ 2.5/3/4/ 5/6/7/8/ 9/10	23.1%	Activities; Independence; Prosocial behavior; Vocational functioning

[a] NA = Not Applicable; NR = Not Reported; y = years.
[b] The reference list of the included studies are presented in Supplementary materials H.

3.3.3. Independence

Overall, we found a small improvement in independence ($d = 0.25$). We found a large improvement of independence after a short follow-up duration in the subgroup with a baseline duration of illness 5–10 years and a small improvement of independence with greater improvement for study outcomes with shorter follow-up durations in the subgroup with a baseline duration of illness >10 years ($\chi^2 = 21.29$; $df = 3$; $p < 0.01$).

3.3.4. Activities

Overall, we found no improvement in activities ($d = 0.15$). We found a small improvement over time for studies with a baseline duration of illness of less than 2 years. We found no improvement over time for subgroups with a longer baseline duration of illness.

3.3.5. Vocational functioning

Overall, we found a small improvement in vocational functioning ($d = 0.31$). We found a medium improvement after a short follow-up and a large improvement after long follow-up for the subgroup with a baseline duration of illness >10 years. Differences in improvement between short and long follow-up were significant ($\chi^2 = 27.92$; $df = 3$; $p < 0.01$). We found no improvement in vocational functioning for the subgroup with a shorter baseline duration of illness (i.e. <2; 2–5 or 5–10 years).

3.4. Outliers and publication bias

We found 13 positive and 7 negative outliers for overall social functioning outcomes, 16 positive and 4 negative outliers for prosocial behavior, 1 positive outlier for independence, and 3 negative outliers for vocational functioning. Excluding outliers did not significantly influence any study outcome.

We found asymmetrical funnel plots, indicating publication bias, for overall social functioning and prosocial behavior (see Supplementary

Material H). For overall social functioning mainly study outcomes with a baseline duration of illness <2 years and 2–5 years and for prosocial behavior larger studies with a duration of illness between 5 and 10 years at baseline positively influenced the outcomes.

3.5. Analysis of potential moderators of outcome at baseline

Meta-regression outcomes and sensitivity analyses are presented in Supplementary Material E and Table 3. For some outcome domains moderators were excluded, because data were available for less than 10 studies.

3.5.1. Overall social functioning

Meta-regression showed that baseline levels of depression, positive symptoms, negative symptoms, subjective quality of life, and overall social functioning were significant moderators for changes in overall social functioning. Subsequently, sensitivity analyses indicated that higher baseline levels of positive symptoms, subjective quality of life, and overall social functioning, and lower baseline levels of negative symptoms was associated with greater improvement in overall social functioning ($\chi^2 = 16.24$; $df = 1$; $p < 0.01$; $\chi^2 = 8.64$; $df = 1$; $p < 0.01$; $\chi^2 = 24.76$; $df = 1$; $p < 0.01$; $\chi^2 = 8.48$; $df = 1$; $p < 0.01$). The influence of baseline positive and negative symptoms and baseline subjective quality of life applied to the subgroup with a duration of illness <2 years. For both baseline negative symptoms and overall social functioning the influence also applied to the subgroup with a duration of illness between 5 and 10 years.

3.5.2. Prosocial behavior

Meta-regression outcomes showed that baseline levels of positive symptoms and substance use, and a health care setting were moderators for changes in prosocial behavior. Sensitivity analyses indicated that higher baseline levels of positive symptoms, and studies executed in a
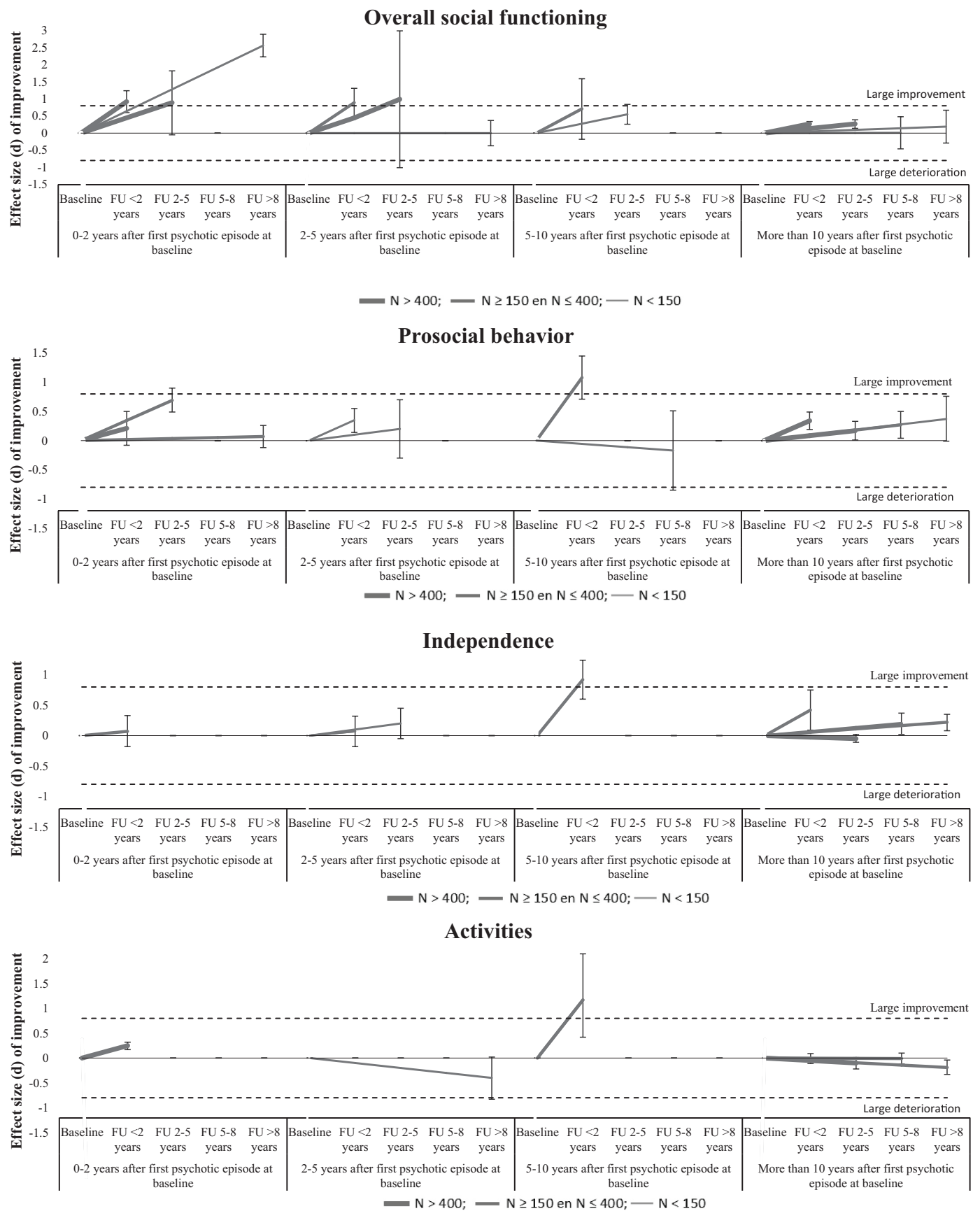
Fig. 2. Effect sizes of improvement and/or deterioration of the five social functioning outcome categories
* In this figure a positive trendline indicates improvement over time and a negative trendline indicates deterioration over time. The upper and lower whiskers show the 95% confidence interval. Thicker lines represent subgroup outcomes based on a higher number of patients.
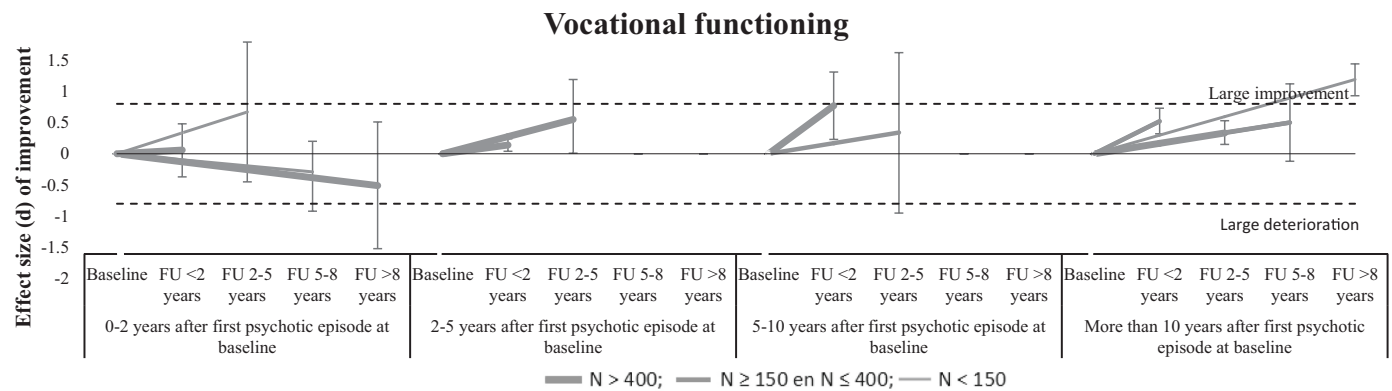
Vocational functioning

Fig. 2. (*continued*).

health care setting were associated with greater improvement in pro-social behavior ($\chi^2 = 9.71$; $df = 1$; $p < 0.01$; $\chi^2 = 4.31$; $df = 1$; $p < 0.05$). Influence of positive symptoms and a health care setting applied to the subgroup with a duration of illness between 5 and 10 years ($\chi^2 = 38.15$; $df = 1$; $p < 0.01$; $\chi^2 = 9.52$; $df = 1$; $p < 0.01$).

3.5.3. Independence

Meta-regression outcomes showed that study samples with a schizophrenia diagnosis, and baseline levels of independence were significant moderators for changes in independence. Studies evaluating patients with high levels of baseline independence ($\chi^2 = 9.72$; $df = 1$; $p < 0.01$) and studies in which not the whole sample had schizophrenia ($\chi^2 = 13.03$; $df = 1$; $p < 0.01$) reported greater improvement in independence. The influence of baseline independence also applied to the subgroup with a duration of illness >10 years at baseline ($\chi^2 = 13.79$; $df = 1$; $p < 0.01$).

3.5.4. Activities

Meta-regression outcomes showed that publication year was a moderator for changes in activities. Sensitivity analyses indicated that studies that were published less than 10 years ago reported stronger improvement in activities than older studies ($\chi^2 = 16.24$; $df = 1$; $p < 0.01$), especially in the subgroup with a duration of illness between 5 and 10 years after baseline ($\chi^2 = 64.24$; $df = 1$; $p < 0.01$).

3.5.5. Vocational functioning

Meta-regression showed that rehabilitation, combined treatment, psychotherapy, depression, negative symptoms, positive symptoms, health care setting, publication year, and baseline vocational functioning are significant moderators for changes in vocational functioning.

Sensitivity analyses indicated that studies applying rehabilitation interventions ($\chi^2 = 41.30$; $df = 1$; $p < 0.01$), or combined treatment ($\chi^2 = 38.50$; $df = 1$; $p < 0.01$) to the (sub)sample describe greater improvement in vocational functioning. In contrast, studies applying psychotherapy reported weaker improvement in vocational functioning ($\chi^2 = 21.31$; $df = 1$; $p < 0.01$). These moderating effects of treatment applied to subgroups with a baseline duration of illness <2 years and 2–5 years.

Furthermore, studies evaluating patients with high levels of baseline positive symptoms ($\chi^2 = 15.77$; $df = 1$; $p < 0.01$), or low levels of baseline negative symptoms ($\chi^2 = 41.55$; $df = 1$; $p < 0.01$) reported greater improvement in vocational functioning. Moderating effects of negative symptoms applied to the subgroup with a baseline duration of illness >10 years ($\chi^2 = 98.31$; $df = 1$; $p < 0.01$).

Finally, studies conducted in a health care setting ($\chi^2 = 54.29$; $df = 1$; $p < 0.01$), published less than 10 years ago ($\chi^2 = 4.04$; $df = 1$; $p < 0.05$) and studies evaluating patients with high baseline vocational functioning ($\chi^2 = 31.64$; $df = 1$; $p < 0.01$) show greater improvement in

vocational functioning than studies without these features. These differences applied to subgroups with both a baseline duration of illness <2 years and a baseline duration of illness 5–10 years.

3.6. Quality assessment

The quality assessment and its sensitivity analysis are presented in Supplementary Material F and G. High risk of bias, and lower study quality, was specifically indicated on a substantial number of studies for study attrition (26.2%) and prognostic factor measurement (36.9%).

Although the QUIPS items study attrition and prognostic factor measurement significantly influenced all outcome domains, the direction of the influence of these QUIPS items varied. Therefore, we did not find a consistent trend of influence of study quality of any of the QUIPS items.

4. Discussion

This meta-analysis investigated changes in social functioning and moderators of change in patients with psychotic disorders, with different durations of illness and duration of follow-up.

We observed medium improvement in overall social functioning, with greater improvement in those within the first 5 years of illness after a longer duration of follow-up. We found small improvement in vocational functioning, prosocial behavior and independence, specifically in subgroups with a baseline duration of illness of more than 5 years. We found no overall improvement of activities.

The results we found are in line with previous landmark longitudinal cohort studies, such as IPSS (Leff et al., 1992) that also found long-term improvement of social functioning for patients with psychotic disorders. Results are also in line with earlier studies indicating that patients with shorter illness duration at baseline showed more substantial improvement in social functioning than patients with longstanding psychosis (Frascarelli et al., 2015; Preston, 2000). Our findings also support the idea that the first 5 years after onset of a psychotic disorder could be labeled as a "critical period of recovery" (Birchwood et al., 1998), in which patients can achieve more improvement in social functioning (Luther et al., 2020). However, we observed small or no improvement in the other outcome domains of social functioning during the first five years of illness, though these results were based on a limited number of study outcomes. This emphasizes the need for more studies investigating specific domains of social functioning during early psychosis. The improvement in vocational functioning, prosocial behavior and independence in patients with a longer baseline duration of illness shows hopeful patterns of improvement for chronic patient populations, but also stresses the need for a focus on improvement in these domains for patients with early psychosis.

After controlling for multiple testing effects, we found indications

Table 2
Meta-analysis of social functioning outcomes.

Overall social functioning					
(Sub)analysis	K (studies (outcomes))	N (baseline-FU)	Effect size (95% CI)* and magnitude of effect**	K (%) large effect** [+/−]***	Heterogeneity (I² (95%CI))*
All studies and outcomes	54 (99)	25,867–24,086	$d =$ **0.60** [M] (0.52–0.69)	+ = 28 (28.57%)/- = 1 (1.02%)	**I² = 97%** (96–97%)

			Subgroups		
Baseline subgroup	**Follow-up cohort**				
Duration of illness < 2 years	<2 years	14 (25)	2720–2506	$d =$ **0.92** [L] (0.60–1.24)[4]	+ = 11 (45.83%)/- = 0 (0.00%)	**I² = 97%** (97–98%)
	≥2–<5 years	4 (4)	790–640	$d =$ 0.89 [L] (−0.05–1.82)	+ = 1 (25.00%)/- = 0 (0.00%)	**I² = 98%** (96–99%)
	≥8 years	1 (1)	123–123	$d =$ **2.56** [L] (2.23–2.89)[24]	+ = 1 (100.00%)/- = 0 (0.00%)	Not Applicable
	Subgroup differences between follow-up cohorts		$\chi^2 = 50.83; df = 2; p < 0.01$		
Duration of illness 2–5 years	<2 years	2 (2)	154–145	$d =$ **0.89** [L] (0.46–1.31)[4]	+ = 1 (50.00%)/- = 0 (0.00%)	I² = 66% (NA)
	≥2–<5 years	2 (2)	531–460	$d =$ 0.99 [L] (−1.01–2.99)	+ = 1 (50.00%)/- = 0 (0.00%)	**I² = 98%** (NA)
	≥8 years	1 (1)	67–67	$d =$ 0.00 [N] (−0.37–0.37)[1]	+ = 0 (0.00%)/- = 0 (0.00%)	Not Applicable
	Subgroup differences between follow-up cohorts		$\chi^2 = 9.69; df = 1; p < 0.01$		
Duration of illness 5–10 years	<2 years	4 (5)	322–322	$d =$ 0.71 [M] (−0.18–1.59)	+ = 2 (40.00%)/- = 0 (0.00%)	**I² = 97%** (94–98%)
	≥2–<5 years	1 (1)	98–92	$d =$ 0.55 [M] (0.26–0.84)	+ = 0 (0.00%)/- = 0 (0.00%)	Not Applicable
	Subgroup differences between follow-up cohorts		$\chi^2 = 0.11; df = 1; p = 0.74$		
Duration of illness >10 years	<2 years	10 (18)	17,824–17,791	$d =$ **0.27** [S] (0.19–0.34)[12]	+ = 3 (16.67%)/- = 0 (0.00%)	**I² = 88%** (83–91%)
	≥2–<5 years	10 (17)	19,145–18,050	$d =$ 0.27 [S] (0.14–0.39)	+ = 1 (5.88%)/- = 0 (0.00%)	**I² = 85%** (79–90%)
	≥5–<8 years	1 (2)	78–78	$d =$ 0.01 [N] (−0.46–0.48)	+ = 0 (0.00%)/- = 0 (0.00%)	I² = 58% (NA)
	≥8 years	1 (1)	33–33	$d =$ 0.19 [N] (−0.29–0.67)[1]	+ = 0 (0.00%)/- = 0 (0.00%)	Not Applicable
	Subgroup differences between follow-up cohorts		$\chi^2 = 1.25; df = 3; p = 0.74$		
Duration of illness unclear	<2 years	7 (14)	996–768	$d =$ **0.64** [M] (0.23–1.04)	+ = 6 (42.86%)/- = 1 (7.14%)	**I² = 97%** (96–97%)
	≥2–<5 years	3 (3)	876–824	$d =$ **0.52** [M] (0.15–0.90)	+ = 1 (33.33%)/- = 0 (0.00%)	**I² = 95%** (89–97%)
	≥ 5–<8 years	2 (2)	289–289	$d =$ 0.81 [L] (−0.35–1.98)	+ = 1 (50.00%)/- = 0 (0.00%)	**I² = 95%** (NA)
	≥8 years	1 (3)	239–239	$d =$ **0.32** [S] (0.21–0.43)	+ = 0 (0.00%)/- = 0 (0.00%)	I² = 23% (0–79%)
	Subgroup differences between follow-up cohorts		$\chi^2 = 3.54; df = 3; p = 0.32$		

Prosocial behavior					
(Sub)analysis	K (studies (outcomes))	N (baseline-FU)	Effect size (95% CI)* and magnitude of effect**	K (%) large effect** [+/−]***	Heterogeneity (I² (95%CI))*
All studies and outcomes	30 (113)	5813–4615	$d =$ **0.36** [S] (0.27–0.46)	+ = 24 (20.69%)/- = 0 (0.00%)	**I² = 94%** (93–94%)

Subgroups					
Baseline subgroup	**Follow-up cohort**				
Duration of illness <2 years	< 2 years	6 (6)	737–659	$d =$ 0.21 [S] (−0.08–0.50)[3]	+ = 0 (0.00%)/- = 0 (0.00%)	**I² = 80%** (59–90%)
	≥ 2–<5 years	2 (2)	190–190	$d =$ 0.69 [M] (0.49–0.90)[4]	+ = 0 (0.00%)/- = 0 (0.00%)	I² = 0% (NA)
	≥8 years	1 (1)	307–300	$d =$ 0.07 [N] (−0.12–0.26)	+ = 0 (0.00%)/- = 0 (0.00%)	Not Applicable
	Subgroup differences between follow-up cohorts		$\chi^2 = 19.52; df = 2; p < 0.01$		
Duration of illness 2–5 years	<2 years	1 (6)	122–117	$d =$ 0.35 [S] (0.14–0.55)[3]	+ = 0 (0.00%)/- = 0 (0.00%)	I² = 29% (0–51%)
	≥2–<5 years	1 (2)	122–105	$d =$ 0.20 [S] (−0.30–0.70)	+ = 0 (0.00%)/- = 0 (0.00%)	I² = 63% (NA)
	Subgroup differences between follow-up cohorts		$\chi^2 = 0.27; df = 1; p = 0.60$		
Duration of illness 5–10 years	<2 years	4 (13)	320–319	$d =$ **1.08** [L] (0.71–1.45)[124]	+ = 8 (61.54%)/- = 0 (0.00%)	**I² = 94%** (91–95%)
	≥5–<8 years	1 (2)	46–46	$d =$ −0.17 [N] (−0.85–0.51)	+ = 0 (0.00%)/- = 0 (0.00%)	Not Applicable
	Subgroup differences between follow-up cohorts		$\chi^2 = 9.98; df = 1; p < 0.01$		
	<2 years	6 (19)	1121–1120	$d =$ **0.34** [S] (0.19–0.49)[3]		

Table 2 (*continued*)

		K (studies (outcomes))	N (baseline-FU)	Effect size (95% CI)* and magnitude of effect**	K (%) large effect** [+/−]***	Heterogeneity (I² (95%CI))*
Prosocial behavior						
All studies and outcomes		30 (113)	5813–4615	$d = $ **0.36** [S] (0.27–0.46)	+ = 24 (20.69%)/- = 0 (0.00%)	**I² = 94%** (93–94%)
Duration of illness >10 years					+ = 3 (15.79%)/- = 0 (0.00%)	**I² = 82%** (76–87%)
	≥2–<5 years	7 (26)	3300–2221	$d = $ **0.17** [N] (0.01–0.33)[1]	+ = 5 (19.23%)/- = 0 (0.00%)	**I² = 94%** (92–96%)
	≥5–<8 years	4 (14)	351–315	$d = $ **0.27** [S] (0.04–0.51)	+ = 3 (21.43%)/- = 0 (0.00%)	**I² = 88%** (83–92%)
	≥8 years	1 (8)	130–125	$d = $ 0.37 [S] (−0.01–0.76)	+ = 3 (37.50%)/- = 0 (0.00%)	**I² = 94%** (90–96%)
	Subgroup differences between follow-up cohorts			$\chi^2 = 2.50; df = 3; p = 0.48$		
Duration of illness unclear	<2 years	3 (4)	107–107	$d = $ 0.94 [L] (0.41–1.48)	+ = 2 (50.00%)/- = 0 (0.00%)	**I² = 87%** (70–94%)
	≥2–<5 years	3 (4)	453–453	$d = $ 0.04 [N] (−0.20–0.27)	+ = 0 (0.00%)/- = 0 (0.00%)	**I² = 75%** (30–91%)
	≥5–<8 years	1 (2)	157–148	$d = $ −0.16 [N] (−0.37–0.05)	+ = 0 (0.00%)/- = 0 (0.00%)	I² = 0% (NA)
	≥8 years	3 (4)	236–159	$d = $ −0.11 [N] (−0.42–0.20)	+ = 0 (0.00%)/- = 0 (0.00%)	I² = 56% (0–87%)
	Subgroup differences between follow-up cohorts			$\chi^2 = 14.85; df = 3; p < 0.01$		
Independence						
(Sub)analysis		K (studies (outcomes))	N (baseline-FU)	Effect size (95% CI)* and magnitude of effect**	K (%) large effect** [+/−]***	Heterogeneity (I² (95%CI))*
All studies and outcomes		18 (40)	4734–3669	$d = $ **0.25** [S] (0.13–0.37)	+ = 6 (15.00%)/- = 0 (0.00%)	**I² = 90%** (88–92%)
Subgroups **Baseline subgroup**	**Follow-up cohort**					
Duration of illness <2 years	<2 years	3 (3)	257–257	$d = $ 0.07 [N] (−0.18–0.33)[3]	+ = 0 (0.00%)/- = 0 (0.00%)	I² = 32% (0–98%)
	Subgroup differences between follow-up cohorts			Not Applicable		
Duration of illness 2–5 years	<2 years	1 (1)	122–122	$d = $ 0.07 [N] (−0.18–0.32)[3]	+ = 0 (0.00%)/- = 0 (0.00%)	Not applicable
	≥2–<5 years	1 (1)	122–122	$d = $ 0.20 [S] (−0.05–0.45)	+ = 0 (0.00%)/- = 0 (0.00%)	Not applicable
	Subgroup differences between follow-up cohorts			$\chi^2 = 0.52; df = 1; p = 0.47$		
Duration of illness 5–10 years	< 2 years	3 (5)	277–276	$d = $ **0.92** [L] (0.60–1.24)[124]	+ = 3 (60.00%)/- = 0 (0.00%)	**I² = 82%** (60–92%)
	Subgroup differences between follow-up cohorts			Not Applicable		
Duration of illness >10 years	<2 years	3 (9)	200–200	$d = $ **0.42** [S] (0.09–0.75)[3]	+ = 3 (33.33%)/- = 0 (0.00%)	**I² = 81%** (65–90%)
	≥2–<5 years	4 (8)	3156–2092	$d = $ −0.05 [N] (−0.11–0.02)	+ = 0 (0.00%)/- = 0 (0.00%)	I² = 16% (1–28%)
	≥5–<8 years	2 (4)	186–181	$d = $ 0.20 [S] (0.02–0.37)	+ = 0 (0.00%)/- = 0 (0.00%)	I² = 51% (0–84%)
	≥8 years	2 (4)	183–173	$d = $ 0.22 [S] (0.08–0.35)	+ = 0 (0.00%)/- = 0 (0.00%)	I² = 0% (0–85%)
	Subgroup differences between follow-up cohorts			$\chi^2 = 21.29; df = 3; p < 0.01$		
Duration of illness unclear	<2 years	1 (1)	124–124	$d = $ 0.12 [N] (0.01–0.23)	+ = 0 (0.00%)/- = 0 (0.00%)	Not applicable
	≥2–<5 years	3 (3)	745–745	$d = $ 0.02 [N] (−0.55–0.58)	+ = 0 (0.00%)/- = 0 (0.00%)	**I² = 96%** (90–98%)
	≥5–<8 years	1 (1)	76–76	$d = $ −0.20 [S] (−0.86–0.45)	+ = 0 (0.00%)/- = 0 (0.00%)	Not applicable
	Subgroup differences between follow-up cohorts			$\chi^2 = 1.01; df = 2; p = 0.60$		
Activities						
(Sub)analysis		K (studies (outcomes))	N (baseline-FU)	Effect size (95% CI)* and magnitude of effect**	K (%) large effect** [+/−]***	Heterogeneity (I² (95%CI))*
All studies and outcomes		13 (32)	4489–3273	$d = $ 0.15 [N] (−0.02–0.32)	+ = 3 (9.38%)/- = 0 (0.00%)	**I² = 95%** (94–96%)
Subgroups **Baseline subgroup**	**Follow-up cohort**					
Duration of illness <2 years	<2 years	1 (2)	764–623	$d = $ **0.25** [S] (0.17–0.32)[4]	+ = 0 (0.00%)/- = 0 (0.00%)	I² = 0% (NA)
	Subgroup differences between follow-up cohorts			Not Applicable		

Table 2 (*continued*)

Activities					
(Sub)analysis		K (studies (outcomes))	N (baseline-FU)	Effect size (95% CI)* and magnitude of effect**	K (%) large effect** [+/−]***	Heterogeneity (I² (95%CI))*
All studies and outcomes		13 (32)	4489–3273	d = 0.15 [N] (−0.02–0.32)	+ = 3 (9.38%)/- = 0 (0.00%)	**I² = 95%** (94–96%)
Duration of illness 2–5 years	≥8 years	1 (1)	60–60	d = −0.40 [S] (−0.83–0.02)	+ = 0 (0.00%)/- = 0 (0.00%)	Not Applicable
	Subgroup differences between follow-up cohorts			Not Applicable		
Duration of illness 5–10 years	<2 years	3 (5)	230–178	d = 1.17 [L] (0.42–2.10)[4]	+ = 3 (60.00%)/- = 0 (0.00%)	**I² = 97%** (97–98%)
	Subgroup differences between follow-up cohorts			Not Applicable		
Duration of illness > 10 years	<2 years	2 (5)	351–351	d = −0.01 [N] (−0.11–0.09)[13]	+ = 0 (0.00%)/- = 0 (0.00%)	I² = 0% (0–79%)
	≥2–<5 years	3 (8)	2458–1394	d = −0.10 [N] (−0.22–0.01)	+ = 0 (0.00%)/- = 0 (0.00%)	I² = 52% (23–70%)
	≥5–<8 years	4 (6)	394–364	d = −0.01 [N] (−0.12–0.10)	+ = 0 (0.00%)/- = 0 (0.00%)	I² = 0% (0–75%)
	≥8 years	1 (3)	152–152	d = −0.19 [N] (−0.33 to −0.04)	+ = 0 (0.00%)/- = 0 (0.00%)	I² = 0% (0–90%)
	Subgroup differences between follow-up cohorts			χ² = 5.40; df = 3; p = 0.14		
Duration of illness unclear	<2 years	1 (1)	362–332	d = 0.15 [N] (0.00–0.30)	+ = 0 (0.00%)/- = 0 (0.00%)	Not Applicable
	≥2–<5 years	1 (1)	252–252	d = **0.27** [S] (0.10–0.44)	+ = 0 (0.00%)/- = 0 (0.00%)	Not Applicable
	Subgroup differences between follow-up cohorts			Continuous outcomes: χ² = 1.04; df = 1; p = 0.31		

Vocational functioning					
(Sub)analysis		K (studies (outcomes))	N (baseline-FU)	Effect size (95% CI)* and magnitude of effect**	K (%) large effect** [+/−]***	Heterogeneity (I² (95%CI))*
All studies and outcomes		27 (61)	6396–4896	d = **0.31** [S] (0.20–0.42)	+ = 12 (19.67%)/- = 1 (1.64%)	**I² = 89%** (87–90%)
Subgroups **Baseline subgroup**	**Follow-up cohort**					
Duration of illness <2 years	<2 years	5 (7)	557–507	d = 0.06 [N] (−0.37–0.48)[3]	+ = 0 (0.00%)/- = 0 (0.00%)	**I² = 94%** (89–96%)
	≥2–<5 years	2 (2)	158–158	d = 0.66 [M] (−0.46–1.78)	+ = 1 (50.00%)/- = 0 (0.00%)	**I² = 95%** (NA)
	≥5–<8 years	2 (2)	125–118	d = −0.29 [S] (−0.92–0.34)	+ = 0 (0.00%)/- = 0 (0.00%)	I² = 75% (NA)
	≥8 years	2 (2)	434–337	d = −0.51 [M] (−1.52–0.51)[4]	+ = 0 (0.00%)/- = 1 (50.00%)	**I² = 87%** (NA)
	Subgroup differences between follow-up cohorts			χ² = 3.12; df = 3; p = 0.37		
Duration of illness 2–5 years	<2 years	2 (7)	535–446	d = 0.14 [N] (0.04–0.24)[34]	+ = 2 (28.57%)/- = 0 (0.00%)	I² = 0% (0–63%)
	≥2–<5 years	2 (3)	567–390	d = 0.55 [M] (0.01–1.09)	+ = 1 (33.33%)/- = 0 (0.00%)	Not Applicable
	Subgroup differences between follow-up cohorts			χ² = 2.08; df = 1; p = 0.15		
Duration of illness 5–10 years	<2 years	2 (2)	493–327	d = 0.77 [M] (0.23–1.31)[124]	+ = 1 (50.00%)/- = 0 (0.00%)	**I² = 90%** (NA)
	≥2–<5 years	2 (2)	223–214	d = 0.34 [S] (−0.95–1.62)	+ = 1 (50.00%)/- = 0 (0.00%)	**I² = 98%** (NA)
	Subgroup differences between follow-up cohorts			χ² = 0.37; df = 1; p = 0.54		
Duration of illness > 10 years	<2 years	3 (6)	302–302	d = **0.52** [M] (0.32–0.73)[23]	+ = 0 (0.00%)/- = 0 (0.00%)	I² = 35% (0–58%)
	≥2–<5 years	4 (12)	3075–2017	d = **0.34** [S] (0.15–0.53)	+ = 1 (8.33%)/- = 0 (0.00%)	**I² = 87%** (80–91%)
	≥5–<8 years	3 (5)	251–230	d = 0.50 [M] (−0.12–1.12)	+ = 3 (60.00%)/- = 0 (0.00%)	**I² = 91%** (82–96%)
	≥8 years	1 (3)	130–120	d = **1.19** [L] (0.93–1.44)[1]	+ = 3 (100.00%)/- = 0 (0.00%)	I² = 0% (0–73%)
	Subgroup differences between follow-up cohorts			χ² = 27.92; df = 3; p < 0.01		
Duration of illness unclear	<2 years	1 (2)	25–25	d = 0.70 [M] (0.24–1.16)	+ = 0 (0.00%)/- = 0 (0.00%)	I² = 0% (NA)
	≥2–<5 years	2 (3)	526–519	d = 0.13 [N] (−0.01–0.27)	+ = 0 (0.00%)/- = 0 (0.00%)	I² = 23% (0–97%)
	≥5–<8 years	1 (3)	157–148	d = −0.06 [N] (−0.22–0.11)	+ = 0 (0.00%)/- = 0 (0.00%)	I² = 0% (0–96%)
	≥8 years	2 (4)	224–216	d = −0.01 [N] (−0.24–0.23)	+ = 0 (0.00%)/- = 0 (0.00%)	I² = 53% (0–82%)
	Subgroup differences between follow-up cohorts			χ² = 10.49; df = 3; p < 0.05		

Outcomes in **bold** are significant (p < 0.05) after Benjamini-Hochberg correction; Outcomes underlined are no longer significant after Benjamini-Hochberg correction for multiple testing.
[1]Significant subgroup differences with the duration of illness <2 years subgroup outcome within the same follow-up cohort.

that high levels of baseline positive symptoms and social functioning, low levels of baseline negative symptoms and studies published in more recent publications were associated with more improvement in multiple domains of social functioning. Furthermore, we found that a high level of baseline subjective quality of life was associated with improvement in overall social functioning and that the presence of specific rehabilitation, or combined treatment, and the absence of psychotherapy were associated with improvement in vocational functioning.

The positive influence of high baseline levels of positive symptoms on improvement in social functioning contradicts previous studies indicating that lower severity of psychotic symptoms is an important predictor for social recovery (Alvarez-Jimenez et al., 2012; Bottlender et al., 2010). The results might be explained by the fact that patients with more severe symptoms have a higher level of functional impairment (Rymaszewska et al., 2007) and thereby greater potential for improvement in social functioning. The negative association between baseline levels of positive symptoms and functioning at baseline ($r = −0.48$; $p < 0.01$) in our included studies corroborates this explanation.

Furthermore, the positive association between low levels of baseline negative symptoms and improvement in social functioning is in accordance with previous findings (Albert et al., 2011; Bottlender et al., 2010; Gee et al., 2016; Möller et al., 2000). This might be explained by the conceptual overlap between features of negative symptoms (e.g. apathy and speech problems) and social functioning and the negative association between negative symptoms and neurocognition, social cognition and adherence to treatment (Bliksted et al., 2017; Ventura et al., 2015), which may hamper social recovery. In our report we could not replicate these negative associations, due to lack of study outcomes and lack of heterogeneity of neurocognition assessments. Therefore, we recommend further investigation of the etiology and pathobiology of negative symptoms and possibilities for integrating interventions targeting negative symptoms within functional rehabilitation (Gee et al., 2016; Stiekema et al., 2018; Fervaha et al., 2014).

The positive influence of baseline subjective quality of life on the improvement in overall social functioning confirms previous findings (Burns-Lynch and Musa, 2016; Lambert et al., 2009). This might be explained by the fact that better subjective quality of life might lead to increased engagement in social roles due to increased hope and optimism and a reduced "why try?" effect (Corrigan et al., 2009).

The positive association between recent publications and improvement in activities and vocational functioning might give some first indications for a shift towards greater emphasis on social functioning in standard care for psychosis. We recommend further elaboration of this trend in future research.

Furthermore, studies delivering rehabilitation and combined treatment to the study (sub)sample are associated with improvement in vocational functioning especially for patients with a short illness duration at baseline. This is in line with previous studies indicating beneficial vocational outcomes for vocational rehabilitation programs, such as individual placement and support (IPS), in early intervention services (Bond et al., 2015; Rinaldi et al., 2004). The negative influence of psychotherapy on vocational outcomes might be explained by the fact that most of the psychotherapy studies were not focused on rehabilitation or combined treatment and thereby less focused on vocational rehabilitation.

It is important to consider that we analyzed the whole study sample of each study, so we analyzed both the intervention and the control condition. Therefore, intervention effects do not exclusively explain

changes in vocational functioning. The results could be explained by the 'Hawthorne effect' which indicates that being a subject of social investigation might explain the behavior-modifying effect (Wickström and Bendix, 2000). We recommend future research investigating long-term effects of different types of treatment and treatment adherence on different levels of social functioning to put current results into perspective.

Finally, we found a negative association between a diagnosis of schizophrenia and improvement in independence. This indicates that a more severe and chronic pattern of psychotic disorders might affect improvement in this outcome domain. However, both study design and study sample did not influence the other outcome domains in this meta-analysis. Therefore, the broad inclusion norms increase the generalizability of our findings with limited influence on the heterogeneity of study outcomes.

A possible important explanation for the results we found might be explained by the fact that the duration of illness subgroups might be biased and censored because sample characteristics between these subgroups differed at baseline. However, in our meta-analysis we found no indications of such a sampling effect, except for the fact that studies with a longer duration of illness were more often diagnosed with schizophrenia than studies with a shorter duration of illness. This might have influenced outcomes as a schizophrenia diagnosis is negatively associated with improvement in independence. Nevertheless, the influence of this moderator is very limited, so the results could not be explained by sampling effects.

There are several limitations to address. First, the subgroup and sensitivity analyses were often based on a limited number of studies with heterogeneous outcomes, making the outcomes less reliable (Böhning et al., 2017). The high heterogeneity might be explained by the fact that social functioning remains a complex and disputed construct with low psychometric quality (Bellack et al., 2006). Although heterogeneity of study outcomes in complex meta-analyses are often inevitable and could not directly translated to clinical implications of study outcomes (Ioannidis, 2008), we partly explained heterogeneity by executing meta-regression analyses on potential moderators of outcomes. Quality assessment also revealed lower quality of a few included studies. However, the sensitivity analysis did not indicate a significant influence of study quality on outcomes. Furthermore, although subgroup and sensitivity analyses were necessary to answer our research questions, the relatively high number of analyses might have caused alpha inflation. Therefore, we executed a Benjamini-Hochberg correction on all significant outcomes to test for potential type-I errors. Furthermore, we could not analyze the influence of potentially relevant moderators, such as stigma, social cognition, premorbid functioning, regional differences or ethnic groups due to limited studies reporting on these factors. These moderators would be valuable to investigate in future research. Finally, indications of publication bias and high numbers of positive outliers might have inflated study outcomes, though analyses of positive outliers does not support this possibility.

Our findings show hopeful patterns of improvement in social functioning in the first 5 years of illness. However, even patients with a longer duration of illness improve in distinct outcome domains of social functioning. This stresses the needs for extensive intervention services. Reduction of negative symptoms and improvement in subjective quality of life might amplify improvement in social functioning. Further research into specific interventions might help to further unlock the social potential of patients with psychotic disorders.

Table 3
Sensitivity analysis of significant moderators.

		K (studies (outcomes))	N (baseline-FU)	Effect size (95% CI)* and magnitude of effect**	K (%) large effect** [+/−]***	Heterogeneity (I² (95% CI))*
Overall social functioning						
(Sub)analysis				All studies and outcomes		
Confounder	**Rating**					
Depression	High	14 (17)	3490–2297	$d = $ **0.82** [L] (0.41–1.23)	+ = 6 (35.29%)/- = 1 (5.88%)	**I² = 98%** (97–98%)
	Low	12 (18)	2066–1832	$d = $ **0.58** [M] (0.15–1.02)	+ = 6 (33.33%)/- = 0 (0.00%)	**I² = 98%** (98–99%)
		Subgroup differences between follow-up cohorts		$\chi^2 = 0.61; df = 1; p = 0.44$		
Positive symptoms	High	14 (25)	1959–1703	$d = $ **1.16** [L] (0.83–1.50)	+ = 14 (56.00%)/- = 0 (0.00%)	**I² = 96%** (96–97%)
	Low	17 (33)	2869–2712	$d = $ **0.42** [S] (0.29–0.56)	+ = 6 (18.75%)/- = 0 (0.00%)	**I² = 90%** (87–92%)
		Subgroup differences between follow-up cohorts		$\chi^2 = 16.24; df = 1; p < 0.01$		
Negative symptoms	High	17 (37)	3934–2817	$d = $ **0.59** [M] (0.43–0.75)	+ = 13 (35.14%)/- = 0 (0.00%)	**I² = 94%** (93–95%)
	Low	15 (19)	3010–2697	$d = $ **1.33** [L] (0.85–1.80)	+ = 10 (52.63%)/- = 0 (0.00%)	**I² = 98%** (98–99%)
		Subgroup differences between follow-up cohorts		$\chi^2 = 8.48; df = 1; p < 0.01$		
Subjective quality of life	High	4 (18)	436–377	$d = $ **0.63** [M] (0.27–0.98)	+ = 4 (22.22%)/- = 0 (0.00%)	**I² = 95%** (94–96%)
	Low	9 (19)	20,636–19,272	$d = $ 0.09 [N] (0.03–0.15)	+ = 2 (10.53%)/- = 0 (0.00%)	**I² = 89%** (85–92%)
		Subgroup differences between follow-up cohorts		$\chi^2 = 8.64; df = 1; p < 0.01$		
Baseline functioning	High	27 (44)	22,236–20,881	$d = $ **0.85** [L] (0.73–0.98)	+ = 19 (43.18%)/- = 1 (2.27%)	**I² = 98%** (97–98%)
	Low	27 (56)	3998–3562	$d = $ **0.41** [S] (0.30–0.53)	+ = 10 (17.86%)/- = 0 (0.00%)	**I² = 92%** (91–93%)
		Subgroup differences between follow-up cohorts		$\chi^2 = 24.76; df = 1; p < 0.01$		
(Sub)analysis		K (studies (outcomes))	N (baseline-FU)	Duration of illness at baseline < 2 years study outcomes. Effect size (95% CI)* and magnitude of effect**	K (%) large effect** [+/−]***	Heterogeneity (I² (95% CI))*
Confounder	**Rating**					
Depression	High	5 (7)	497–389	$d = $ 1.17 [L] (0.21–2.14)	+ = 3 (42.86%)/- = 0 (0.00%)	**I² = 98%** (98–99%)
	Low	6 (9)	1042–973	$d = $ **0.99** [L] (0.35–1.64)	+ = 5 (55.56%)/- = 0 (0.00%)	**I² = 98%** (98–99%)
		Subgroup differences between follow-up cohorts		$\chi^2 = 0.09; df = 1; p = 0.76$		
Positive symptoms	High	6 (15)	1096–889	$d = $ **1.22** [L] (0.79–1.64)	+ = 8 (53.33%)/- = 0 (0.00%)	**I² = 96%** (95–97%)
	Low	5 (5)	1201–1059	$d = $ 0.48 [S] (0.09–0.87)	+ = 2 (50.00%)/- = 0 (0.00%)	**I² = 88%** (74–94%)
		Subgroup differences between follow-up cohorts		$\chi^2 = 6.23; df = 1; p < 0.05$		
Negative symptoms	High	4 (11)	339–288	$d = $ **0.79** [M] (0.40–1.17)	+ = 5 (45.45%)/- = 0 (0.00%)	**I² = 92%** (87–95%)
	Low	9 (11)	2292–2012	$d = $ **1.68** [L] (1.04–2.33)	+ = 7 (63.64%)/- = 0 (0.00%)	**I² = 98%** (98–99%)
		Subgroup differences between follow-up cohorts		$\chi^2 = 5.47; df = 1; p < 0.05$		
Subjective quality of life	High	2 (7)	278–234	$d = $ **1.23** [L] (0.61–1.84)	+ = 4 (57.14%)/- = 0 (0.00%)	**I² = 96%** (93–97%)
	Low	1 (2)	1290–1159	$d = $ 0.21 [S] (−0.01–0.43)	+ = 0 (0.00%)/- = 0 (0.00%)	I² = 72% (NA)
		Subgroup differences between follow-up cohorts		$\chi^2 = 9.32; df = 1; p < 0.01$		
Baseline functioning	High	12 (18)	17,907–17,744	$d = $ **1.15** [L] (0.71–1.59)	+ = 9 (50.00%)/- = 0 (0.00%)	**I² = 98%** (97–98%)
	Low	5 (11)	1273–1094	$d = $ **0.67** [M] (0.30–1.04)	+ = 4 (36.36%)/- = 0 (0.00%)	**I² = 95%** (92–96%)
		Subgroup differences between follow-up cohorts		$\chi^2 = 2.69; df = 1; p = 0.10$		
(Sub)analysis		K (studies (outcomes))	N (baseline-FU)	Duration of illness at baseline 2–5 years study outcomes. Effect size (95% CI)* and magnitude of effect**	K (%) large effect** [+/−]***	Heterogeneity (I² (95% CI))*
Confounder	**Rating**					
Depression	High	2 (2)	142–124	$d = $ 1.34 [L] (0.02–2.65)	+ = 1 (50.00%)/- = 0 (0.00%)	**I² = 94%** (NA)
	Low	X	X	X	X	X
		Subgroup differences between follow-up cohorts		Not applicable		
Positive symptoms	High	X	X	X	X	X
	Low	3 (3)	209–191	$d = $ 0.88 [L] (−0.06–1.82)	+ = 1 (33.33%)/- = 0 (0.00%)	**I² = 94%** (83–98%)
		Subgroup differences between follow-up cohorts		Not applicable		
Negative symptoms	High	1 (1)	67–67	$d = $ 0.00 [N] (−0.37–0.37)	+ = 0 (0.00%)/- = 0 (0.00%)	Not Applicable
	Low	2 (2)	142–124	$d = $ 1.34 [L] (0.02–2.65)	+ = 1 (50.00%)/- = 0 (0.00%)	**I² = 94%** (NA)
		Subgroup differences between follow-up cohorts		$\chi^2 = 3.68; df = 1; p = 0.05$		

Table 3 (*continued*)

		Overall social functioning				
(Sub)analysis		All studies and outcomes				
		K (studies (outcomes))	N (baseline-FU)	Effect size (95% CI)* and magnitude of effect**	K (%) large effect** [+/−]***	Heterogeneity (I² (95% CI))*
Subjective quality of life	High	X	X	X	X	X
	Low	X	X	X	X	X
		Subgroup differences between follow-up cohorts		Not applicable		
Baseline functioning	High	2 (2)	543–481	$d = 0.54$ [M] (−0.58–1.82)	+ = 1 (50.00%)/- = 0 (0.00%)	**I² = 96%** (NA)
	Low	3 (3)	209–191	$d = 0.88$ [L] (−0.06–1.82)	+ = 1 (33.33%)/- = 0 (0.00%)	**I² = 94%** (83–98%)
		Subgroup differences between follow-up cohorts		$\chi^2 = 0.20$; $df = 1$; $p = 0.65$		

(Sub)analysis		Duration of illness at baseline 5–10 years study outcomes				
		K (studies (outcomes))	N (baseline-FU)	Effect size (95% CI)* and magnitude of effect**	K (%) large effect** [+/−]***	Heterogeneity (I² (95% CI))*
Confounder	**Rating**					
Depression	High	3 (3)	330–324	$d = \underline{1.35}$ [L] (0.41–2.28)	+ = 2 (66.67%)/- = 0 (0.00%)	**I² = 97%** (94–98%)
	Low	1 (2)	47–47	$d = 0.01$ [N] (−0.28–0.30)	+ = 0 (0.00%)/- = 0 (0.00%)	I² = 0% (NA)
		Subgroup differences between follow-up cohorts		$\chi^2 = 7.21$; $df = 1$; $p < 0.01$		
Positive symptoms	High	2 (2)	234–228	$d = \underline{0.85}$ [L] (0.27–1.44)	+ = 1 (50.00%)/- = 0 (0.00%)	**I² = 89%** (NA)
	Low	2 (3)	143–143	$d = 0.80$ [L] (−0.79–2.39)	+ = 1 (33.33%)/- = 0 (0.00%)	**I² = 98%** (96–99%)
		Subgroup differences between follow-up cohorts		$\chi^2 = 0.00$; $df = 1$; $p = 0.95$		
Negative symptoms	High	3 (4)	281–275	$d = 0.45$ [S] (−0.11–1.01)	+ = 1 (25.00%)/- = 0 (0.00%)	**I² = 91%** (81–96%)
	Low	1 (1)	96–96	$d = \underline{2.37}$ [L] (2.00–2.74)	+ = 1 (100.00%)/- = 0 (0.00%)	Not applicable
		Subgroup differences between follow-up cohorts		$\chi^2 = 31.57$; $df = 1$; $p < 0.01$		
Subjective quality of life	High	X	X	X	X	X
	Low	X	X	X	X	X
		Subgroup differences between follow-up cohorts		Not applicable		
Baseline functioning	High	1 (1)	96–96	$d = \mathbf{2.37}$ [L] (2.00–2.74)	+ = 1 (100.00%)/- = 0 (0.00%)	Not applicable
	Low	4 (5)	324–318	$d = 0.36$ [S] (−0.14–0.86)	+ = 1 (20.00%)/- = 0 (0.00%)	**I² = 91%** (81–95%)
		Subgroup differences between follow-up cohorts		$\chi^2 = 40.27$; $df = 1$; $p < 0.01$		

(Sub)analysis		Duration of illness at baseline > 10 years study outcomes				
		K (studies (outcomes))	N (baseline-FU)	Effect size (95% CI)* and magnitude of effect**	K (%) large effect** [+/−]***	Heterogeneity (I² (95% CI))*
Confounder	**Rating**					
Depression	High	3 (4)	2506–1445	$d = 0.20$ [S] (−0.04–0.43)	+ = 0 (0.00%)/- = 0 (0.00%)	**I² = 85%** (64–94%)
	Low	3 (4)	525–506	$d = \mathbf{0.21}$ [S] (0.12–0.31)	+ = 0 (0.00%)/- = 0 (0.00%)	I² = 0% (0–85%)
		Subgroup differences between follow-up cohorts		$\chi^2 = 0.02$; $df = 1$; $p = 0.90$		
Positive symptoms	High	3 (3)	404–404	$d = 0.35$ [S] (−0.20–0.90)	+ = 1 (50.00%)/- = 0 (0.00%)	**I² = 92%** (76–97%)
	Low	4 (14)	576–561	$d = \mathbf{0.23}$ [S] (0.09–0.37)	+ = 0 (0.00%)/- = 0 (0.00%)	**I² = 72%** (53–84%)
		Subgroup differences between follow-up cohorts		$\chi^2 = 0.16$; $df = 1$; $p = 0.68$		
Negative symptoms	High	5 (14)	2692–1631	$d = \underline{0.24}$ [S] (0.04–0.45)	+ = 1 (7.14%)/- = 0 (0.00%)	**I² = 90%** (85–93%)
	Low	2 (3)	455–440	$d = \underline{0.18}$ [N] (0.08–0.27)	+ = 0 (0.00%)/- = 0 (0.00%)	I² = 0% (0–90%)
		Subgroup differences between follow-up cohorts		$\chi^2 = 0.88$; $df = 1$; $p = 0.35$		
Quality of life	High	2 (11)	158–143	$d = \underline{0.24}$ [S] (0.04–0.44)	+ = 0 (0.00%)/- = 0 (0.00%)	**I² = 78%** (61–88%)
	Low	7 (14)	19,336–18,256	$d = \mathbf{0.12}$ [N] (0.07–0.17)	+ = 2 (14.29%)/- = 0 (0.00%)	**I² = 81%** (72–87%)
		Subgroup differences between follow-up cohorts		$\chi^2 = 1.28$; $df = 1$; $p = 0.26$		
Baseline functioning	High	7 (14)	19,226–18,146	$d = \mathbf{0.13}$ [N] (0.08–0.19)	+ = 1 (7.14%)/- = 0 (0.00%)	**I² = 82%** (73–88%)
	Low	11 (24)	1258–1210	$d = \mathbf{0.32}$ [S] (0.19–0.46)	+ = 3 (12.50%)/- = 0 (0.00%)	**I² = 81%** (71–86%)
		Subgroup differences between follow-up cohorts		$\chi^2 = 6.52$; $df = 1$; $p < 0.05$		

		Prosocial behavior				
(Sub)analysis		All studies and outcomes				
		K (studies (outcomes))	N (baseline-FU)	Effect size (95% CI)* and magnitude of effect**	K (%) large effect** [+/−]***	Heterogeneity (I² (95% CI))*
Confounder	**Rating**					
Substance use	High	5 (13)	827–766	$d = \underline{0.34}$ [S] (0.18–0.50)	+ = 0 (0.00%)/- = 0 (0.00%)	**I² = 67%** (52.77%)

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Table 3 (*continued*)

		Prosocial behavior				
(Sub)analysis		All studies and outcomes				
		K (studies (outcomes))	N (baseline-FU)	Effect size (95% CI)* and magnitude of effect**	K (%) large effect** [+/−]***	Heterogeneity (I² (95% CI))*
	Low	5 (54)	2842–1778	$d =$ **0.30** [S] (0.18–0.43)	+ = 15 (27.78%)/- = 0 (0.00%)	**I² = 93%** (92–94%)
		Subgroup differences between follow-up cohorts			$\chi^2 = 0.12; df = 1; p = 0.73$	
Positive symptoms	High	6 (54)	743–734	$d =$ **0.50** [M] (0.33–0.67)	+ = 19 (35.19%)/- = 0 (0.00%)	**I² = 96%** (95–96%)
	Low	10 (24)	1057–1020	$d =$ **0.15** [N] (0.01–0.29)	+ = 0 (0.00%)/- = 0 (0.00%)	**I² = 81%** (75–86%)
		Subgroup differences between follow-up cohorts			$\chi^2 = 9.71; df = 1; p < 0.01$	
Health care setting	Health care	16 (81)	1964–1894	$d =$ **0.43** [S] (0.28–0.58)	+ = 22 (27.16%)/- = 0 (0.00%)	**I² = 95%** (94–95%)
	Naturalistic	14 (32)	3836–2707	$d =$ **0.20** [S] (0.02–0.29)	+ = 4 (12.50%)/- = 0 (0.00%)	**I² = 91%** (89–93%)
		Subgroup differences between follow-up cohorts			$\chi^2 = 4.31; df = 1; p < 0.05$	
(Sub)analysis		Duration of illness at baseline < 2 years study outcomes				
		K (studies (outcomes))	N (baseline-FU)	Effect size (95% CI)* and magnitude of effect**	K (%) large effect** [+/−]***	Heterogeneity (I² (95% CI))*
Confounder	**Rating**					
Substance use	High	5 (6)	760–704	$d =$ <u>0.39</u> [S] (0.10–0.67)	+ = 0 (0.00%)/- = 0 (0.00%)	**I² = 82%** (64–91%)
	Low	X	X	X	X	X
		Subgroup differences between follow-up cohorts			Not Applicable	
Positive symptoms	High	3 (3)	169–161	$d =$ **0.45** [S] (0.13–0.77)	+ = 0 (0.00%)/- = 0 (0.00%)	I² = 50% (0–85%)
	Low	3 (4)	425–404	$d =$ 0.34 [S] (−0.06–0.74)	+ = 0 (0.00%)/- = 0 (0.00%)	**I² = 90%** (75–96%)
		Subgroup differences between follow-up cohorts			$\chi^2 = 0.18; df = 1; p = 0.67$	
Health care setting	Health care	4 (5)	453–404	$d =$ **0.46** [S] (0.19–0.74)	+ = 0 (0.00%)/- = 0 (0.00%)	**I² = 72%** (37–88%)
	Naturalistic	4 (4)	656–620	$d =$ 0.11 [N] (−0.15–0.36)	+ = 0 (0.00%)/- = 0 (0.00%)	**I² = 73%** (26–90%)
		Subgroup differences between follow-up cohorts			$\chi^2 = 3.49; df = 1; p = 0.06$	
(Sub)analysis		Duration of illness at baseline 2–5 years study outcomes				
		K (studies (outcomes))	N (baseline-FU)	Effect size (95% CI)* and magnitude of effect**	K (%) large effect** [+/−]***	Heterogeneity (I² (95% CI))*
Confounder	**Rating**					
Substance use	High	1 (8)	122–117	$d =$ **0.32** [S] (0.14–0.49)	+ = 0 (0.00%)/- = 0 (0.00%)	I² = 32% (0–70%)
	Low	X	X	X	X	X
		Subgroup differences between follow-up cohorts			Not Applicable	
Positive symptoms	High	X	X	X	X	X
	Low	X	X	X	X	X
		Subgroup differences between follow-up cohorts			Not Applicable	
Health care setting	Health care	1 (8)	122–117	$d =$ **0.32** [S] (0.14–0.49)	+ = 0 (0.00%)/- = 0 (0.00%)	I² = 32% (0–70%)
	Naturalistic	X	X	X	X	X
		Subgroup differences between follow-up cohorts			Not Applicable	
(Sub)analysis		Duration of illness at baseline 5–10 years study outcomes				
		K (studies (outcomes))	N (baseline-FU)	Effect size (95% CI)* and magnitude of effect**	K (%) large effect** [+/−]***	Heterogeneity (I² (95% CI))*
Confounder	**Rating**					
Substance use	High	X	X	X	X	X
	Low	X	X	X	X	X
		Subgroup differences between follow-up cohorts			Not Applicable	
Positive symptoms	High	1 (6)	170–169	$d =$ **1.68** [L] (1.32–2.03)	+ = 6 (100.00%)/- = 0 (0.00%)	**I² = 91%** (83–95%)
	Low	1 (2)	47–47	$d =$ 0.24 [S] (−0.06–0.53)	+ = 0 (0.00%)/- = 0 (0.00%)	I² = 0% (NA)
		Subgroup differences between follow-up cohorts			$\chi^2 = 38.15; df = 1; p < 0.01$	
Health care setting	Health care	2 (8)	216–215	$d =$ **1.24** [L] (0.77–1.72)	+ = 6 (75.00%)/- = 0 (0.00%)	**I² = 95%** (93–97%)
	Naturalistic	3 (7)	216–188	$d =$ **0.43** [S] (0.24–0.63)	+ = 2 (28.57%)/- = 0 (0.00%)	I² = 13% (0–75%)
		Subgroup differences between follow-up cohorts			$\chi^2 = 9.52; df = 1; p < 0.01$	
(Sub)analysis		Duration of illness at baseline > 10 years study outcomes				
		K (studies (outcomes))	N (baseline-FU)	Effect size (95% CI)* and magnitude of effect**	K (%) large effect** [+/−]***	Heterogeneity (I² (95% CI))*
Confounder	**Rating**					
Substance use	High	X	X	X	X	X
	Low	3 (47)	2433–1369	$d =$ **0.32** [S] (0.19–0.45)		**I² = 93%** (92–94%)

Table 3 (*continued*)

Prosocial behavior					
(Sub)analysis	All studies and outcomes				
	K (studies (outcomes))	N (baseline-FU)	Effect size (95% CI)* and magnitude of effect**	K (%) large effect** [+/−]***	Heterogeneity (I² (95% CI))*
				+ = 15 (31.91%)/- = 0 (0.00%)	
Positive symptoms	Subgroup differences between follow-up cohorts			Not Applicable	
High	1 (43)	152–152	d = **0.34** [S] (0.21–0.48)	+ = 13 (0.00%)/- = 0 (0.00%)	**I² = 91%** (89–92%)
Low	4 (11)	403–387	d = 0.16 [N] (−0.02–0.34)	+ = 0 (0.00%)/- = 0 (0.00%)	**I² = 71%** (46–84%)
Health care setting	Subgroup differences between follow-up cohorts			χ² = 2.72; df = 1; p = 0.10	
Health care	8 (58)	1148–1133	d = **0.30** [S] (0.20–0.40)	+ = 14 (24.14%)/- = 0 (0.00%)	**I² = 88%** (86–90%)
Naturalistic	4 (9)	2582–1489	d = 0.05 [N] (−0.28–0.37)	+ = 0 (0.00%)/- = 0 (0.00%)	**I² = 96%** (94–97%)
	Subgroup differences between follow-up cohorts			χ² = 2.10; df = 1; p = 0.15	

Independence					
(Sub)analysis	All studies and outcomes				
	K (studies (outcomes))	N (baseline-FU)	Effect size (95% CI)* and magnitude of effect**	K (%) large effect** [+/−]***	Heterogeneity (I² (95% CI))*
Confounder	**Rating**				
Positive symptoms	High	6 (21)	802–801	d = **0.30** [S] (0.13–0.47)	+ = 3 (14.29%)/- = 0 (0.00%)	**I² = 92%** (88–94%)
	Low	4 (5)	647–647	d = −0.05 [N] (−0.37–0.26)	+ = 0 (0.00%)/- = 0 (0.00%)	**I² = 77%** (46–90%)
	Subgroup differences between follow-up cohorts			χ² = 3.82; df = 1; p < 0.05	
Schizophrenia diagnosis	Yes	6 (7)	812–517	d = −0.03 [N] (−0.22–0.16)	+ = 0 (0.00%)/- = 0 (0.00%)	**I² = 71%** (46–84%)
	No	9 (18)	4530–3985	d = **0.56** [M] (0.30–0.81)	+ = 6 (33.33%)/- = 0 (0.00%)	**I² = 91%** (88–93%)
	Subgroup differences between follow-up cohorts			χ² = 13.03; df = 1; p < 0.01	
Baseline Independence	High	9 (26)	932–931	d = **0.37** [S] (0.20–0.54)	+ = 6 (23.08%)/- = 0 (0.00%)	**I² = 90%** (87–92%)
	Low	9 (14)	3802–2738	d = 0.02 [N] (−0.13–0.16)	+ = 0 (0.00%)/- = 0 (0.00%)	**I² = 81%** (72–87%)
	Subgroup differences between follow-up cohorts			χ² = 9.72; df = 1; p < 0.01	

(Sub)analysis	Duration of illness at baseline < 2 years study outcomes				
	K (studies (outcomes))	N (baseline-FU)	Effect size (95% CI)* and magnitude of effect**	K (%) large effect** [+/−]***	Heterogeneity (I² (95% CI))*
Confounder	**Rating**				
Positive symptoms	High	2 (2)	104–104	d = 0.26 [S] (−0.06–0.59)	+ = 0 (0.00%)/- = 0 (0.00%)	I² = 0% (NA)
	Low	1 (1)	153–153	d = −0.08 [N] (−0.30–0.14)	+ = 0 (0.00%)/- = 0 (0.00%)	Not Applicable
	Subgroup differences between follow-up cohorts			χ² = 2.91; df = 1; p = 0.09	
Schizophrenia diagnosis	Yes	2 (2)	234–208	d = 0.07 [N] (−0.28–0.41)	+ = 0 (0.00%)/- = 0 (0.00%)	I² = 62% (NA)
	No	1 (1)	49–41	d = −0.08 [N] (−0.30–0.14)	+ = 0 (0.00%)/- = 0 (0.00%)	Not Applicable
	Subgroup differences between follow-up cohorts			χ² = 0.16; df = 1; p = 0.69	
Baseline Independence	High	2 (2)	104–104	d = 0.26 [S] (−0.06–0.59)	+ = 0 (0.00%)/- = 0 (0.00%)	I² = 0% (NA)
	Low	1 (1)	153–153	d = −0.08 [N] (−0.30–0.14)	+ = 0 (0.00%)/- = 0 (0.00%)	Not Applicable
	Subgroup differences between follow-up cohorts			χ² = 2.91; df = 1; p = 0.09	

(Sub)analysis	Duration of illness at baseline 2–5 years study outcomes				
	K (studies (outcomes))	N (baseline-FU)	Effect size (95% CI)* and magnitude of effect**	K (%) large effect** [+/−]***	Heterogeneity (I² (95% CI))*
Confounder	**Rating**				
Positive symptoms	High	X	X	X	X	X
	Low	X	X	X	X	X
	Subgroup differences between follow-up cohorts			Not Applicable	
Schizophrenia diagnosis	Yes	1 (2)	122–105	d = 0.14 [N] (−0.04–0.31)	+ = 0 (0.00%)/- = 0 (0.00%)	I² = 0% (NA)
	No	X	X	X	X	X
	Subgroup differences between follow-up cohorts			Not Applicable	
Baseline Independence	High	1 (2)	122–122	d = 0.14 [N] (−0.04–0.31)	+ = 0 (0.00%)/- = 0 (0.00%)	I² = 0% (NA)
	Low	X	X	X	X	X
	Subgroup differences between follow-up cohorts			Not Applicable	

Table 3 (*continued*)

	Independence				
(Sub)analysis	All studies and outcomes				
	K (studies (outcomes))	N (baseline-FU)	Effect size (95% CI)* and magnitude of effect**	K (%) large effect** [+/−]***	Heterogeneity (I² (95% CI))*

(Sub)analysis		Duration of illness at baseline 5–10 years study outcomes				
		K (studies (outcomes))	N (baseline-FU)	Effect size (95% CI)* and magnitude of effect**	K (%) large effect** [+/−]***	Heterogeneity (I² (95% CI))*
Confounder	**Rating**					
Positive symptoms	High	1 (3)	170–169	$d =$ **1.18** [L] (1.04–1.32)	+ = 3 (100.00%)/- = 0 (0.00%)	I² = 6% (0–90%)
	Low	1 (1)	47–47	$d = 0.39$ [S] (−0.02–0.80)	+ = 0 (0.00%)/- = 0 (0.00%)	Not Applicable
		Subgroup differences between follow-up cohorts			$\chi^2 = 12.74; df = 1; p < 0.01$	
Schizophrenia diagnosis	Yes	X	X	X	X	X
	No	3 (5)	292–215	$d =$ **0.92** [L] (0.60–1.24)	+ = 3 (60.00%)/- = 0 (0.00%)	**I² = 82%** (60–92%)
		Subgroup differences between follow-up cohorts			Not Applicable	
Baseline Independence	High	3 (5)	277–276	$d =$ **0.92** [L] (0.60–1.24)	+ = 3 (60.00%)/- = 0 (0.00%)	**I² = 82%** (60–92%)
	Low	X	X	X	X	X
		Subgroup differences between follow-up cohorts			Not Applicable	

(Sub)analysis		Duration of illness at baseline > 10 years study outcomes				
		K (studies (outcomes))	N (baseline-FU)	Effect size (95% CI)* and magnitude of effect**	K (%) large effect** [+/−]***	Heterogeneity (I² (95% CI))*
Confounder	**Rating**					
Positive symptoms	High	1 (13)	152–152	$d =$ **0.12** [N] (0.03–0.20)	+ = 0 (0.00%)/- = 0 (0.00%)	I² = 42% (0–70%)
	Low	1 (2)	78–78	$d =$ **0.11** [N] (−0.58–0.80)	+ = 0 (0.00%)/- = 0 (0.00%)	I² = 40% (NA)
		Subgroup differences between follow-up cohorts			$\chi^2 = 0.00; df = 1; p = 0.99$	
Schizophrenia diagnosis	Yes	3 (13)	3202–3026	$d = 0.08$ [N] (−0.01–0.16)	+ = 0 (0.00%)/- = 0 (0.00%)	**I² = 63%** (48–73%)
	No	4 (8)	163–137	$d = \underline{0.43}$ [S] (0.09–0.78)	+ = 0 (0.00%)/- = 0 (0.00%)	**I² = 78%** (65–87%)
		Subgroup differences between follow-up cohorts			$\chi^2 = 3.88; df = 1; p = 0.05$	
Baseline Independence	High	2 (16)	177–177	$d =$ **0.23** [S] (0.09–0.36)	+ = 3 (18.75%)/- = 0 (0.00%)	**I² = 75%** (59–85%)
	Low	5 (9)	3080–2016	$d = -0.06$ [N] (−0.12–0.00)	+ = 0 (0.00%)/- = 0 (0.00%)	I² = 0% (0–57%)
		Subgroup differences between follow-up cohorts			$\chi^2 = 13.79; df = 1; p < 0.01$	

	Activities				
(Sub)analysis	All studies and outcomes				
	K (studies (outcomes))	N (baseline-FU)	Effect size (95% CI)* and magnitude of effect**	K (%) large effect** [+/−]***	Heterogeneity (I² (95% CI))*

Confounder	**Rating**					
Publication year	Recent	4 (7)	1548–1426	$d =$ **1.01** [L] (0.49–1.53)	+ = 3 (42.86%)/- = 0 (0.00%)	**I² = 99%** (98–99%)
	Dated	9 (25)	2941–1847	$d = -$**0.07** [N] (−0.12 to −0.01)	+ = 0 (0.00%)/- = 0 (0.00%)	I² = 15% (9–20%)
		Subgroup differences between follow-up cohorts		$\chi^2 = 16.24; df = 1; p < 0.01$		

(Sub)analysis		Duration of illness at baseline < 2 years study outcomes				
		K (studies (outcomes))	N (baseline-FU)	Effect size (95% CI)* and magnitude of effect**	K (%) large effect** [+/−]***	Heterogeneity (I² (95% CI))*
Confounder	**Rating**					
Publication year	Recent	1 (2)	764–673	$d = 0.25$ [S] (0.17–0.32)	+ = 0 (0.00%)/- = 0 (0.00%)	I² = 0% (NA)
	Dated	X	X	X	X	X
		Subgroup differences between follow-up cohorts	Not applicable			

(Sub)analysis		Duration of illness at baseline 2–5 years study outcomes				
		K (studies (outcomes))	N (baseline-FU)	Effect size (95% CI)* and magnitude of effect**	K (%) large effect** [+/−]***	Heterogeneity (I² (95% CI))*
Confounder	**Rating**					
Publication year	Recent	X	X	X	X	X
	Dated	1 (1)	60–60	$d = -0.40$ [S] (−0.83–0.02)	+ = 0 (0.00%)/- = 0 (0.00%)	Not Applicable
		Subgroup differences between follow-up cohorts		Not Applicable		

(Sub)analysis		Duration of illness at baseline 5–10 years study outcomes				
		K (studies (outcomes))	N (baseline-FU)	Effect size (95% CI)* and magnitude of effect**	K (%) large effect** [+/−]***	Heterogeneity (I² (95% CI))*
Confounder	**Rating**					
Publication year	Recent	1 (3)	170–169	$d = \underline{2.08}$ [L] (1.63–2.53)	+ = 3 (100.00%)/- = 0 (0.00%)	**I² = 87%** (64–96%)

Table 3 (*continued*)

Activities					
(Sub)analysis		All studies and outcomes			
		K (studies (outcomes))	N (baseline-FU)	Effect size (95% CI)* and magnitude of effect**	K (%) large effect** [+/−]***	Heterogeneity (I² (95% CI))*
	Dated	2 (2)	60–60	$d = -0.28$ [S] (−0.64–0.08)	+ = 0 (0.00%)/− = 0 (0.00%)	I² = 0% (NA)
	Subgroup differences between follow-up cohorts				$\chi^2 = 64.24$; $df = 1$; $p < 0.01$	

(Sub)analysis		Duration of illness at baseline > 10 years study outcomes				
		K (studies (outcomes))	N (baseline-FU)	Effect size (95% CI)* and magnitude of effect**	K (%) large effect** [+/−]***	Heterogeneity (I² (95% CI))*
Confounder	**Rating**					
Publication year	Recent	X	X	X	X	X
	Dated	6 (22)	2821–1727	$d = \underline{-0.05}$ [N] (−0.10 to −0.00)	+ = 0 (0.00%)/− = 0 (0.00%)	I² = 11% (6–16%)
	Subgroup differences between follow-up cohorts				Not Applicable	

Vocational functioning					
(Sub)analysis		All studies and outcomes			
		K (studies (outcomes))	N (baseline-FU)	Effect size (95% CI)* and magnitude of effect**	K (%) large effect** [+/−]***	Heterogeneity (I² (95% CI))*
Confounder	**Rating**					
Rehabilitation	Yes	12 (41)	2170–2077	$d = \mathbf{0.58}$ [M] (0.43–0.73)	+ = 12 (29.27%)/− = 0 (0.00%)	**I² = 86%** (83–89%)
	No	12 (21)	3930–2531	$d = -0.08$ [N] (−0.21–0.06)	+ = 0 (0.00%)/− = 1 (4.76%)	**I² = 87%** (82–90%)
	Subgroup differences between follow-up cohorts				$\chi^2 = 41.30$; $df = 1$; $p < 0.01$	
Psychotherapy	Yes	11 (21)	3875–2487	$d = 0.02$ [N] (−0.12–0.16)	+ = 0 (0.00%)/− = 0 (0.00%)	**I² = 88%** (84–91%)
	No	13 (41)	2225–2121	$d = \mathbf{0.52}$ [M] (0.36–0.68)	+ = 12 (29.27%)/− = 1 (2.44%)	**I² = 87%** (85–90%)
	Subgroup differences between follow-up cohorts				$\chi^2 = 21.31$; $df = 1$; $p < 0.01$	
Combined treatment	Yes	12 (40)	2243–2150	$d = \mathbf{0.58}$ [M] (0.43–0.73)	+ = 12 (30.00%)/− = 0 (0.00%)	**I² = 87%** (83–89%)
	No	12 (22)	3857–2458	$d = -0.05$ [N] (−0.18–0.08)	+ = 0 (0.00%)/− = 1 (4.55%)	**I² = 86%** (81–89%)
	Subgroup differences between follow-up cohorts				$\chi^2 = 38.50$; $df = 1$; $p < 0.01$	
Depression	High	3 (12)	2763–1610	$d = \underline{0.14}$ [N] (0.06–0.22)	+ = 3 (25.00%)/− = 0 (0.00%)	I² = 39% (21–53%)
	Low	5 (12)	1324–1221	$d = 0.04$ [N] (−0.31–0.40)	+ = 1 (8.33%)/− = 0 (0.00%)	**I² = 94%** (91–96%)
	Subgroup differences between follow-up cohorts				$\chi^2 = 0.27$; $df = 1$; $p = 0.60$	
Positive symptoms	High	5 (21)	414–407	$d = \mathbf{0.71}$ [M] (0.53–0.89)	+ = 7 (33.33%)/− = 0 (0.00%)	**I² = 73%** (63–80%)
	Low	7 (21)	1389–1267	$d = \underline{0.22}$ [S] (0.05–0.38)	+ = 5 (23.81%)/− = 0 (0.00%)	**I² = 85%** (81–89%)
	Subgroup differences between follow-up cohorts				$\chi^2 = 15.77$; $df = 1$; $p < 0.01$	
Negative symptoms	High	6 (14)	3251–2079	$d = 0.02$ [N] (−0.06–0.09)	+ = 0 (0.00%)/− = 0 (0.00%)	I² = 41% (23–54%)
	Low	10 (35)	1359–1244	$d = \mathbf{0.62}$ [M] (0.45–0.78)	+ = 11 (31.43%)/− = 0 (0.00%)	**I² = 86%** (82–89%)
	Subgroup differences between follow-up cohorts				$\chi^2 = 41.55$; $df = 1$; $p < 0.01$	
Setting	Naturalistic	12 (21)	3609–2365	$d = \underline{-0.12}$ [N] (−0.23 to −0.01)	+ = 0 (0.00%)/− = 1 (4.76%)	**I² = 78%** (71–84%)
	Health care	15 (44)	2787–2531	$d = \mathbf{0.56}$ [M] (0.42–0.70)	+ = 12 (27.27%)/− = 0 (0.00%)	**I² = 87%** (84–89%)
	Subgroup differences between follow-up cohorts				$\chi^2 = 54.29$; $df = 1$; $p < 0.01$	
Publication year	Recent (≤10 years[1])	15 (30)	2615–2244	$d = \mathbf{0.43}$ [S] (0.28–0.58)	+ = 6 (20.00%)/− = 0 (0.00%)	**I² = 86%** (82–89%)
	Dated (>10 years[1])	12 (35)	3781–2652	$d = \mathbf{0.21}$ [S] (0.07–0.36)	+ = 6 (17.14%)/− = 1 (2.86%)	**I² = 89%** (86–91%)
	Subgroup differences between follow-up cohorts				$\chi^2 = 4.04$; $df = 1$; $p < 0.05$	
Baseline functioning	High	14 (47)	3133–2773	$d = \mathbf{0.49}$ [S] (0.35–0.62)	+ = 12 (25.53%)/− = 0 (0.00%)	**I² = 87%** (85–89%)
	Low	13 (18)	3263–2060	$d = -0.09$ [N] (−0.24–0.06)	+ = 0 (0.00%)/− = 1 (5.56%)	**I² = 85%** (79–89%)
	Subgroup differences between follow-up cohorts				$\chi^2 = 31.64$; $df = 1$; $p < 0.01$	

(Sub)analysis		Duration of illness at baseline < 2 years study outcomes				
		K (studies (outcomes))	N (baseline-FU)	Effect size (95% CI)* and magnitude of effect**	K (%) large effect** [+/−]***	Heterogeneity (I² (95% CI))*
Confounder	**Rating**					
Rehabilitation	Yes	2 (4)	120–120	$d = \mathbf{0.81}$ [L] (0.48–1.13)	+ = 1 (25.00%)/− = 0 (0.00%)	**I² = 64%** (4–86%)
	No	6 (7)	860–706	$d = \underline{-0.43}$ [S] (−0.69 - -0.17)	+ = 0 (0.00%)/− = 1 (14.29%)	**I² = 82%** (65–90%)

Table 3 (*continued*)

(Sub)analysis		K (studies (outcomes))	N (baseline-FU)	Effect size (95% CI)* and magnitude of effect**	K (%) large effect** [+/−]***	Heterogeneity (I² (95% CI))*
Vocational functioning						
All studies and outcomes						
Subgroup differences between follow-up cohorts				χ² = 33.34; df = 1; p < 0.01		
Psychotherapy	Yes	5 (6)			807–664	d = −0.37 [S] (−0.63 to −0.11)
				+ = 0 (0.00%)/- = 0 (0.00%)	I² = 82% (64–91%)	
	No	3 (5)			173–162	d = 0.48 [S] (−0.09–1.05)
				+ = 1 (20.00%)/- = 1 (20.00%)	I² = 88% (74–95%)	
Subgroup differences between follow-up cohorts				χ² = 7.14; df = 1; p < 0.01		
Combined treatment	Yes	2 (4)	120–120	d = 0.81 [L] (0.48–1.13)	+ = 1 (25.00%)/- = 0 (0.00%)	I² = 64% (4–86%)
	No	6 (7)	860–706	d = −0.43 [S] (−0.69 to −0.17)	+ = 0 (0.00%)/- = 1 (14.29%)	I² = 82% (65–90%)
Subgroup differences between follow-up cohorts				χ² = 33.34; df = 1; p < 0.01		
Depression	High	2 (2)	208–208	d = 0.36 [S] (0.09–0.63)	+ = 0 (0.00%)/- = 0 (0.00%)	I² = 38% (NA)
	Low	5 (8)	823–687	d = 0.11 [N] (−0.31–0.52)	+ = 0 (0.00%)/- = 0 (0.00%)	I² = 94% (91–96%)
Subgroup differences between follow-up cohorts				χ² = 1.01; df = 1; p = 0.31		
Positive symptoms	High	4 (6)	262–255	d = 0.46 [S] (−0.01–0.93)	+ = 1 (16.67%)/- = 0 (0.00%)	I² = 88% (76–94%)
	Low	2 (2)	303–300	d = −0.21 [S] (−1.13–0.72)	+ = 0 (0.00%)/- = 0 (0.00%)	I² = 96% (NA)
Subgroup differences between follow-up cohorts				χ² = 1.59; df = 1; p = 0.21		
Negative symptoms	High	2 (2)	430–337	d = −0.29 [S] (−0.88–0.29)	+ = 0 (0.00%)/- = 0 (0.00%)	I² = 77% (NA)
	Low	5 (7)	516–493	d = 0.40 [S] (−0.06–0.87)	+ = 1 (14.29%)/- = 0 (0.00%)	I² = 93% (71–96%)
Subgroup differences between follow-up cohorts				χ² = 3.29; df = 1; p = 0.07		
Setting	Naturalistic	8 (9)	1089–935	d = −0.30 [S] (−0.56 to −0.04)	+ = 0 (0.00%)/- = 1 (11.11%)	I² = 86% (77–92%)
	Health care	2 (4)	120–120	d = 0.81 [L] (0.48–1.13)	+ = 1 (25.00%)/- = 0 (0.00%)	I² = 64% (4–86%)
Subgroup differences between follow-up cohorts				χ² = 27.03; df = 1; p < 0.01		
Publication year	Recent (≤10 years[1])	6 (8)	880–771	d = 0.33 [S] (−0.06–0.72)	+ = 1 (12.50%)/- = 0 (0.00%)	I² = 92% (87–95%)
	Dated (> 10 years[1])	4 (5)	329–284	d = −0.46 [S] (−0.77 to −0.15)	+ = 0 (0.00%)/- = 1 (20.00%)	I² = 76% (44–89%)
Subgroup differences between follow-up cohorts				χ² = 9.71; df = 1; p < 0.01		
Baseline functioning	High	2 (4)	446–360	d = 0.64 [M] (0.01–1.28)	+ = 1 (25.00%)/- = 0 (0.00%)	I² = 93% (84–97%)
	Low	8 (9)	763–695	d = −0.25 [S] (−0.56–0.06)	+ = 0 (0.00%)/- = 1 (11.11%)	I² = 89% (81–93%)
Subgroup differences between follow-up cohorts				χ² = 6.24; df = 1; p < 0.05		

(Sub)analysis		K (studies (outcomes))	N (baseline-FU)	Effect size (95% CI)* and magnitude of effect**	K (%) large effect** [+/−]***	Heterogeneity (I² (95% CI))*
Duration of illness at baseline 2–5 years study outcomes						
Confounder	**Rating**					
Rehabilitation	Yes	2 (9)	535–446	d = 0.16 [N] (0.07–0.25)	+ = 3 (33.33%)/- = 0 (0.00%)	I² = 0% (0–85%)
	No	1 (1)	163–163	d = 0.78 [M] (0.52–1.03)	+ = 0 (0.00%)/- = 0 (0.00%)	Not applicable
Subgroup differences between follow-up cohorts				χ² = 19.58; df = 1; p < 0.01		
Psychotherapy	Yes	1 (1)	163–163	d = 0.78 [M] (0.52–1.03)	+ = 0 (0.00%)/- = 0 (0.00%)	Not applicable
	No	2 (9)	535–446	d = 0.16 [N] (0.07–0.25)	+ = 3 (33.33%)/- = 0 (0.00%)	I² = 0% (0–85%)
Subgroup differences between follow-up cohorts				χ² = 19.58; df = 1; p < 0.01		
Combined treatment	Yes	2 (9)	535–446	d = 0.28 [S] (0.10–0.46)	+ = 3 (33.33%)/- = 0 (0.00%)	I² = 66% (46–79%)
	No	X	X	X	X	X
Subgroup differences between follow-up cohorts				Not applicable		
Depression	High	2 (9)	535–446	d = 0.16 [N] (0.07–0.25)	+ = 3 (33.33%)/- = 0 (0.00%)	I² = 0% (0–85%)
	Low	X	X	X	X	X
Subgroup differences between follow-up cohorts				Not applicable		
Positive symptoms	High	X	X	X	X	X
	Low	1 (8)	404–315	d = 0.17 [N] (0.07–0.26)	+ = 3 (37.50%)/- = 0 (0.00%)	I² = 0% (0–66%)

Table 3 (*continued*)

<table>
<tr><td colspan="6" align="center">Vocational functioning</td></tr>
<tr><td>(Sub)analysis</td><td colspan="5">All studies and outcomes</td></tr>
<tr><td></td><td>K (studies (outcomes))</td><td>N (baseline-FU)</td><td>Effect size (95% CI)* and magnitude of effect**</td><td>K (%) large effect** [+/−]***</td><td>Heterogeneity (I² (95% CI))*</td></tr>
<tr><td>Subgroup differences between follow-up cohorts</td><td></td><td></td><td></td><td colspan="2" align="center">Not applicable</td></tr>
<tr><td>Negative symptoms   High</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td></tr>
<tr><td></td><td>X</td><td></td><td>X</td><td></td><td></td></tr>
<tr><td>Low</td><td>2 (9)</td><td>535–446</td><td>d = 0.16 [N] (0.07–0.25)</td><td>+ = 3 (33.33%)/- = 0 (0.00%)</td><td>I² = 0% (0–85%)</td></tr>
<tr><td colspan="3">Subgroup differences between follow-up cohorts</td><td></td><td colspan="2" align="center">Not applicable</td></tr>
<tr><td>Setting   Naturalistic</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td></tr>
<tr><td>Health care</td><td>3 (10)</td><td>698–609</td><td>d = 0.28 [S] (0.10–0.46)</td><td>+ = 3 (30.00%)/- = 0 (0.00%)</td><td>I² = 66% (46–79%)</td></tr>
<tr><td colspan="3">Subgroup differences between follow-up cohorts</td><td></td><td colspan="2" align="center">Not applicable</td></tr>
<tr><td>Publication year   Recent (≤10 years[1])</td><td>3 (10)</td><td>698–609</td><td>d = <u>0.28</u> [S] (0.10–0.46)</td><td>+ = 3 (30.00%)/- = 0 (0.00%)</td><td>I² = 66% (46–79%)</td></tr>
<tr><td>Dated (>10 years[1])</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td></tr>
<tr><td colspan="3">Subgroup differences between follow-up cohorts</td><td></td><td colspan="2" align="center">Not applicable</td></tr>
<tr><td>Baseline functioning   High</td><td>3 (10)</td><td>698–609</td><td>d = 0.28 [S] (0.10–0.46)</td><td>+ = 3 (30.00%)/- = 0 (0.00%)</td><td>I² = 66% (46–79%)</td></tr>
<tr><td>Low</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td></tr>
<tr><td colspan="3">Subgroup differences between follow-up cohorts</td><td></td><td colspan="2" align="center">Not applicable</td></tr>
</table>

<table>
<tr><td>(Sub)analysis</td><td colspan="5">Duration of illness at baseline 5–10 years study outcomes</td></tr>
<tr><td></td><td>K (studies (outcomes))</td><td>N (baseline-FU)</td><td>Effect size (95% CI)* and magnitude of effect**</td><td>K (%) large effect** [+/−]***</td><td>Heterogeneity (I² (95% CI))*</td></tr>
<tr><td>Confounder   Rating</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Rehabilitation   Yes</td><td>1 (2)</td><td>131–128</td><td>d = <u>1.02</u> [L] (0.84–1.20)</td><td>+ = 2 (100.00%)/- = 0 (0.00%)</td><td>I² = 0% (NA)</td></tr>
<tr><td>No</td><td>2 (2)</td><td>454–291</td><td>d = 0.09 [N] (−0.71–0.89)</td><td>+ = 0 (0.00%)/- = 0 (0.00%)</td><td>I² = 95% (NA)</td></tr>
<tr><td colspan="3">Subgroup differences between follow-up cohorts</td><td></td><td colspan="2" align="center">χ² = 4.89; df = 1; p < 0.05</td></tr>
<tr><td>Psychotherapy   Yes</td><td>1 (1)</td><td>362–199</td><td>d = <u>0.50</u> [M] (0.28–0.71)</td><td>+ = 0 (0.00%)/- = 0 (0.00%)</td><td>Not applicable</td></tr>
<tr><td>No</td><td>2 (3)</td><td>223–220</td><td>d = 0.58 [M] (−0.27–1.42)</td><td>+ = 2 (66.67%)/- = 0 (0.00%)</td><td>I² = 97% (93–98%)</td></tr>
<tr><td colspan="3">Subgroup differences between follow-up cohorts</td><td></td><td colspan="2" align="center">χ² = 0.03; df = 1; p = 0.86</td></tr>
<tr><td>Combined treatment   Yes</td><td>1 (2)</td><td>131–128</td><td>d = 1.02 [L] (0.84–1.20)</td><td>+ = 2 (66.67%)/- = 0 (0.00%)</td><td>I² = 0% (NA)</td></tr>
<tr><td>No</td><td>2 (2)</td><td>454–291</td><td>d = −0.32 [S] (−0.61 - -0.03)</td><td>+ = 0 (0.00%)/- = 0 (0.00%)</td><td>Not applicable</td></tr>
<tr><td colspan="3">Subgroup differences between follow-up cohorts</td><td></td><td colspan="2" align="center">χ² = 4.89; df = 1; p < 0.05</td></tr>
<tr><td>Depression   High</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td></tr>
<tr><td>Low</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td></tr>
<tr><td colspan="3">Subgroup differences between follow-up cohorts</td><td></td><td colspan="2" align="center">Not applicable</td></tr>
<tr><td>Positive symptoms   High</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td></tr>
<tr><td>Low</td><td>1 (2)</td><td>131–128</td><td>d = 1.02 [L] (0.84–1.20)</td><td>+ = 2 (100.00%)/- = 0 (0.00%)</td><td>I² = 0% (NA)</td></tr>
<tr><td colspan="3">Subgroup differences between follow-up cohorts</td><td></td><td colspan="2" align="center">Not applicable</td></tr>
<tr><td>Negative symptoms   High</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td></tr>
<tr><td>Low</td><td>1 (2)</td><td>131–128</td><td>d = <u>1.02</u> [L] (0.84–1.20)</td><td>+ = 2 (100.00%)/- = 0 (0.00%)</td><td>I² = 0% (NA)</td></tr>
<tr><td colspan="3">Subgroup differences between follow-up cohorts</td><td></td><td colspan="2" align="center">Not applicable</td></tr>
<tr><td>Setting   Naturalistic</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td></tr>
<tr><td>Health care</td><td>3 (4)</td><td>585–419</td><td>d = 0.56 [M] (−0.01–1.12)</td><td>+ = 2 (50.00%)/- = 0 (0.00%)</td><td>I² = 97% (93–98%)</td></tr>
<tr><td colspan="3">Subgroup differences between follow-up cohorts</td><td></td><td colspan="2" align="center">Not applicable</td></tr>
<tr><td>Publication year   Recent (≤10 years[1])</td><td>2 (3)</td><td>493–327</td><td>d = 0.84 [L] (0.47–1.20)</td><td>+ = 2 (66.67%)/- = 0 (0.00%)</td><td>I² = 85% (47–96%)</td></tr>
<tr><td>Dated (>10 years[1])</td><td>1 (1)</td><td>92–92</td><td>d = <u>−0.32</u> [S] (−0.61 to −0.03)</td><td>+ = 0 (0.00%)/- = 0 (0.00%)</td><td>Not applicable</td></tr>
<tr><td colspan="3">Subgroup differences between follow-up cohorts</td><td></td><td colspan="2" align="center">χ² = 23.74; df = 1; p < 0.01</td></tr>
<tr><td>Baseline functioning   High</td><td>2 (3)</td><td>493–327</td><td>d = 0.84 [L] (0.47–1.20)</td><td>+ = 2 (66.67%)/- = 0 (0.00%)</td><td>I² = 85% (47–96%)</td></tr>
<tr><td>Low</td><td>1 (1)</td><td>92–92</td><td>d = <u>−0.32</u> [S] (−0.61 to −0.03)</td><td>+ = 0 (0.00%)/- = 0 (0.00%)</td><td>Not applicable</td></tr>
<tr><td colspan="3">Subgroup differences between follow-up cohorts</td><td></td><td colspan="2" align="center">χ² = 23.74; df = 1; p < 0.01</td></tr>
</table>

<table>
<tr><td>(Sub)analysis</td><td colspan="5">Duration of illness at baseline > 10 years study outcomes</td></tr>
<tr><td></td><td>K (studies (outcomes))</td><td>N (baseline-FU)</td><td>Effect size (95% CI)* and magnitude of effect**</td><td>K (%) large effect** [+/−]***</td><td>Heterogeneity (I² (95% CI))*</td></tr>
<tr><td>Confounder   Rating</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Rehabilitation   Yes</td><td>5 (23)</td><td>990–990</td><td>d = 0.60 [M] (0.37–0.84)</td><td></td><td>I² = 88% (8–87%)</td></tr>
</table>

Table 3 (*continued*)

(Sub)analysis		K (studies (outcomes))	N (baseline-FU)	Effect size (95% CI)* and magnitude of effect**	K (%) large effect** [+/−]***	Heterogeneity (I² (95% CI))*
					Vocational functioning	
					All studies and outcomes	
	No	2 (3)	2296–1214	d = 0.03 [N] (−0.03–0.09)	+ = 6 (26.09%)/- = 0 (0.00%); + = 0 (0.00%)/- = 0 (0.00%)	I² = 0% (0–93%)
	Subgroup differences between follow-up cohorts				χ² = 21.85; df = 1; p < 0.01	
Psychotherapy	Yes	3 (5)	2386–1304	d = <u>0.22</u> [S] (0.01–0.42)	+ = 0 (0.00%)/- = 0 (0.00%)	**I² = 86%** (68–94%)
	No	4 (21)	900–900	d = **0.59** [M] (0.34–0.85)	+ = 6 (28.57%)/- = 0 (0.00%)	**I² = 89%** (85–91%)
	Subgroup differences between follow-up cohorts				χ² = 5.11; df = 1; p < 0.05	
Combined treatment	Yes	4 (21)	900–900	d = **0.59** [M] (0.34–0.85)	+ = 6 (28.57%)/- = 0 (0.00%)	**I² = 89%** (85–91%)
	No	3 (5)	2386–1304	d = <u>0.22</u> [S] (0.01–0.42)	+ = 0 (0.00%)/- = 0 (0.00%)	**I² = 86%** (68–94%)
	Subgroup differences between follow-up cohorts				χ² = 5.11; df = 1; p < 0.05	
Depression	High	1 (2)	2228–1164	d = 0.04 [N] (−0.03–0.10)	+ = 0 (0.00%)/- = 0 (0.00%)	I² = 0% (NA)
	Low	1 (1)	635–635	d = **−0.43** [S] (−0.60 to −0.25)	+ = 0 (0.00%)/- = 0 (0.00%)	Not applicable
	Subgroup differences between follow-up cohorts				χ² = 24.03; df = 1; p < 0.01	
Positive symptoms	High	1 (15)	152–152	d = **0.82** [L] (0.68–0.96)	+ = 6 (40.00%)/- = 0 (0.00%)	I² = 32% (0–64%)
	Low	X	X	X	X	X
	Subgroup differences between follow-up cohorts				Not applicable	
Negative symptoms	High	1 (2)	2228–1164	d = 0.04 [N] (−0.03–0.10)	+ = 0 (0.00%)/- = 0 (0.00%)	I² = 0% (NA)
	Low	1 (15)	152–152	d = **0.82** [L] (0.68–0.96)	+ = 6 (40.00%)/- = 0 (0.00%)	I² = 32% (18–44%)
	Subgroup differences between follow-up cohorts				χ² = 98.31; df = 1; p < 0.01	
Setting	Naturalistic	2 (3)	2296–1214	d = 0.03 [N] (−0.03–0.09)	+ = 0 (0.00%)/- = 0 (0.00%)	I² = 0% (0–93%)
	Health care	5 (23)	990–990	d = **0.60** [M] (0.37–0.84)	+ = 6 (40.00%)/- = 0 (0.00%)	**I² = 88%** (84–91%)
	Subgroup differences between follow-up cohorts				χ² = 1.37; df = 1; p = 0.24	
Publication year	Recent (≤10 years[1])	2 (6)	150–150	d = **0.45** [S] (0.25–0.65)	+ = 0 (0.00%)/- = 0 (0.00%)	I² = 46% (7–68%)
	Dated (>10 years[1])	5 (20)	3136–2060	d = **0.54** [M] (0.33–0.74)	+ = 6 (30.00%)/- = 0 (0.00%)	**I² = 91%** (88–93%)
	Subgroup differences between follow-up cohorts				χ² = 0.36; df = 1; p = 0.55	
Baseline functioning	High	4 (19)	945–933	d = **0.68** [M] (0.40–0.96)	+ = 6 (31.58%)/- = 0 (0.00%)	**I² = 90%** (86–92%)
	Low	3 (7)	2341–1277	d = 0.11 [N] (−0.02–0.23)	+ = 0 (0.00%)/- = 0 (0.00%)	**I² = 59%** (28–77%)
	Subgroup differences between follow-up cohorts				χ² = 1.86; df = 1; p = 0.17	

Outcomes in **bold** are significant (p < 0.05) after Benjamini-Hochberg correction; Outcomes <u>underlined</u> are no longer significant after Benjamini-Hochberg correction for multiple testing.

* significant (*p* < 0.05)

** N = No effect (d > −0.20 - <0.20); S = Small effect (d ≤ −0.20 and >−0.50–≥0.20 and <0.50); M = Medium effect (d ≤ −0.50 and >−0.80–≥0.50 and <0.80); L = Large effect (d < −0.80–>0.80).

*** + = improvement of outcome at follow-up; - = deterioration of outcome at follow-up.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.schres.2021.11.010.

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