

Review article

Disorder, not just state of risk: meta-analysis of functioning and quality of life in people at high risk of psychosis

Paolo Fusar-Poli,* Matteo Rocchetti,* Alberto Sardella, Alessia Avila, Martina Brandizzi, Edgardo Caverzasi, Pierluigi Politi, Stephan Ruhrmann and Philip McGuire

Background

The nosology of the psychosis high-risk state is controversial. Traditionally conceived as an 'at risk' state for the development of psychotic disorders, it is also conceptualised as a clinical syndrome associated with functional impairment.

Aims

To investigate meta-analytically the functional status of patients at high clinical risk for psychosis and its association with longitudinal outcomes.

Method

Three meta-analyses compared level of functioning ($n=3012$) and quality of life (QoL) ($n=945$) between a high-risk group, a healthy control group and group with psychosis, and baseline functioning in people in the high-risk group who did or did not have a transition to psychosis at follow-up ($n=654$).

Results

People at high risk had a large impairment in functioning

($P<0.001$) and worse QoL ($P=0.001$) than the healthy control group, but only small to moderately better functioning ($P=0.012$) and similar QoL ($P=0.958$) compared with the psychosis group. Among the high-risk group, those who did not develop psychosis reported better functioning ($P=0.001$) than those who did.

Conclusions

Our results indicate that the high-risk state is characterised by consistent and large impairments of functioning and reduction in QoL similar to those in other coded psychiatric disorders.

Declaration of interest

None.

Copyright and usage

© The Royal College of Psychiatrists 2015.

The clinical state of high risk of psychosis defines a condition characterised by attenuated psychotic symptoms, brief limited intermittent psychotic episode, genetic vulnerability or the presence of basic symptoms.¹ As the name suggests, these diagnostic criteria were originally developed to identify people at high risk of developing a psychotic disorder over time. Under this conceptualisation the condition would allow detection and treatment of a group at very high risk of developing a severe and full disorder longitudinally. This paradigm would fit the aims of indicated prevention in this group,² who have up to 30% risk of developing psychosis, mostly schizophrenia spectrum disorders,³ within the following 2 years. Accordingly, preventive treatments primarily aim at reducing the risk associated with the condition and thus preventing the outcome.^{4,5} The 'high risk' paradigm does not explicitly require functional impairments as inclusion criteria,⁶ with the exception of the genetic risk and deterioration subgroup, which however is traditionally small. On the other hand, over the past few years a competing paradigm has emerged. The 'attenuated psychosis' syndrome (APS) has been published in DSM-5.^{7,8} The APS construct specifically requires patient distress or disability, which has not explicitly been part of the high-risk concept, although distress and disability are implicit in the symptom severity ratings that are required for the research diagnosis of high risk,⁸ defined as ultra-high risk (so not basic symptoms). In this sense the APS better resembles the clinical condition of angina pectoris, which is *per se* associated with signs and symptoms impairing the quality of life (QoL) and level of functioning of the individual. The APS diagnosis has been relegated to the research appendix of the DSM-5 because of lack of consensus among researchers on the validity of this category

as a syndrome and for the inconclusiveness of data supporting its diagnostic reliability.⁹

One way to partially circumvent this controversial issue is to clarify the functional status of people at high risk at the time of their presentation to prodromal services and independently from their longitudinal outcomes. In fact, according to the DSM criteria,⁷ an impairment of functioning along with significant distress are basic criteria for the conceptual validity of all psychiatric disorders,¹⁰ differentiating a physiological trait or asymptomatic risk factor from a disorder and determining the patient's need for treatment: 'mental disorders are usually associated with significant distress in social, occupational, or other important activities.'⁷ A number of studies investigating functioning or QoL in people at high risk have been published in recent years. Surprisingly, to date no quantitative synthesis has been published regarding the functioning and QoL of such people when they are seeking help from prodromal clinics. The results are particularly controversial when people at high risk are compared with patients with established psychosis.^{11–14}

Our first aim was to investigate validity of the high-risk state by addressing consistency and magnitude of baseline functioning and QoL in high-risk individuals compared with a healthy control group and people with a frank diagnosis of psychosis. We additionally investigated the impact of baseline difference in high-risk functioning on the longitudinal development of psychotic disorders.

Method

The main research hypothesis and the study protocol were decided *a priori*. We used a systematic search strategy to identify relevant articles. Two investigators (A.S. and A.A.) conducted a two-step

*Joint first authors.

literature search. As a first step the Web of Knowledge database (Thomson Reuters) was searched, incorporating both the Web of Science and Medline. The search was extended until December 2013, including abstracts in English language only. The electronic research adopted several combinations of the following keywords: “at risk mental state”, “psychosis risk”, “prodrome”, “prodromal psychosis”, “ultra high risk”, “functioning”, “quality of life” and name of the possible assessment instruments (see online supplement DS1 for details). The second step involved the implementation of an additional electronic search based on a manual search of the reference lists of the retrieved articles. Abstracts of articles identified through these two steps were then screened for the selection criteria, and articles surviving this screening were assessed for eligibility on the basis of a full-text reading. Discrepancies were resolved through consensus with a third author (M.R.). To achieve a high standard of reporting we adopted the Meta-analysis of Observational Studies in Epidemiology (MOOSE) checklist.¹⁵

Selection criteria

Inclusion criteria for the first two meta-analyses, focusing on the difference between the groups in functioning (meta-analysis 1) and QoL (meta-analysis 2), were as follows:

- original article, written in English;
- inclusion of a sample at high risk (i.e. presence of attenuated psychosis symptoms, genetic risk and deterioration, brief limited and intermittent psychotic episode, basic symptoms) according to international standard definition;¹
- inclusion of a comparison group of healthy participants or patients with psychosis;
- cross-sectional study, cohort study or descriptive study reporting sufficient meta-analytical data on functioning.

Meta-analysis 3 focused on the difference in functioning between high-risk participants who made (HR-T) or did not make (HR-NT) a transition to psychosis at follow-up in descriptive longitudinal studies. Inclusion criteria (a) and (b) were the same as above, with an additional criterion that the article reported baseline data on functioning together with the longitudinal transition outcome at follow-up. Exclusion criteria were common to all analyses: articles were excluded if they were abstracts, pilot data-sets or reviews, failed to report enough data for meta-analysis or had overlapping data-sets. Specifically, in case of multiple publications deriving from the same study population, we selected the article reporting the largest and most recent data-set.

Recorded variables

Data extraction and quality assessment were independently performed by two investigators (A.S. and A.A.). Inconsistency and disagreements on quality rating were double-checked and resolved with a third author (M.R.). The following variables were recorded from each article: author, year of publication, quality criterion (see below), comparison group type (healthy participants or patients with established psychosis), epidemiological data of high-risk and control samples (baseline sample sizes, mean age, proportion of females), the high-risk diagnostic instrument adopted, the instrument employed to assess functioning and the level of functioning. The last variable was the primary outcome measure for the first meta-analysis. The following data on functioning were extracted: mean value and standard deviation of the mean in both the high-risk and comparison groups, direction of the difference and level of significance of the difference.¹⁶ We additionally extracted data on QoL as defined by the mean of different psychometric instruments and used it as secondary outcome measure. If

the data were reported for subgroups we merged the values (online Table DS1). For meta-analysis 3 we extracted baseline functioning in the HR-T and HR-NT groups as the primary outcome. Demographic data, publication year and duration of follow-up (months) were extracted finally to assess their putative moderator effect.

Quality assessment

Although quality assessments can be reliably conducted in meta-analyses of experimental studies their use in observational research is controversial, with no clear consensus on rating methods or their appropriate use in the analysis.¹⁷ We adapted the Newcastle–Ottawa Scale for the evaluation of non-randomised studies (www.ohri.ca/programs/clinical_epidemiology/oxford.asp). The scale evaluates the quality of observational studies, allocating a maximum of nine stars for the highest quality. This tool has been adopted in recent meta-analyses.¹⁸

Statistical analysis

We performed three meta-analyses using Comprehensive Meta-Analysis Software version 2.¹⁹ When the same outcome was evaluated within the same study with more than one scale we retained just one measure according to a predefined order (see Method in online supplement DS1). As a measure of effect size in meta-analyses 1 and 2 Hedges’ *g* was adopted, i.e. the difference between the functioning (or QoL) means of the comparison and high-risk groups, divided by the standard deviation and weighted for sample size, to correct for bias from small sample sizes. In meta-analysis 3 Hedges’ *g* was employed to test differences in functioning between the HR-T and HR-NT groups. The influence of putative continuous moderators (year of publication, demographic variables, length of follow-up) was tested using meta-regression analyses, dividing the significance level ($P=0.05$, two-tailed) by number of moderators tested to adjust for multiple comparisons. The slope of meta-regression line – β coefficient: direct (+) or inverse (–) – indicates the strength of the relationship between moderator and outcome. Meta-regressions were performed when at least ten studies were available for the preselected outcome of interest. We additionally performed a supplementary analysis using the cross-sectional studies employing the Global Assessment of Functioning (GAF). Furthermore, since the most recent studies adopting the Comprehensive Assessment of At-Risk Mental States (CAARMS) for high-risk state included functioning as a diagnostic criterion,⁹ a subgroup analysis was performed to control for this possible confounder. Further methodological details are available in online supplement DS1.

Heterogeneity, publication bias and sensitivity

Heterogeneity among study point estimates was assessed using *Q* statistics,²⁰ with the proportion of the total variability in the effect size estimates being evaluated with the I^2 index.²¹ As meta-analysis of observational studies is supposed to be characterised by significant heterogeneity, random effect models were used. In general, random effect models are more conservative than fixed effect models, and appear to better address heterogeneity between studies and study populations, allowing for greater flexibility in parsing effect size variability. Moreover, they are less influenced by extreme variations in sample size.²² The possibility of a publication bias in our study was tested with the Duval & Tweedie trim and fill method.²³ This method imputes values estimated to be missing from the analysis (e.g. for publication bias) and re-estimates the effect size. If the conclusion of the meta-analysis remains unchanged following the trim and fill adjustment the results can be considered as robust. To further assess the robustness

of the results, we performed sensitivity analyses by sequentially removing each study and rerunning all three meta-analyses. We also conducted a second sensitivity analysis for meta-analysis 2 excluding studies with quality ratings in the lowest quartile, to determine whether potential methodological weaknesses influenced meta-analytic estimates.

Results

For meta-analyses 1 and 2 electronic and manual search uncovered 1168 potential abstracts. After the first screening through abstract reading 226 full-text articles were downloaded for selection, of which 30 met the inclusion criteria as they were comparing functioning or QoL between high-risk participants and comparisons, accounting for a total of 3608 participants (meta-analysis 1: $n=3012$, mean age 20.7 years, 38.8% female; meta-analysis 2: $n=945$, mean age 23.7 years, 41.4% female; online Fig. DS1 (a) and (b)). There were no studies employing basic symptom criteria in the final database. For meta-analysis 3, electronic and manual search uncovered 1181 potential abstracts. After the first screening through abstract reading 244 full-text articles were downloaded for selection; of these, 10 longitudinal studies reporting baseline functioning in the transition and non-transition groups were eventually included (mean length of follow-up 28.3 months, $n=654$; mean age at baseline 19.1 years, 43.5% female; online Fig. DS1 (c)). The details of the final database are reported in online Table DS2.

Functioning in high-risk individuals

Comparison with healthy control group

There was a large and significant impairment in functioning across the high-risk group compared with the healthy control group, with small 95% confidence intervals indicating the precision of the estimate (Hedges' $g=-3.01$, 95% CI -3.68 to -2.34 , $P<0.001$, $n=18$; Fig. 1(a)). The Duval & Tweedie trim and fill procedures found no missing study (random model applied), suggesting absence of publication bias. There was considerable heterogeneity across the included studies ($Q=497.4$, $I^2=96.6\%$, d.f. = 17, $P<0.001$) but the direction of the effect was consistent and significant for each study. No study accounted for more than 5.9% of the overall effect size. Meta-regression analysis adjusted for multiple comparison found that a proportion of females in the healthy control group was correlated with the magnitude of the effect size ($\beta=-2.61$, 95% CI -3.75 to -1.48 , $P<0.001$, $Q=20.5$, $n=15$). Conversely, there was no association between level of functioning and high-risk gender, high-risk or healthy control group age or publication year. The sensitivity analysis computing after removing each study and the studies in the lower quartile of quality rating confirmed our findings with no significant change.

Comparison with the psychosis group

People in the high-risk group were less impaired on functional status than patients with frank psychosis. The magnitude of this effect was small to moderate (Hedges' $g=0.34$, 95% CI 0.07 to 0.60, $P=0.012$, $n=14$; Fig. 1(b)), with large confidence intervals indicating imprecision. There was no publication bias. There was significant heterogeneity across studies ($Q=63.3$, $I^2=79.5\%$, d.f. = 13, $P<0.001$). Meta-regression analyses adjusted for multiple comparisons revealed better functioning in women in both high-risk ($\beta=-1.76$, 95% CI -3.03 to -0.49 , $P=0.007$, $Q=7.4$, $n=14$) and psychosis group ($\beta=-2.43$, 95% CI -3.61 to -1.25 , $P<0.001$, $Q=16.3$, $n=14$) comparisons (online Fig.

DS2). Conversely, there was no association in either group with age or with publication year. These results were confirmed by sensitivity analyses. Results of the supplementary analyses investigating the mean GAF scores of the three comparison groups, and the possible effect of the high-risk diagnostic tool (i.e. CAARMS *v.* Structured Interview for Prodromal Symptoms, SIPS), are reported online (Figs DS3 and DS4).

Quality of life

Meta-analysis 2 showed that the high-risk group had poorer QoL than the healthy control group (Hedges' $g=-1.75$, 95% CI -2.83 to -0.67 , $P=0.001$, $n=4$; Fig. 2(a)). Furthermore, we found no difference in QoL between the high-risk and psychosis groups (Hedges' $g=0.02$, 95% CI -0.64 to 0.67, $P=0.958$, $n=3$; Fig. 2(b)). The heterogeneity in the subgroup analysis was considerable (high-risk *v.* healthy control group: $Q=91.8$, $I^2=96.7\%$, d.f. = 3, $P<0.001$; high-risk *v.* psychosis group: $Q=16.1$, $I^2=87.6\%$, d.f. = 2, $P<0.001$); however, given the small number of studies, we did not perform meta-regression analyses. The sensitivity analysis computing after removing each study confirmed our findings, with no significant change.

Functioning and psychosis transition

There was meta-analytical difference in baseline level of functioning between the HR-T and HR-NT groups (mean follow-up 28.9 months, s.d. = 16.0). The magnitude of the effect was moderate, with those in the HR-T group showing poorer baseline functioning than the HR-NT group (Hedges' $g=0.43$, 95% CI 0.17 to 0.68, $P=0.001$, $n=10$; Fig. 3). The trim and fill procedure showed that the result was robust against publication bias. The heterogeneity between studies was moderate ($Q=20.0$, $I^2=54.9\%$, d.f. = 9, $P=0.018$). Meta-regressions adjusted for multiple comparisons revealed a significant correlation with publication year ($\beta=-0.10$, 95% CI -0.17 to -0.03 , $P=0.005$, $Q=7.8$, $n=10$), but no association with length of follow-up ($P=0.121$), gender of participants ($P=0.651$) or age ($P=0.254$). The sensitivity analysis computing after removing each study confirmed our findings with no significant change.

Discussion

People at high risk of psychosis (defined on the basis of ultra-high risk criteria) had a statistically significant impairment in global functioning that was very large compared with a healthy control group, but only small to moderate when compared with patients with psychosis. Within the high-risk group, lower baseline level of global functioning predicted the later onset of psychosis. Impairments of QoL in the high-risk group were similar to those observed in the psychosis group. The results were robust and not affected by publication bias.

The results of our meta-analysis are important for research and clinicians working in the field of psychosis prevention because there is no consensus with respect to the functional status of people at high risk of psychosis. For example, some authors argue that such people are not at all dysfunctional, as their signs and symptoms represent 'normal developmental processes' or expressions of psychosis vulnerability that are common in the general population.²⁴ These authors also suggested that help-seeking is only a behaviour not suggestive of functional impairments and questioned whether these individuals actually need treatment,²⁴ concluding that 'it is not appropriate to treat high-risk people before the psychosis onset.'²⁵ To our knowledge this is the first ever meta-analysis clearly addressing these

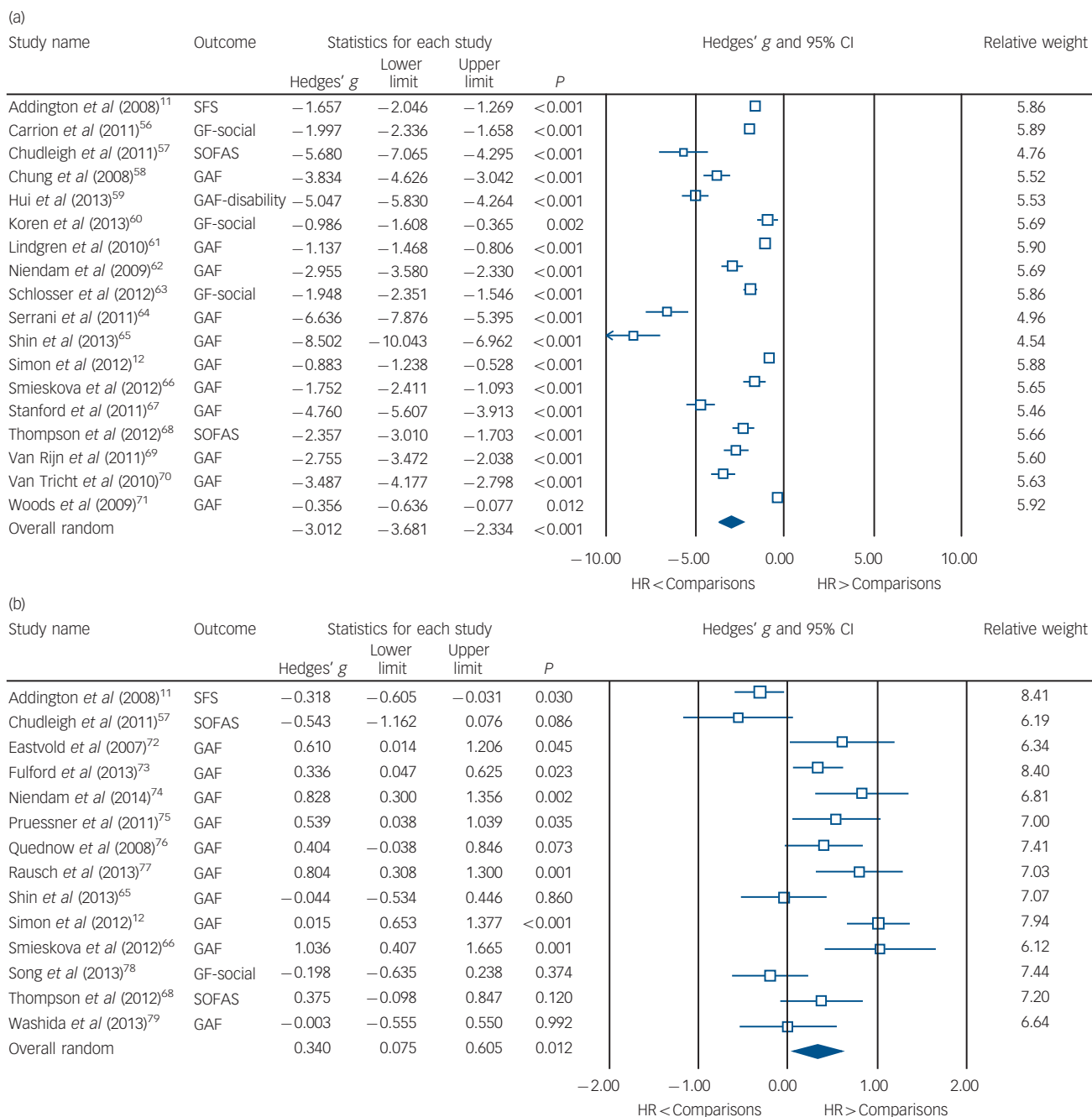


Fig. 1 Functional impairment: forest plots of meta-analysis 1. The large effect size of the subgroup analysis indicated (a) lower functioning of the high-risk group *v.* the healthy control group and (b) a moderate standardised difference in functioning between the high-risk group and the psychosis group.

GAF, Global Assessment of Functioning; GF-social, Global Functioning – social scale; HR, high risk; SOFAS, Social and Occupational Functioning Assessment Scale; SFS, Social Functioning Scale.

speculations and investigating the functional status of high-risk participants compared with healthy control and psychosis groups.

Functional impairment

We clearly found that functioning of people at high risk was strongly impaired compared with the healthy control group but only modestly impaired compared with people with psychosis. These impairments may have been present for a long period prior to referral to high-risk services.²⁶ Our supplementary analysis focusing only on studies employing the GAF indicated a mean score of about 79 for the healthy control group, 50 for the high-

risk group and 45 for the psychosis group. This pattern suggests that the functional level in people at high risk is closer to that observed in people with psychosis as opposed to that observed in healthy individuals. This pattern is further supported by the meta-analysis of the QoL, which found no significant difference between the high-risk and psychosis groups and again a significant reduction in QoL compared with the healthy control group. It is relevant that functional impairment as well as QoL reported for the high-risk group was observed at the initial assessment in early detection centres before any focused intervention was initiated. Impairments in functioning and QoL are therefore a key feature of the high-risk state, at least as defined with the ultra-high risk

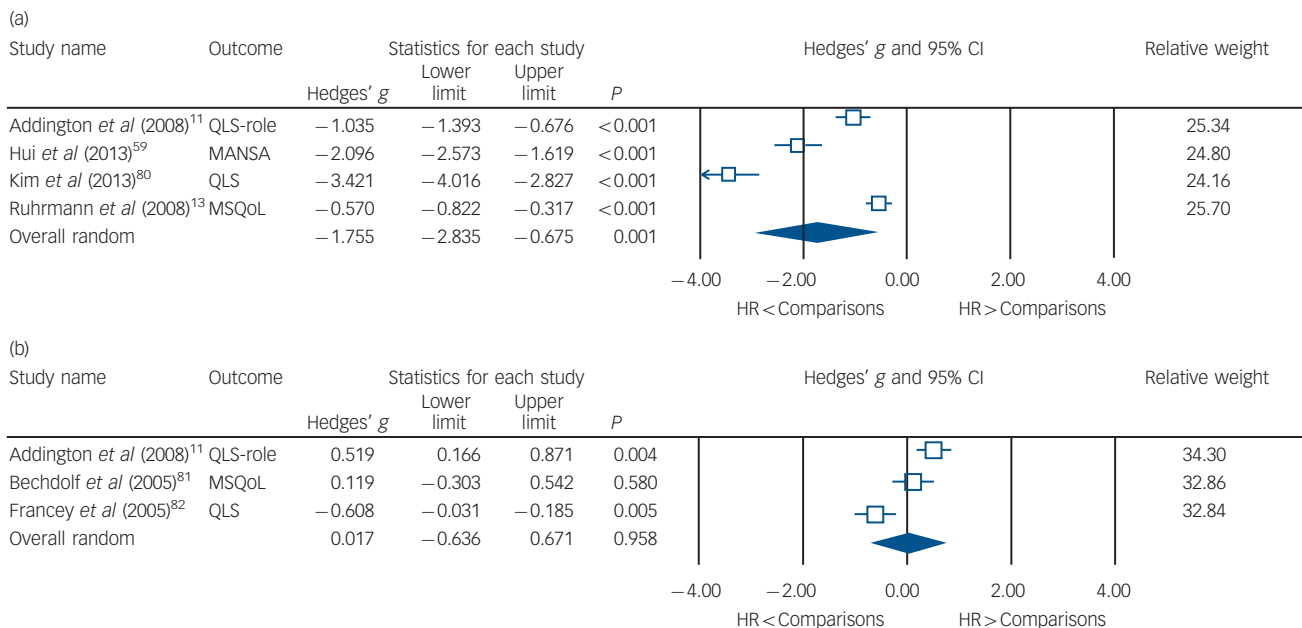


Fig. 2 Quality of life: forest plots of meta-analysis 2. The subgroup analysis indicated that quality of life of the high-risk group was worse than that of the healthy control group (a) but similar to that of the psychosis group (b).

HR, high risk; MANSA, Manchester Short Assessment of Quality of Life; MSQoL, Modular System for Quality of Life; QLS, Quality of Life Scale.

criteria (we found no basic symptom studies eligible for the current meta-analysis). Since QoL in the high-risk group was similar to that observed in patients with psychosis, it is possible to argue that severe functional impairment may lead to self-stigmatising by high-risk patients independently of any diagnostic label.²⁷ To better understand the magnitude of the functional impairment of the high-risk state, it can be qualitatively compared with that of other psychiatric disorders (Fig. 4).

Although such a comparison should be interpreted cautiously as it is not based on original data, on a qualitative basis the graph indicates that the point estimate of the global functioning in the high-risk group is lower than those observed in bipolar disorder, and similar to that of major depressive disorders and social phobia. This is the first meta-analytical evidence that high-risk individuals are ‘probably at risk but certainly ill’, as previously advocated.²⁸

The findings of large functional impairments in the high-risk group clearly contradict the speculative assumption that they represent normal developmental phenotypes and are not in need of care. Conversely, in synopsis of the results of the meta-analyses and the qualitative placement of the observed GAF scores shown in Fig. 4, it seems strongly justifiable to conclude that the functional state observed in those meeting high-risk criteria calls not only for prevention of a future transition to psychosis, but also for treatment of the current mental state and problems.

Comorbidity

It may be argued that functional impairment in those at high risk of psychosis is secondary to comorbid disorders diagnosed in this group. There is evidence that affective comorbidities are highly

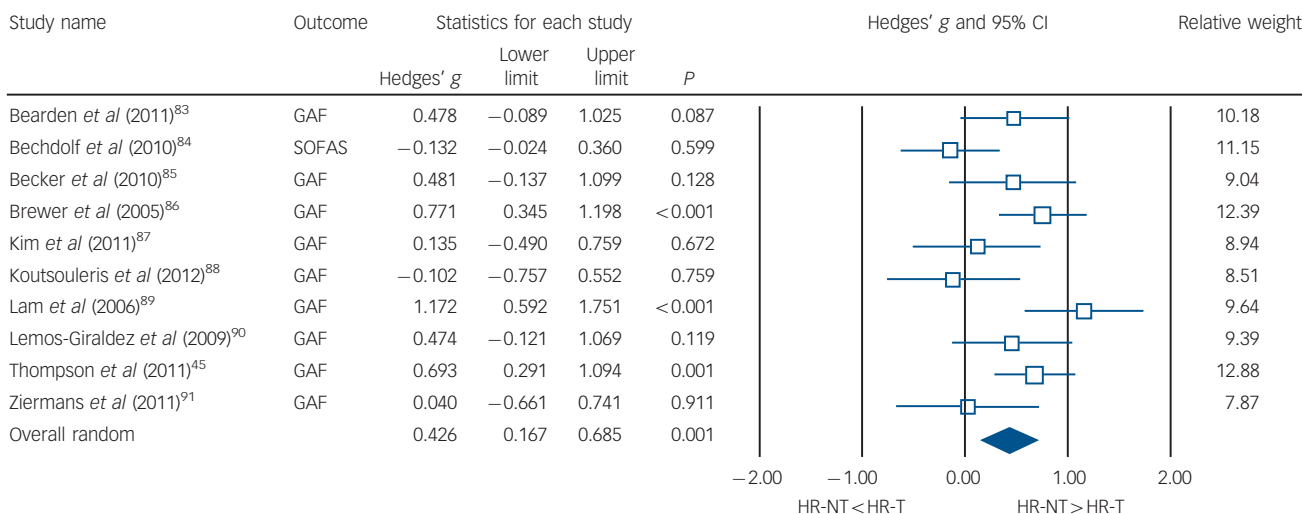


Fig. 3 Baseline functional impairment and transition to psychosis: forest plot of meta-analysis 3. Participants at high risk who developed psychosis during the follow-up period had poorer baseline functioning than participants who did not.

GAF, Global Assessment of Functioning; HR-NT, high risk, no transition to psychosis; HR-T, high risk, transition to psychosis; SOFAS, Social and Occupational Functioning Assessment Scale.

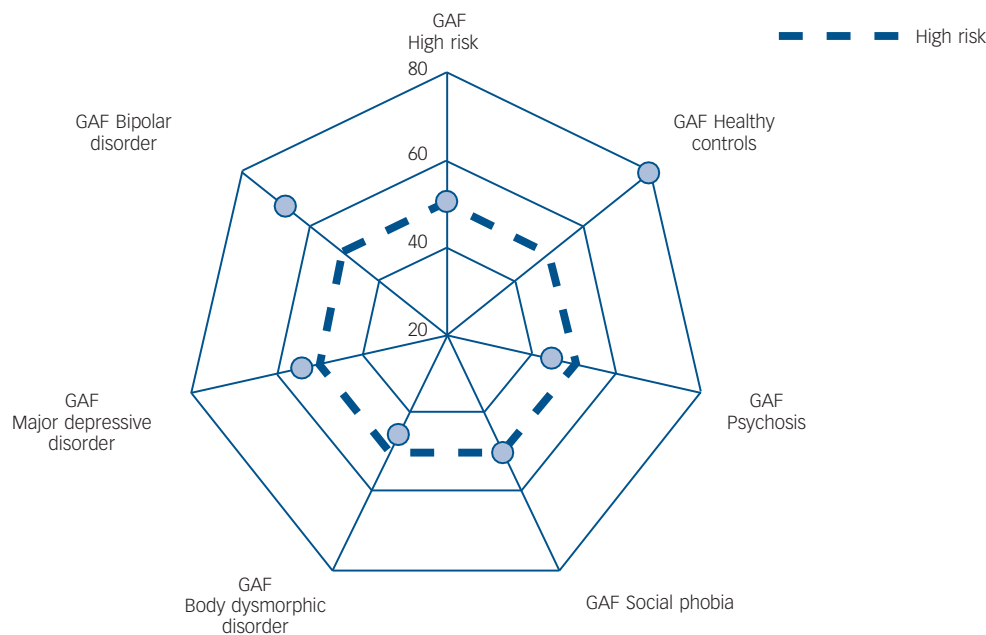


Fig. 4 Qualitative comparison of Global Assessment of Functioning (GAF) scores in different psychiatric conditions.

The plot displays the result of our supplementary meta-analysis of GAF point estimates for the high-risk group (defined with ultra-high risk criteria), the healthy control group and the psychosis group, which has been qualitatively compared with GAF estimates in bipolar disorder (taken from Hajek *et al.*), major depressive disorder (from Schaub *et al.*), body dysmorphic disorder (from Phillips *et al.*) and social phobia (from Kelly *et al.*).^{52–55} The dashed line represents the high-risk group mean GAF score, to facilitate visual comparison.

prevalent in these individuals,²⁹ affecting psychopathology, neurobiology and baseline functioning.^{30,31} However, in an earlier meta-analysis we found comorbid affective disorders to be present in less than half of the high-risk group (comorbid depressive disorder 41%, anxiety disorder 15%).³⁰ Consequently, the functional and QoL impairment observed in the high-risk group could not entirely be secondary to the presence of affective comorbidities. The European Prediction of Psychosis (EPOS) study estimated the impact of both high-risk and depressive psychopathology on baseline GAF scores, using the Beck Depression Inventory and the SIPS as independent variables; step-wise linear regression retained SIPS-positive and SIPS-negative scores only, explaining 14.9% of variance and thus indicating that GAF scores were predominantly determined by deterioration of role functioning.³² On the other hand, even if comorbid symptoms fulfilling the thresholds for certain DSM or ICD disorders had an impact on the GAF ratings, these scores could be interpreted as a true expression of the high-risk state: such comorbid symptoms could well be considered as part of the high-risk state, in line with retrospective findings indicating that prevalence of depressive mood at the time of psychosis onset is 83%,³³ and with phenomenological evidence of affective dysregulation at the core of psychosis liability.³⁴ Affective symptoms may thus be part of the high-risk state and might be expression of an early, mild stage of the same neurobiological process that causes psychosis.³³

Specificity and sensitivity

We also supported the notion that functional impairment may help in enriching the risk (specificity) of high-risk samples.³⁵ In fact, as compared with ultra-high-risk individuals,³⁶ short-term transition risk in individuals with psychotic-like symptoms but good functioning is extremely low (about 1.2% within 2 years).³⁷ However, it is possible that rigorous functioning criteria might enrich the high-risk sample but at the cost of sensitivity. Another study investigating the prevalence of high-risk symptoms in a

community sample aged 11–13 years found the proportion of participants meeting CAARMS high-risk criteria declined from 7.7% to 0.9% when a 30% decrease of functioning was considered a criterion.³⁸ Thus, at least at the population level, adding this functioning criterion may lead to an immense loss of sensitivity. A corresponding finding was reported from the Personal Assessment and Crisis Evaluation (PACE) 400 study.³⁹ It has still to be elucidated in longitudinal follow-up studies whether there is a criterion leading to a better balance of sensitivity and specificity; however, risk stratification might overcome this problem.³² Furthermore, even without transition to psychosis, functional decline may constitute an outcome of the high-risk state with a comparable clinical significance. Thus, besides a loss of sensitivity, defining impaired functioning as an obligatory entry criterion for high-risk status may result in missing the main goal of prevention, i.e. lowering the huge personal and socioeconomic burden of the disease related to impaired functioning.⁴⁰ Future studies may therefore have to find a balance between sufficient risk enrichment in terms of transition to psychosis and sufficient sensitivity in terms of functional outcome.

The need for care

Besides these speculations, our meta-analysis provides conclusive and consistent evidence that people at high risk are truly in need of care. Our analysis found no evidence of publication bias, and all the sensitivity analyses performed confirmed our findings. We investigated factors modulating functional level in high-risk participants. A small proportion of the observed heterogeneity was explained by gender, suggesting better functional level in women with psychosis. Such a result is in line with available studies in the psychosis spectrum disorders reporting higher functional levels in women than in men.⁴¹

Our longitudinal meta-analysis revealed that high-risk individuals who later developed psychosis had poorer functioning at baseline. This finding is not new,⁴² and is in line with the significant predictive value of high-risk functional impairment

towards transition that has been reported in large independent samples.^{32,43–45} Some authors support the idea of high risk as a continuum towards psychosis, marked by a change in functioning and course of thinking.⁴³ These results may have both clinical and research implications. High-risk samples could be stratified at baseline on the basis of their functional level and focused interventions or experimental trials could be individualised accordingly. Additionally, since most high-risk participants received at least in part some active treatment, our longitudinal results are in line with reports of low efficacy of preventive interventions on social functioning in these people.⁵ In this analysis we found a significant modulating effect for year of publication, suggesting that in the most recent studies the difference in functioning between the two transition groups decreased. This can be interpreted as the consequence of changes in recruitment strategies of prodromal clinics, with inclusion of less functionally impaired patients in the most recent years.¹ Overall, when interpreting the impact of baseline functioning on transition outcomes, it is important to note that psychosis is just one possible outcome of the high-risk state; remission, transition to a non-psychotic disorder and persistence of the high-risk state account for the majority of outcomes at follow-up.¹ Our analysis was unable to test the impact of baseline level of functioning on these outcomes. Functional status, on the other hand, could be considered as a good indicator of broader clinical outcome also in patients who will subsequently develop psychosis.^{1,35}

Study limitations

Some limitations need to be acknowledged. First, the concept of functional impairment had some intrinsic conceptual caveats. Most of the scales adopted, especially the GAF, do not provide a clear distinction between functioning and symptoms.⁴⁶ However, the vast majority of studies of the high-risk state published to date have used the GAF as a standard measure of functioning. The Social and Occupational Functioning Assessment Scale (SOFAS) has been developed to overcome this issue. Unlike the GAF, which includes not only social and occupational performance but also symptoms as a dimension of functioning, the SOFAS aims to assess functioning without the influence of the patient's symptoms.⁴⁷ However, both scales have strong negative correlations with the Clinical Global Impression and the Positive and Negative Syndrome Scale.⁴⁷ Further development in the field may imply the use of psychometric instruments powered to disentangle these two overlapping domains. Another limitation is that we did not attempt to acquire unpublished data. Yet another is that in both subgroup analyses a large part of the heterogeneity remained unexplained. Differences in sampling procedures and assessment measures could be some of the putative moderators that further studies need to take into account to increase the generalisability of findings. Also, the quality of the studies included may have affected interpretation of the results: only half of the studies used a matched (i.e. at least by age) comparison group (see online Table DS3). Another potential limitation is that the researchers assessing functioning and QoL were masked to case-comparison allocation in only a minority of studies. However, our sensitivity analysis showed no effect of quality of studies on the meta-analytical estimates. Furthermore, given conceptual and pragmatic differences between the high-risk and DSM-5 paradigms,⁶ and given the lack of generalisability of high-risk research to the general population,⁴⁸ our findings cannot be directly used to support the validity of the APS diagnosis. Our results support conceptual validity of the high-risk state, i.e. correctly distinguishing between disorder and normality,⁴⁹ rather than its construct validity. Conversely, DSM-5 criteria for a mental

disorder focus on construct validity, requiring that the disorder in question is distinct from other disorders, has familial aggregation, presence in diverse populations and environmental risk factors, has concurrent validators such as cognitive and temperament correlates, biological markers and a certain comorbidity profile, and has predictive validity with respect to diagnostic stability, predictability of the course of illness, and response to treatment.⁵⁰ Conceptual and construct validity are independent.⁴⁹ Although the high-risk state may encompass different comorbid disorders,^{30,31} and thus lack full construct validity, it can be conceptually valid since it encompasses only disorders. However, the same arguments can be used to question construct validity of affective disorders, given their high co-occurrence during first episodes of psychosis.³³ Indeed, satisfying construct validity has as yet not been achieved even for many other hitherto encoded mental disorders. A full discussion of these issues is beyond the scope of the current investigations and has been critically presented in other recent papers.^{6,51}

Clinical implications

The high-risk state (defined with ultra-high risk criteria) is characterised by consistent and serious impairments of functioning and reduction of QoL that seem to be similar to those in other coded psychiatric disorders. These impairments call not only for prevention of a future transition to psychosis and functional deterioration, but also for treatment of the current disorder.

Paolo Fusar-Poli, PhD, Department of Psychosis Studies, Institute of Psychiatry, Psychology and Neuroscience, King's College London, and Outreach and Support in South London (OASIS) prodromal team, South London and the Maudsley National Health Service (NHS) Foundation Trust, London; **Matteo Rocchetti**, MD, Department of Psychosis Studies, Institute of Psychiatry, Psychology and Neuroscience, King's College London, UK, and Department of Brain and Behavioural Sciences, University of Pavia, Pavia, Italy; **Alberto Sardella**, PsyD, **Alessia Avila**, PsyD, Department of Psychosis Studies, Institute of Psychiatry, Psychology and Neuroscience, King's College London, UK; **Martina Brandizzi**, MD, Department of Psychosis Studies, Institute of Psychiatry, Psychology and Neuroscience, King's College London, UK, and Neurosciences, Mental Health and Sensory Functions Department, Sapienza University of Rome, Rome, Italy; **Edgardo Caverzasi**, Professor, **Pierluigi Politi**, Professor, Department of Brain and Behavioral Sciences, University of Pavia, Pavia, Italy; **Stephan Ruhrmann**, PhD, Department of Psychiatry and Psychotherapy, University of Cologne, Cologne, Germany; **Philip McGuire**, Professor, Department of Psychosis Studies, Institute of Psychiatry, Psychology and Neuroscience, King's College London, and OASIS prodromal team, South London and the Maudsley NHS Foundation Trust, London, UK

Correspondence: Dr Paolo Fusar-Poli, Department of Psychosis Studies, Institute of Psychiatry, Psychology and Neuroscience, PO Box 63, De Crespigny Park, London SE5 8AF, UK. Email: paolo.fusar-poli@kcl.ac.uk

First received 4 Sep 2014, final revision 24 Nov 2014, accepted 17 Dec 2014

Funding

This work was supported by the Department of Psychosis Studies, King's College London, Institute of Psychiatry, Psychology and Neuroscience. M.R., E.C. and P.P. were also supported by the University of Pavia; M.B. was also supported by the Sapienza University of Rome.

References

- 1 Fusar-Poli P, Borgwardt S, Bechdolf A, Addington J, Riecher-Rossler A, Schultz-Lutter F, et al. The psychosis high-risk state: a comprehensive state-of-the-art review. *JAMA Psychiatry* 2013; **70**: 107–20.
- 2 Mrazek PB, Haggerty RJ, eds. *Reducing Risks for Mental Disorders: Frontiers for Preventive Intervention Research*. National Academies Press, 1994.
- 3 Fusar-Poli P, Bechdolf A, Taylor MJ, Bonoldi I, Carpenter WT, Yung AR, et al. At risk for schizophrenic or affective psychoses? A meta-analysis of DSM/ICD diagnostic outcomes in individuals at high clinical risk. *Schizophr Bull* 2013; **39**: 923–32.
- 4 Stafford MR, Jackson H, Mayo-Wilson E, Morrison AP, Kendall T. Early interventions to prevent psychosis: systematic review and meta-analysis. *BMJ* 2013; **346**: f185.

- 5 Van der Gaag M, Smit F, Bechdolf A, French P, Linszen DH, Yung AR, et al. Preventing a first episode of psychosis: meta-analysis of randomized controlled prevention trials of 12 month and longer-term follow-ups. *Schizophr Res* 2013; **149**: 56–62.
- 6 Fusar-Poli P, Carpenter WT, Woods SW, McGlashan TH. Attenuated psychosis syndrome: ready for DSM-5.1? *Annu Rev Clin Psychol* 2014; **10**: 155–92.
- 7 American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders (5th edn) (DSM-5)*. APA, 2013.
- 8 Woods SW, Walsh BC, Saksa JR, McGlashan TH. The case for including attenuated psychotic symptoms syndrome in DSM-5 as a psychosis risk syndrome. *Schizophr Res* 2010; **123**: 199–207.
- 9 Schultze-Lutter F, Schimmelmann BG, Ruhrmann S, Michel C. 'A rose is a rose is a rose', but at-risk criteria differ. *Psychopathology* 2013; **46**: 75–87.
- 10 Blumenthal-Barby JS. Psychiatrist's new manual (DSM-5): ethical and conceptual dimensions. *J Med Ethics* 2014; **40**: 531–6.
- 11 Addington J, Penn D, Woods SW, Addington D, Perkins DO. Social functioning in individuals at clinical high risk for psychosis. *Schizophr Res* 2008; **99**: 119–24.
- 12 Simon AE, Graedel M, Cattapan-Ludewig K, Gruber K, Ballinari P, Roth B, et al. Cognitive functioning in at-risk mental states for psychosis and 2-year clinical outcome. *Schizophr Res* 2012; **142**: 108–15.
- 13 Ruhrmann S, Paruch J, Bechdolf A, Pukrop R, Wagner M, Berning J, et al. Reduced subjective quality of life in persons at risk for psychosis. *Acta Psychiatr Scand* 2008; **117**: 357–68.
- 14 Ruhrmann S, Paruch J, Bechdolf A, Pukrop R, Wagner M, Berning J, et al. Reduced subjective quality of life in persons at risk for psychosis. *Acta Psychiatr Scand* 2008; **117**: 357–68.
- 15 Stroup DF, Berlin JA, Morton SC, Olkin I, Williamson GD, Rennie D, et al. Meta-analysis of observational studies in epidemiology: a proposal for reporting. Meta-analysis Of Observational Studies in Epidemiology (MOOSE) group. *JAMA* 2000; **283**: 2008–12.
- 16 Rosenthal R. Meta-analysis: a review. *Psychosom Med* 1991; **53**: 247–271.
- 17 Juni P, Witschi A, Bloch R, Egger M. The hazards of scoring the quality of clinical trials for meta-analysis. *JAMA* 1999; **282**: 1054–60.
- 18 Mertz D, Kim TH, Johnstone J, Lam PP, Science M, Kuster SP, et al. Populations at risk for severe or complicated influenza illness: systematic review and meta-analysis. *BMJ* 2013; **347**: f5061.
- 19 Borenstein M, Hedges L, Higgins J, Rothstein H. *Comprehensive Meta-Analysis Version 2*. Biostat, 2005.
- 20 Paulson JF, Bazemore SD. Prenatal and postpartum depression in fathers and its association with maternal depression: a meta-analysis. *JAMA* 2010; **303**: 1961–9.
- 21 Lipsey M, Wilson D. *Practical Meta-analysis*. Sage, 2000.
- 22 Cooper H, Hedges L, Valentine J. *Handbook of Research Synthesis and Meta-Analysis*. Sage, 2009.
- 23 Duval S, Tweedie R. Trim and fill: a simple funnel-plot-based method of testing and adjusting for publication bias in meta-analysis. *Biometrics* 2000; **56**: 455–63.
- 24 Castle DJ. The truth, and nothing but the truth, about early intervention in psychosis. *Aust N Z J Psychiatry* 2012; **46**: 10–3.
- 25 Castle DJ. Is it appropriate to treat people at high-risk of psychosis before first onset? – no. *Med J Australia* 2012; **196**: 557.
- 26 Fusar-Poli P, Meneghelli A, Valmaggia L, Allen P, Galvan F, McGuire P, et al. Duration of untreated prodromal symptoms and 12-month functional outcome of individuals at risk of psychosis. *Br J Psychiatry* 2009; **194**: 181–2.
- 27 Ruhrmann S, Klosterkötter J, Bodatsch M, Nikolaidis A, Julkowski D, Hilboll D, et al. Chances and risks of predicting psychosis. *Eur Arch Psychiatry Clin Neurosci* 2012; **262** (suppl 2): S85–90.
- 28 Ruhrmann S, Schultze-Lutter F, Klosterkötter J. Probably at-risk, but certainly ill – advocating the introduction of a psychosis spectrum disorder in DSM-V. *Schizophr Res* 2010; **120**: 23–37.
- 29 Salokangas RK, Ruhrmann S, von Reventlow HG, Heinimaa M, Svriskis T, From T, et al. Axis I diagnoses and transition to psychosis in clinical high-risk patients EPOS project: prospective follow-up of 245 clinical high-risk outpatients in four countries. *Schizophr Res* 2012; **138**: 192–7.
- 30 Fusar-Poli P, Nelson B, Valmaggia L, Yung AR, McGuire PK. Comorbid depressive and anxiety disorders in 509 individuals with an at-risk mental state: impact on psychopathology and transition to psychosis. *Schizophr Bull* 2014; **40**: 120–31.
- 31 Modinos G, Allen P, Frascarelli M, Tognin S, Valmaggia L, Xenaki L, et al. Are we really mapping psychosis risk? Neuroanatomical signature of affective disorders in subjects at ultra high risk. *Psychol Med* 2014; **44**: 3491–501.
- 32 Ruhrmann S, Schultze-Lutter F, Salokangas RKR, Heinimaa M, Linszen D, Dingemans P, et al. Prediction of psychosis in adolescents and young adults at high risk: results from the prospective European prediction of psychosis study. *Arch Gen Psychiatry* 2010; **67**: 241–51.
- 33 Hafner H, Maurer K, Trendler G, an der Heiden W, Schmidt M, Konnecke R. Schizophrenia and depression: challenging the paradigm of two separate diseases – a controlled study of schizophrenia, depression and healthy controls. *Schizophr Res* 2005; **77**: 11–24.
- 34 Mishara AL, Fusar-Poli P. The phenomenology and neurobiology of delusion formation during psychosis onset: Jaspers, Truman symptoms, and aberrant salience. *Schizophr Bull* 2013; **39**: 278–86.
- 35 Fusar-Poli P, Van Os J. Lost in transition: setting the psychosis threshold in prodromal research. *Acta Psychiatr Scand* 2013; **127**: 248–52.
- 36 Kempton MJ, Bonoldi I, Valmaggia L, McGuire P, Fusar-Poli P. Speed of psychosis progression in people at ultra-high clinical risk: a complementary meta-analysis. *JAMA Psychiatry* 2015; **72**: 622–3.
- 37 Kaymaz N, Drukker M, Lieb R, Wittchen HU, Werbeloff N, Weiser M, et al. Do subthreshold psychotic experiences predict clinical outcomes in unselected non-help-seeking population-based samples? A systematic review and meta-analysis, enriched with new results. *Psychol Med* 2012; **42**: 2239–53.
- 38 Kelleher I, Murtagh A, Molloy C, Roddy S, Clarke MC, Harley M, et al. Identification and characterization of prodromal risk syndromes in young adolescents in the community: a population-based clinical interview study. *Schizophr Bull* 2012; **38**: 239–46.
- 39 Nelson B, Yuen HP, Wood SJ, Lin A, Spiliotacopoulos D, Bruxner A, et al. Long-term follow-up of a group at ultra high risk ('prodromal') for psychosis: the PACE 400 study. *JAMA Psychiatry* 2013; **70**: 793–802.
- 40 Gustavsson A, Svensson M, Jacobi F, Allgulander C, Alonso J, Beghi E, et al. Cost of disorders of the brain in Europe 2010. *Eur Neuropsychopharmacol* 2011; **21**: 718–79.
- 41 Grossman LS, Harrow M, Rosen C, Faull R. Sex differences in outcome and recovery for schizophrenia and other psychotic and nonpsychotic disorders. *Psychiatr Serv* 2006; **57**: 844–50.
- 42 Velthorst E, Nelson B, Wiltink S, de Haan L, Wood SJ, Lin A, et al. Transition to first episode psychosis in ultra high risk populations: does baseline functioning hold the key? *Schizophr Res* 2013; **143**: 132–7.
- 43 Cannon TD, Cadenhead K, Cornblatt B, Woods SW, Addington J, Walker E, et al. Prediction of psychosis in youth at high clinical risk. *Arch Gen Psychiatry* 2008; **65**: 28–37.
- 44 Velthorst E, Nieman DH, Linszen D, Becker H, de Haan L, Dingemans PM, et al. Disability in people clinically at high risk of psychosis. *Br J Psychiatry* 2010; **197**: 278–84.
- 45 Thompson A, Nelson B, Yung A. Predictive validity of clinical variables in the 'at risk' for psychosis population: international comparison with results from the North American Prodrome Longitudinal Study. *Schizophr Res* 2011; **126**: 51–7.
- 46 Ustun B, Kennedy C. What is 'functional impairment'? Disentangling disability from clinical significance. *World Psychiatry* 2009; **8**: 82–5.
- 47 Samara MT, Engel RR, Millier A, Kandenwein J, Toumi M, Leucht S. Equipercile linking of scales measuring functioning and symptoms: examining the GAF, SOFAS, CGI-S, and PANSS. *Eur Neuropsychopharmacol* 2014; **24**: 1767–72.
- 48 Schultze-Lutter F, Michel C, Ruhrmann S, Schimmelmann BG. Prevalence and clinical significance of DSM-5 attenuated psychosis syndrome in adolescents and young adults in the general population: the Bern Epidemiological At-Risk (BEAR) Study. *Schizophr Bull* 2014; **40**: 1499–508.
- 49 Wakefield JC. Wittgenstein's nightmare: why the RDoC grid needs a conceptual dimension. *World Psychiatry* 2014; **13**: 38–40.
- 50 Epperson CN, Steiner M, Hartlage SA, Eriksson E, Schmidt PJ, Jones I, et al. Premenstrual dysphoric disorder: evidence for a new category for DSM-5. *Am J Psychiatry* 2012; **169**: 465–75.
- 51 Wakefield JC. The DSM-5 debate over the bereavement exclusion: psychiatric diagnosis and the future of empirically supported treatment. *Clin Psychol Rev* 2013; **33**: 825–45.
- 52 Hajek T, Slaney C, Garnham J, Ruzickova M, Passmore M, Alda M. Clinical correlates of current level of functioning in primary care-treated bipolar patients. *Bipolar Disord* 2005; **7**: 286–91.
- 53 Schaub A, Neubauer N, Mueser KT, Engel R, Moller HJ. Neuropsychological functioning in inpatients with major depression or schizophrenia. *BMC Psychiatry* 2013; **13**: 203.
- 54 Phillips KA, Quinn G, Stout RL. Functional impairment in body dysmorphic disorder: a prospective, follow-up study. *J Psychiatr Res* 2008; **42**: 701–7.
- 55 Kelly MM, Dalrymple K, Zimmerman M, Phillips KA. A comparison study of body dysmorphic disorder versus social phobia. *Psychiatr Res* 2013; **205**: 109–16.

- 56 Carrion RE, Goldberg TE, McLaughlin D, Auther AM, Correll CU, Cornblatt BA. Impact of neurocognition on social and role functioning in individuals at clinical high risk for psychosis. *Am J Psychiatry* 2011; **168**: 806–13.
- 57 Chudleigh C, Naismith SL, Blaszczyński A, Hermens DF, Hodge MA, Hickie IB. How does social functioning in the early stages of psychosis relate to depression and social anxiety? *Early Interv Psychiatry* 2011; **5**: 224–32.
- 58 Chung YS, Kang D-H, Shin NY, Yoo SY, Kwon JS. Deficit of theory of mind in individuals at ultra-high-risk for schizophrenia. *Schizophr Res* 2008; **99**: 111–8.
- 59 Hui C, Morcillo C, Russo DA, Stochl J, Shelley GF, Painter M, et al. Psychiatric morbidity, functioning and quality of life in young people at clinical high risk for psychosis. *Schizophr Res* 2013; **148**: 175–80.
- 60 Koren D, Reznik N, Adres M, Scheyer R, Apter A, Steinberg T, et al. Disturbances of basic self and prodromal symptoms among non-psychotic help-seeking adolescents. *Psychol Med* 2013; **43**: 1365–76.
- 61 Lindgren M, Manninen M, Laajasalo T, Mustonen U, Kalska H, Suvisaari J, et al. The relationship between psychotic-like symptoms and neurocognitive performance in a general adolescent psychiatric sample. *Schizophr Res* 2010; **123**: 77–85.
- 62 Niendam TA, Berzak J, Cannon TD, Bearden CE. Obsessive compulsive symptoms in the psychosis prodrome: correlates of clinical and functional outcome. *Schizophr Res* 2009; **108**: 170–5.
- 63 Schlosser DA, Jacobson S, Chen Q, Sugar CA, Niendam TA, Li G, et al. Recovery from an at-risk state: clinical and functional outcomes of putatively prodromal youth who do not develop psychosis. *Schizophr Bull* 2012; **38**: 1225–33.
- 64 Serrani D. Neurocognitive assessment of ultra high risk of psychosis states using the MATRICS battery (Measurement and Treatment Research to Improve Cognition in Schizophrenia). *Rev Psiquiatr Clin* 2011; **38**: 130–4.
- 65 Shin YS, Kim SN, Shin NY, Jung WH, Hur JW, Byun MS, et al. Increased intra-individual variability of cognitive processing in subjects at risk mental state and schizophrenia patients. *PLoS One* 2013; **8**: e78354.
- 66 Smieskova R, Fusar-Poli P, Aston J, Simon A, Bendfeldt K, Lenz C, et al. Insular volume abnormalities associated with different transition probabilities to psychosis. *Psychol Med* 2012; **42**: 1613–25.
- 67 Stanford AD, Messinger J, Malaspina D, Corcoran CM. Theory of Mind in patients at clinical high risk for psychosis. *Schizophr Res* 2011; **131**: 11–7.
- 68 Thompson A, Pappas A, Bartholomeusz C, Allott K, Amminger GP, Nelson B, et al. Social cognition in clinical 'at risk' for psychosis and first episode psychosis populations. *Schizophr Res* 2012; **141**: 204–9.
- 69 Van Rijn S, Aleman A, de Sonneville L, Sprong M, Ziermans T, Schothorst P, et al. Misattribution of facial expressions of emotion in adolescents at increased risk of psychosis: the role of inhibitory control. *Psychol Med* 2011; **41**: 499–508.
- 70 Van Tricht MJ, Nieman DH, Koelman JHTM, van der Meer JN, Bour LJ, de Haan L, et al. Reduced parietal P300 amplitude is associated with an increased risk for a first psychotic episode. *Biol Psychiatry* 2010; **68**: 642–8.
- 71 Woods SW, Addington J, Cadenhead KS, Cannon TD, Cornblatt BA, Heinssen R, et al. Validity of the prodromal risk syndrome for first psychosis: findings from the North American Prodrome Longitudinal Study. *Schizophr Bull* 2009; **35**: 894–908.
- 72 Eastvold AD, Heaton RK, Cadenhead KS. Neurocognitive deficits in the (putative) prodrome and first episode of psychosis. *Schizophr Res* 2007; **93**: 266–77.
- 73 Fulford D, Niendam TA, Floyd EG, Carter CS, Mathalon DH, Vinogradov S, et al. Symptom dimensions and functional impairment in early psychosis: more to the story than just negative symptoms. *Schizophr Res* 2013; **147**: 125–31.
- 74 Niendam TA, Lesh TA, Yoon J, Westphal AJ, Hutchison N, Daniel Ragland J, et al. Impaired context processing as a potential marker of psychosis risk state. *Psychiatry Res* 2014; **221**: 13–20.
- 75 Pruessner M, Iyer SN, Faridi K, Joobor R, Malla AK. Stress and protective factors in individuals at ultra-high risk for psychosis, first episode psychosis and healthy controls. *Schizophr Res* 2011; **129**: 29–35.
- 76 Quednow BB, Frommann I, Berning J, Kuehn KU, Maier W, Wagner M. Impaired sensorimotor gating of the acoustic startle response in the prodrome of schizophrenia. *Biol Psychiatry* 2008; **64**: 766–73.
- 77 Rausch F, Eifler S, Esser A, Esslinger C, Schirrmbeck F, Meyer-Lindenberg A, et al. The Early Recognition Inventory ERInas detects at risk mental states of psychosis with high sensitivity. *Compr Psychiatry* 2013; **54**: 1068–76.
- 78 Song YY, Kang JI, Kim SJ, Lee MK, Lee E, An SK. Temperament and character in individuals at ultra-high risk for psychosis and with first-episode schizophrenia: associations with psychopathology, psychosocial functioning, and aspects of psychological health. *Compr Psychiatry* 2013; **54**: 1161–8.
- 79 Washida K, Takeda T, Habara T, Sato S, Oka T, Tanaka M, et al. Efficacy of second-generation antipsychotics in patients at ultra-high risk and those with first-episode or multi-episode schizophrenia. *Neuropsychiatr Dis Treat* 2013; **9**: 861–8.
- 80 Kim KR, Song YY, Park JY, Lee EH, Lee M, Lee SY, et al. The relationship between psychosocial functioning and resilience and negative symptoms in individuals at ultra-high risk for psychosis. *Aust N Z J Psychiatry* 2013; **47**: 762–71.
- 81 Bechdolf A, Pukrop R, Kohn D, Tschinkel S, Veith V, Schultze-Lutter F, et al. Subjective quality of life in subjects at risk for a first episode of psychosis: a comparison with first episode schizophrenia patients and healthy controls. *Schizophr Res* 2005; **79**: 137–43.
- 82 Francey SM, Jackson HJ, Phillips LJ, Wood SJ, Yung AR, McGorry PD. Sustained attention in young people at high risk of psychosis does not predict transition to psychosis. *Schizophr Res* 2005; **79**: 127–36.
- 83 Bearden CE, Wu KN, Caplan R, Cannon TD. Thought disorder and communication deviance as predictors of outcome in youth at clinical high risk for psychosis. *J Am Acad Child Adolesc Psychiatry* 2011; **50**: 669–80.
- 84 Bechdolf A, Thompson A, Nelson B, Cotton S, Simmons MB, Amminger GP, et al. Experience of trauma and conversion to psychosis in an ultra-high-risk (prodromal) group. *Acta Psychiatr Scand* 2010; **121**: 377–84.
- 85 Becker HE, Nieman DH, Wiltink S, Dingemans PM, de Fliert JRV, Velthorst E, et al. Neurocognitive functioning before and after the first psychotic episode: does psychosis result in cognitive deterioration? *Psychol Med* 2010; **40**: 1599–606.
- 86 Brewer WJ, Francey SM, Wood SJ, Jackson HJ, Pantelis C, Phillips LJ, et al. Memory impairments identified in people at ultra-high risk for psychosis who later develop first-episode psychosis. *Am J Psychiatry* 2005; **162**: 71–8.
- 87 Kim HS, Shin NY, Jang JH, Kim E, Shim G, Park HY, et al. Social cognition and neurocognition as predictors of conversion to psychosis in individuals at ultra-high risk. *Schizophr Res* 2011; **130**: 170–5.
- 88 Koutsouleris N, Davatzikos C, Bottlender R, Patschrek-Kliche K, Scheuerecker J, Decker P, et al. Early recognition and disease prediction in the at-risk mental states for psychosis using neurocognitive pattern classification. *Schizophr Bull* 2012; **38**: 1200–15.
- 89 Lam MML, Hung SF, Chen EYH. Transition to psychosis: 6-month follow-up of a Chinese high-risk group in Hong Kong. *Aust N Z J Psychiatry* 2006; **40**: 414–20.
- 90 Lemos-Giraldez S, Vallina-Fernandez O, Fernandez-Iglesias P, Vallejo-Secco G, Fonseca-Pedrero E, Paino-Pineiro M, et al. Symptomatic and functional outcome in youth at ultra-high risk for psychosis: a longitudinal study. *Schizophr Res* 2009; **115**: 121–9.
- 91 Ziermans TB, Schothorst PF, Sprong M, van Engeland H. Transition and remission in adolescents at ultra-high risk for psychosis. *Schizophr Res* 2011; **126**: 58–64.



Supplement DS1

<i>Method</i>	2
<i>Research code</i>	2
<i>Data extraction</i>	2
<i>Supplementary meta-analyses</i>	2
<i>Table DS1. Merging of continuous variables 7</i>	3
<i>Table DS2a. Studies included in the meta-analyses</i>	4
<i>Table DS2b. Studies included in the meta-analyses</i>	6
<i>Table DS3. Quality criteria for the studies included in the meta-analyses</i>	7
<i>Table DS4. Studies excluded from the meta-analyses</i>	8
<i>Fig. DS1. PRISMA flow charts</i>	14
<i>Fig. DS2. Meta-regressions</i>	15
<i>Fig. DS3. Supplementary meta-analysis</i>	16
<i>Fig. DS4. Supplementary meta-analysis</i>	17
<i>References</i>	18

Note: references in this online supplement are numbered independently of the print version.

Method

Research code

We adopted the following code for our multiple database electronic search:

((("at risk mental state" OR "at-risk mental state" OR "psychosis risk" OR (prodrom* AND psycho*) OR ultra-high risk OR UHR OR CAARMS OR SIPS OR SOPS OR SPIA) AND ("functioning" OR GAF OR "Global Assessment of Functioning" OR quality of life OR *QOL* OR QLS))

The keywords were searched in titles, abstracts, author keywords and with the Thomas Reuters tool Keywords Plus[®]. The electronic search retrieved 1156 studies.

Data extraction

For the data extraction we adopted the following a priori rules:

- We classified “non-psychiatric controls” and “non HR subjects” and “subjects without psychiatric disorders” as “healthy controls”.
- When more than one scale was adopted for the primary outcomes, we selected the first measure available in the following order:
 - o Functioning:
 - GAF¹
 - SOFAS¹
 - GF social²
 - Others
 - o Quality of Life:
 - QLS³
 - MSQoL⁴
 - Others
- Null hypothesis significance tests were considered two tailed if not otherwise specified.

In Hui et al. 2013⁵ the GAF scale¹ was divided into subscales. We excluded the symptoms subscale measure and included the disability subscale, accordingly with the topic of the study.

Supplementary meta-analyses

We performed a supplementary subgroup analysis to investigate the mean GAF scores in HR, healthy comparisons and patients diagnosed with psychosis. We decided to investigate this particular scale as it was recommended for global assessment of functioning in DSM IV TR¹. Such an analysis allows the qualitative comparison of functional level between HR samples and other psychiatric samples assessed with the GAF. Point estimates and dispersion measures have been computed applying random effect models given the high heterogeneity (HR: $Q=362.23$, $I^2=95.58\%$, $df=16$, $p<0.001$; healthy comparisons: $Q=1364.33$, $I^2=99.33\%$, $df=9$, $p<0.001$; psychosis comparisons: $Q=145.48$, $I^2=93.81\%$, $df=9$, $p<0.001$).

A second supplementary analysis investigated the possible confounding effect of the HR diagnostic tool on cross sectional data. No difference emerged between studies adopting functioning as diagnostic criteria (e.g. using the latest version of Comprehensive Assessment for At Risk Mental State⁶) in both HR vs healthy (between subgroup heterogeneity: $Q=0.127$, $p=0.722$, mixed effect model applied) and HR vs psychosis (between subgroup heterogeneity: $Q=0.307$, $p=0.580$, mixed effect model applied).

*Table DSI. Merging of continuous variables*⁷

	Subgroup 1	Subgroup 2	Combined group
Sample size	N1	N2	$N1 + N2$
Mean	M1	M2	$\frac{N1M1 + N2M2}{N1 + N2}$
SD	SD1	SD2	$\sqrt{\frac{(N1 - 1)SD1^2 + (N2 - 1)SD2^2 + \frac{N1N2}{N1 + N2}(M1^2 + M2^2 - 2M1M2)}{N1 + N2 - 1}}$

M, mean; N, sample size; SD, standard deviation.

Table DS2a. Studies included in the meta-analyses

Cross-sectional data				HR			Comparison			
Study name	Functioning/QoL assessment	HR diagnostic tool	Quality (NOS)	Sample size	Female (%)	Age (years)	Group	Sample size	Female (%)	Age (years)
Addington et al. 2008 ⁸	SFS, QLS-role	SIPS	5	86	43	19.4	Healthy	55	40	21.7
							First-episode psychosis	50	40	25.1
							Chronic psychosis	53	28	35.5
Bechdolf et al. 2005 ⁹	MSQoL	ERlraos	7	45	31.1	25.7	First-episode psychosis	40	40	27.8
Carrion et al. 2011 ¹⁰	GF-social	SIPS	7	127	33.1	16.9	Healthy	80	55	16
Chudleigh et al. 2011 ¹¹	SOFAS	CAARMS	6	20	45	22.75	Healthy	20	50	22
							First-episode psychosis	20	35	22.05
Chung et al. 2008 ¹²	GAF	CAARMS	7	33	42.4	20.8	Healthy	36	44.4	21.97
Eastvold et al. 2007 ¹³	GAF	SIPS	7	40	49	20.8	First-episode psychosis	15	45	21.5
Francey et al. 2005 ¹⁴	QLS	SIPS	6	70	47.1	20.1	Healthy	32	25	23.34
Fulford et al. 2013 ¹⁵	GAF	SIPS	6	98	40.8	17.7	First-episode psychosis	88	28.4	21.28
Hui et al. 2013 ⁵	GAF-disability, MANSA	CAARMS	7	60	48.3	20.2	Healthy	45	46.7	21.4
Kim et al. 2013 ¹⁶	QLS	SIPS	7	60	41.6	19.7	Healthy	47	48.9	20.3
Koren et al. 2013 ¹⁷	GF-social	SIPS	6	14	-	-	Healthy	43	-	-
Lindgren et al. 2010 ¹⁸	GAF	SIPS	8	62	36.6	16.6	Healthy	112	-	-
Niendam et al. 2009 ¹⁹	GAF	SIPS	6	64	39.1	16.4	Healthy	26	58	17.67
Niendam et al. 2013 ²⁰	GAF	SOPS	7	25	44	16.9	First-episode psychosis	35	26	18.27
Pruessner et al. 2011 ²¹	GAF	CAARMS	6	30	46.7	20.3	First-episode psychosis	32	43.8	22.72
Quednow et al. 2008 ²²	GAF	ERlraos	6	54	35	26.7	First-episode psychosis	31	45	34.7
Rausch et al. 2013 ²³	GAF	CAARMS	6	63	20.6	24.6	First-episode psychosis	22	27.27	28.5
Ruhrmann et al. 2008 ²⁴	MSQoL	ERlraos	7	215	37.7	25.8	Healthy	87	54	24.6
Schlosser et al. 2012 ²⁵	GF-social	SOPS	6	84	38.8	16.9	Healthy	58	52	17.9
Serrani 2011 ²⁶	GAF	CAARMS	7	27	19	17.4	Healthy	38	19	18.2
Shin et al. 2013 ²⁷	GAF	CAARMS	6	27	40.7	20.9	Healthy	38	39.47	22.4
							First-episode psychosis	37	59.4	22.6
Simon et al. 2012 ²⁸	GAF	SOPS	6	99	38.4	20.7	Healthy	49	20	21.6
							First-episode psychosis	48	33.3	22.4
Smieskova et al. 2012 ²⁹	GAF	BSIP	6	31	29	24.9	Healthy	19	47	26.58
							First-episode psychosis	16	25	25.13
Song et al. 2013 ³⁰	GF-social	SIPS	6	50	40	20	First-episode psychosis	33	57.57	21.4

Cross-sectional data

Study name	Functioning/QoL assessment	HR diagnostic tool	Quality (NOS)	HR			Comparison			
				Sample size	Female (%)	Age (years)	Group	Sample size	Female (%)	Age (years)
Stanford et al. 2011 ³¹	GAF	SIPS	5	63	20.6	19.6	Healthy	24	37.5	21
Thompson et al. 2012 ³²	SOFAS	CAARMS	8	30	53.3	19.1	Healthy	30	58.1	19.3
							First-episode psychosis	40	37.5	20.5
van Rijn et al. 2011 ³³	GAF	SIPS	8	36	30.5	15.2	Healthy	23	43.47	15.9
van Tricht et al. 2010 ³⁴	GAF	SIPS	6	61	31.1	19.6	Healthy	26	53.5	20
Washida et al. 2013 ³⁵	GAF	CAARMS	6	17	70.6	23.7	First-episode psychosis	23	39.13	23.3
							Chronic psychosis	21	47.62	26.3
Woods et al. 2009 ³⁶	GAF	SIPS	7	368	-	-	Healthy	57	-	-

Legend: BSIP, Basel Screening Instrument for Psychosis; CAARMS, Comprehensive Assessment of At Risk Mental States; ERIRAOS, Early Recognition Inventory and Interview for the Retrospective Assessment of the Onset of Schizophrenia; GAF, Global Assessment of Functioning; GF-social, Global Functioning: social scale; HR, High Risk; MANSA, Manchester Short Assessment of Quality of Life; MSQoL, Modular System for Quality of Life; NOS, Newcastle-Ottawa Scale; QLS, Quality of Life Scale; QoL, Quality of Life; SFS, Social Functioning Scale; SIPS, Structured Interview for Prodromal Syndromes; SOFAS, Social and Occupational Functioning Assessment Scale; SOPS, Scale of Prodromal Symptoms

Table DS2b. Studies included in the meta-analyses

Study name	Functioning/QoL assessment	HR diagnostic tool	Follow-up length (months)	HR		
				Sample size	Female (%)	Age (years)
Bearden et al. 2011 ³⁷	GAF	SIPS	14.8	54	29.63	17.4
Bechdolf et al. 2010 ³⁸	SOFAS	CAARMS	20.21	92	65.2	18
Becker et al. 2010 ³⁹	GAF	SIPS	18	41	30	19.7
Brewer et al. 2005 ⁴⁰	GAF	CAARMS	36	98	47.3	19.8
Kim et al. 2011 ⁴¹	GAF	CAARMS	62.4	49	38.7	21.1
Koutsouleris et al. 2012 ⁴²	GAF	CAARMS	48	35	33.3	24.7
Lam et al. 2006 ⁴³	GAF	CAARMS	6	62	41.9	16.2
Lemos-Giraldez et al. 2009 ⁴⁴	GAF	SIPS	36	61	34.4	21.7
Thompson et al. 2011 ⁴⁵	GAF	CAARMS	28	104	51	19.4
Ziermans et al. 2011 ⁴⁶	GAF	SIPS	24	58	33.3	15.4

Legend: BSIP, Basel Screening Instrument for Psychosis; CAARMS, Comprehensive Assessment of At Risk Mental States; ERlraos, Early Recognition Inventory and Interview for the Retrospective Assessment of the Onset of Schizophrenia; GAF, Global Assessment of Functioning; GF-social, Global Functioning: social scale; HR, High Risk; MANSA, Manchester Short Assessment of Quality of Life; MSQoL, Modular System for Quality of Life; NOS, Newcastle-Ottawa Scale; QLS, Quality of Life Scale; QoL, Quality of Life; SFS, Social Functioning Scale; SIPS, Structured Interview for Prodromal Syndromes; SOFAS, Social and Occupational Functioning Assessment Scale; SOPS, Scale of Prodromal Symptoms

Table DS3. Quality criteria for the studies included in the meta-analyses

Study name	Selection	Comparability	Exposure	NOS stars
Addington et al. 2008 ⁸	★★★		★★	5
Bechdorf et al. 2005 ⁹	★★★★	★	★★	7
Carrion et al. 2011 ¹⁰	★★★★	★	★★	7
Chudleigh et al. 2011 ¹¹	★★★★		★★	6
Chung et al. 2008 ¹²	★★★★	★	★★	7
Eastvold et al. 2007 ¹³	★★★★	★	★★	7
Francey et al. 2005 ¹⁴	★★★★		★★	6
Fulford et al. 2013 ¹⁵	★★★★		★★	6
Hui et al. 2013 ⁵	★★★★	★	★★	7
Kim et al. 2013 ¹⁶	★★★	★★	★★	7
Koren et al. 2013 ¹⁷	★★★★		★★	6
Lindgren et al. 2010 ¹⁸	★★★★	★	★★★	8
Niendam et al. 2009 ¹⁹	★★★	★	★★	6
Niendam et al. 2013 ²⁰	★★★★	★	★★	7
Pruessner et al. 2011 ²¹	★★★★		★★	6
Quednow et al. 2008 ²²	★★★★		★★	6
Rausch et al. 2013 ²³	★★★★		★★	6
Ruhrmann et al. 2008 ²⁴	★★★★	★	★★	7
Schlosser et al. 2012 ²⁵	★★★★		★★	6
Serrani 2011 ²⁶	★★★	★★	★★	7
Shin et al. 2013 ²⁷	★★★★		★★	6
Simon et al. 2012 ²⁸	★★★★		★★	6
Smieskova et al. 2012 ²⁹	★★★★		★★	6
Song et al. 2013 ³⁰	★★★★		★★	6
Stanford et al. 2011 ³¹	★★★		★★	5
Thompson et al. 2012 ³²	★★★★	★★	★★	8
van Rijn et al. 2011 ³³	★★★★	★★	★★	8
van Tricht et al. 2010 ³⁴	★★★	★★	★	6
Washida et al. 2013 ³⁵	★★★★		★★	6
Woods et al. 2009 ³⁶	★★★★	★	★★	7

Legend: NOS, Newcastle-Ottawa Scale

Subsections: **Selection** (case definition, representativeness of the cases, selection of controls, definition of controls - max 4 stars); **Comparability** (on the basis of design: study controls for age, study controls for any additional factor - max 2 stars); **Exposure** (ascertainment of functioning or quality of life, same method of ascertainment for cases and controls, Non-Response rate - max 3 stars).

Table DS4. Studies excluded from the meta-analyses

Study name	Year	Exclusion criteria
McGorry, et al. ⁴⁷	1996	L-b
Klosterkotter, et al. ⁴⁸	2001	L-e
McGorry, et al. ⁴⁹	2002	CS-c, L-e
Miller, et al. ⁵⁰	2003	L-e
Ruhrmann, et al. ⁵¹	2003	CS-a, L-a
Yung, et al. ⁵²	2003	CS-c, L-e
Addington, et al. ⁵³	2004	CS-a, L-a
Francey, et al. ⁵⁴	2004	CS-a, L-a
Hawkins, et al. ⁵⁵	2004	CS-d, L-c
Mason, et al. ⁵⁶	2004	CS-c, L-e
Morrison, et al. ⁵⁷	2004	L-d
Phillips, et al. ⁵⁸	2004	CS-a, L-a
Yung, et al. ⁵⁹	2004	CS-c, L-f
Barnett, et al. ⁶⁰	2005	CS-c, L-c
Bechdolf, et al. ⁹	2005	L-c
Brewer, et al. ⁴⁰	2005	CS-d
Cannon ⁶¹	2005	CS-a, L-a
Francey, et al. ¹⁴	2005	L-f
Hunt, et al. ⁶²	2005	CS-a, L-a
Amminger, et al. ⁶³	2006	CS-c, L-e
Becker, et al. ⁶⁴	2006	CS-a, L-a
Becker, et al. ⁶⁵	2006	CS-a
Becker, et al. ⁶⁶	2006	CS-a
Brewer, et al. ⁶⁷	2006	CS-a, L-a
Klaassen, et al. ⁶⁸	2006	CS-a, L-a
Lam, et al. ⁴³	2006	CS-c
Lencz, et al. ⁶⁹	2006	CS-d, L-e
Macedo, et al. ⁷⁰	2006	CS-a, L-a
McGlashan, et al. ⁷¹	2006	L-d
Niendam, et al. ⁷²	2006	CS-c, L-c
Nordentoft, et al. ⁷³	2006	L-d
Silverstein, et al. ⁷⁴	2006	CS-d, L-c
Simon, et al. ⁷⁵	2006	CS-d, L-c
Trotman, et al. ⁷⁶	2006	CS-b, L-b
Wood, et al. ⁷⁷	2006	CS-b, L-b
Yung, et al. ⁷⁸	2006	CS-d, L-e
Yung, et al. ⁷⁹	2006	CS-b, L-b
Addington, et al. ⁸⁰	2007	CS-a, L-a
Ballon, et al. ⁸¹	2007	CS-e, L-c
Berger, et al. ⁸²	2007	CS-a, L-a
Cannon, et al. ⁸³	2007	CS-a, L-a
Cornblatt, et al. ⁸⁴	2007	L-e

Study name	Year	Exclusion criteria
Cornblatt, et al. ²	2007	CS-c, L-e
Czernikiewicz, et al. ⁸⁵	2007	CS-a, L-a
Eastvold, et al. ¹³	2007	L-e
Jabben, et al. ⁸⁶	2007	CS-b, L-b
Killackey, et al. ⁸⁷	2007	CS-a, L-a
Kok, et al. ⁸⁸	2007	CS-b, L-b
Morrison, et al. ⁸⁹	2007	L-e
Myles-Worsley, et al. ⁹⁰	2007	CS-d, L-c
Nieman, et al. ⁹¹	2007	CS-d, L-c
Niendam, et al. ⁹²	2007	CS-c, L-c
Niendam, et al. ⁹³	2007	CS-c, L-f
Niendam, et al. ⁹⁴	2007	CS-a, L-a
Patel, et al. ⁹⁵	2007	CS-a, L-a
Phillips, et al. ⁹⁶	2007	CS-c, L-d
Pinkham, et al. ⁹⁷	2007	CS-d, L-c
Sanderson, et al. ⁹⁸	2007	CS-a, L-a
Schultze-Lutter, et al. ⁹⁹	2007	L-e
Simon, et al. ¹⁰⁰	2007	CS-d, L-c
Svirskis, et al. ¹⁰¹	2007	CS-b
Thompson, et al. ¹⁰²	2007	CS-c, L-f
Thompson, et al. ¹⁰³	2007	CS-c, L-e
Yung, et al. ¹⁰⁴	2007	CS-c, L-e
Addington, et al. ⁸	2008	L-c
Cannon, et al. ¹⁰⁵	2008	CS-c, L-e
Chung, et al. ¹²	2008	L-c
Corcoran, et al. ¹⁰⁶	2008	CS-c, L-e
De Masi, et al. ¹⁰⁷	2008	CS-a, L-a
Hurlemann, et al. ¹⁰⁸	2008	CS-d, L-c
Karlsgodt, et al. ¹⁰⁹	2008	CS-a, L-a
O'Brien, et al. ¹¹⁰	2008	CS-c, L-e
Oezguerdal, et al. ¹¹¹	2008	CS-d, L-c
Quednow, et al. ²²	2008	L-c
Ruhrmann, et al. ²⁴	2008	L-c
Shim, et al. ¹¹²	2008	CS-c, L-f
Shim, et al. ¹¹³	2008	CS-e, L-c
Tarbox, et al. ¹¹⁴	2008	CS-a, L-a
Willhite, et al. ¹¹⁵	2008	CS-c, L-e
Yung, et al. ¹¹⁶	2008	L-e
Fusar-Poli, et al. ¹¹⁷	2009	CS-c, L-e
Grano, et al. ¹¹⁸	2009	CS-c, L-e
Hauser, et al. ¹¹⁹	2009	CS-c, L-c
Karlsgodt, et al. ¹²⁰	2009	CS-d, L-e
Keri, et al. ¹²¹	2009	CS-a, L-a

Study name	Year	Exclusion criteria
Koutsouleris, et al. ¹²²	2009	L-e
Lemos-Giraldez, et al. ⁴⁴	2009	CS-c
Niendam, et al. ¹²³	2009	CS-a, L-a
Niendam, et al. ¹⁹	2009	L-c
O'Brien, et al. ¹²⁴	2009	CS-c, L-c
Oezguerdal, et al. ¹²⁵	2009	CS-d, L-c
Phillips, et al. ¹²⁶	2009	CS-c, L-e
Riecher-Roessler, et al. ¹²⁷	2009	L-e
Simon, et al. ¹²⁸	2009	CS-c, L-e
Velthorst, et al. ¹²⁹	2009	CS-c, L-f
Woods, et al. ³⁶	2009	L-e
Yung, et al. ¹³⁰	2009	CS-b, L-b
Amminger, et al. ¹³¹	2010	CS-c, L-d
Armando, et al. ¹³²	2010	CS-b, L-b
Becker, et al. ³⁹	2010	CS-e
Chung, et al. ¹³³	2010	CS-c, L-c
Compton, et al. ¹³⁴	2010	CS-b, L-b
Fusar-Poli, et al. ¹³⁵	2010	CS-d, L-f
Fusar-Poli, et al. ¹³⁶	2010	CS-d, L-e
Ilonen, et al. ¹³⁷	2010	CS-d, L-c
Jang, et al. ¹³⁸	2010	CS-a, L-a
Korver, et al. ¹³⁹	2010	CS-d, L-c
Koutsouleris, et al. ¹⁴⁰	2010	CS-d, L-f
Lindgren, et al. ¹⁸	2010	L-c
Linszen, et al. ¹⁴¹	2010	CS-a, L-a
Luebbe, et al. ¹⁴²	2010	CS-b, L-b
Machielsen, et al. ¹⁴³	2010	CS-d, L-c
Mittal, et al. ¹⁴⁴	2010	L-e
Nelson, et al. ¹⁴⁵	2010	L-e
Romano, et al. ¹⁴⁶	2010	CS-b, L-b
Ruhrmann, et al. ¹⁴⁷	2010	CS-a, L-a
Ruhrmann, et al. ¹⁴⁸	2010	CS-c, L-e
Sabb, et al. ¹⁴⁹	2010	CS-e, L-f
Schlosser, et al. ¹⁵⁰	2010	CS-c, L-e
Seidman, et al. ¹⁵¹	2010	CS-d, L-e
Shim, et al. ¹⁵²	2010	CS-e, L-c
Simon, et al. ¹⁵³	2010	L-f
van Tricht, et al. ³⁴	2010	L-f
Velthorst, et al. ¹⁵⁴	2010	CS-c, L-f
Woodberry, et al. ¹⁵⁵	2010	CS-d, L-c
Addington, et al. ¹⁵⁶	2011	CS-d, L-e
Addington, et al. ¹⁵⁷	2011	CS-c, L-e
Bearden, et al. ³⁷	2011	CS-e

Study name	Year	Exclusion criteria
Bechdorf, et al. ¹⁵⁸	2011	CS-a, L-a
Bruene, et al. ¹⁵⁹	2011	CS-d, L-e
Carrion, et al. ¹⁰	2011	L-c
Chudleigh, et al. ¹¹	2011	L-c
Collip, et al. ¹⁶⁰	2011	CS-b, L-b
Corcoran, et al. ¹⁶¹	2011	CS-e, L-c
Fontenelle, et al. ¹⁶²	2011	CS-c, L-e
Frommann, et al. ¹⁶³	2011	CS-d, L-c
Fusar-Poli, et al. ¹⁶⁴	2011	CS-d, L-f
Fusar-Poli, et al. ¹⁶⁵	2011	CS-d, L-f
Gee, et al. ¹⁶⁶	2011	CS-a, L-a
Grano, et al. ¹⁶⁷	2011	CS-c, L-e
Grano, et al. ¹⁶⁸	2011	CS-d, L-c
Jang, et al. ¹⁶⁹	2011	CS-d, L-f
Keshavan, et al. ¹⁷⁰	2011	CS-a, L-a
Kim, et al. ⁴¹	2011	CS-d
Lin, et al. ¹⁷¹	2011	CS-c, L-e
Mees, et al. ¹⁷²	2011	L-a
Mittal, et al. ¹⁷³	2011	CS-c, L-e
Mukkala, et al. ¹⁷⁴	2011	CS-d, L-c
Niendam, et al. ¹⁷⁵	2011	CS-a, L-a
Pruessner, et al. ²¹	2011	L-c
Raballo, et al. ¹⁷⁶	2011	CS-c, L-e
Rauchensteiner, et al. ¹⁷⁷	2011	CS-d, L-c
Rietdijk, et al. ¹⁷⁸	2011	CS-c, L-c
Serrani ²⁶	2011	L-c
Simeonova, et al. ¹⁷⁹	2011	CS-c, L-e
Song, et al. ¹⁸⁰	2011	CS-b, L-b
Stanford, et al. ³¹	2011	L-c
Thompson, et al. ⁴⁵	2011	CS-c
van Rijn, et al. ¹⁸¹	2011	CS-e, L-c
van Rijn, et al. ³³	2011	L-c
Velthorst, et al. ¹⁸²	2011	CS-c, L-f
Yung, et al. ¹⁸³	2011	CS-c, L-e
Addington, et al. ¹⁸⁴	2012	CS-a, L-a
Amminger, et al. ¹⁸⁵	2012	CS-d, L-c
Armando, et al. ¹⁸⁶	2012	CS-c, L-c
Armando, et al. ¹⁸⁷	2012	CS-c, L-c
Bechdorf, et al. ¹⁸⁸	2012	CS-c, L-d
Bowie, et al. ¹⁸⁹	2012	CS-d, L-e
Cornblatt, et al. ¹⁹⁰	2012	CS-c, L-d
Demjaha, et al. ¹⁹¹	2012	L-f
Fusar-Poli, et al. ¹⁹²	2012	CS-a, L-a

Study name	Year	Exclusion criteria
Fusar-Poli, et al. ¹⁹³	2012	CS-a, L-a
Hur, et al. ¹⁹⁴	2012	CS-e, L-c
Jaracz, et al. ¹⁹⁵	2012	CS-a, L-a
Kelleher, et al. ¹⁹⁶	2012	CS-d, L-c
Koutsouleris, et al. ⁴²	2012	CS-d
Lavoie, et al. ¹⁹⁷	2012	CS-c, L-e
Lee, et al. ¹⁹⁸	2012	CS-b, L-b
Lin, et al. ¹⁹⁹	2012	L-a
Marques, et al. ²⁰⁰	2012	CS-d, L-c
Marshall, et al. ²⁰¹	2012	CS-c, L-e
Masillo, et al. ²⁰²	2012	CS-d, L-c
Morrison, et al. ²⁰³	2012	CS-c, L-e
Quijada, et al. ²⁰⁴	2012	CS-c, L-e
Rao, et al. ²⁰⁵	2012	CS-a, L-a
Remberk, et al. ²⁰⁶	2012	CS-b, L-b
Rietdijk, et al. ²⁰⁷	2012	CS-c, L-e
Schlosser, et al. ²⁵	2012	L-f
Schultze-Lutter, et al. ²⁰⁸	2012	CS-d, L-e
Simon, et al. ²⁸	2012	L-e
Smieskova, et al. ²⁹	2012	L-e
Song, et al. ²⁰⁹	2012	CS-a, L-a
Stain, et al. ²¹⁰	2012	CS-a, L-a
Strobl, et al. ²¹¹	2012	CS-a, L-a
Thompson, et al. ³²	2012	L-c
Tomassini, et al. ²¹²	2012	CS-a, L-a
Valli, et al. ²¹³	2012	CS-a, L-a
²¹⁴	2012	L-d
Verma, et al. ²¹⁵	2012	CS-c, L-e
Addington, et al. ²¹⁶	2013	CS-d, L-c
Amminger, et al. ²¹⁷	2013	CS-c, L-e
Bugra, et al. ²¹⁸	2013	CS-d, L-c
Comparelli, et al. ²¹⁹	2013	CS-c, L-c
De Herdt, et al. ²²⁰	2013	CS-a, L-a
Debbane, et al. ²²¹	2013	CS-b, L-b
Fulford, et al. ¹⁵	2013	L-c
Fusar-Poli, et al. ²²²	2013	CS-a, L-a
Gerlinger, et al. ²²³	2013	CS-a, L-a
Grano, et al. ²²⁴	2013	CS-c, L-c
Hui, et al. ⁵	2013	L-e
Hur, et al. ²²⁵	2013	CS-d, L-c
Jalbrzikowski, et al. ²²⁶	2013	CS-e, L-e
Kelleher, et al. ²²⁷	2013	CS-d, L-c
Kim, et al. ¹⁶	2013	L-e

Study name	Year	Exclusion criteria
Kline, et al. ²²⁸	2013	CS-d, L-c
Koren, et al. ¹⁷	2013	L-c
Lecardeur ²²⁹	2013	CS-a, L-a
Lee, et al. ²³⁰	2013	L-e
Lin, et al. ²³¹	2013	CS-a, L-a
Lin, et al. ²³²	2013	CS-c, L-e
McGorry, et al. ²³³	2013	CS-c, L-e
Mossaheb, et al. ²³⁴	2013	CS-c, L-e
Mueller, et al. ²³⁵	2013	CS-a, L-a
Nelson, et al. ²³⁶	2013	CS-c, L-e
Nieman, et al. ²³⁷	2013	CS-c, L-e
Niendam, et al. ²³⁸	2013	CS-a, L-a
Rapp, et al. ²³⁹	2013	CS-d, L-c
Ratheesh, et al. ²⁴⁰	2013	CS-d, L-f
Rausch, et al. ²³	2013	L-c
Riecher-Roessler, et al. ²⁴¹	2013	CS-a, L-a
Shin, et al. ²⁷	2013	L-c
Song, et al. ³⁰	2013	L-e
Stafford, et al. ²⁴²	2013	CS-a, L-a
Stowkowy, et al. ²⁴³	2013	CS-e
Sullivan, et al. ²⁴⁴	2013	CS-b, L-b
Taylor, et al. ²⁴⁵	2013	CS-c, L-c
Teyssier ²⁴⁶	2013	CS-a, L-a
Thompson, et al. ²⁴⁷	2013	CS-e, L-c
Tiffin, et al. ²⁴⁸	2013	CS-a, L-a
Tikka, et al. ²⁴⁹	2013	CS-d, L-c
Valmaggia, et al. ²⁵⁰	2013	CS-c, L-e
Velthorst, et al. ²⁵¹	2013	CS-c, L-e
Walder, et al. ²⁵²	2013	CS-c, L-e
Washida, et al. ³⁵	2013	L-e
Zaytseva, et al. ²⁵³	2013	CS-a, L-a
Niendam, et al. ²⁰	2014	L-c

Legend: HR, High Risk

Exclusion criteria for meta-analysis 1 and 2:

CS-a: Review, not original article written in English published on peer reviewed journal; **CS-b:** Missing HR diagnosis; **CS-c:** No comparison group; **CS-d:** No data for meta-analysis; **CS-e:** Overlapping dataset.

Exclusion criteria for meta-analysis 3:

L-a: Review, not original article written in English published on peer reviewed journal; **L-b:** Missing HR diagnosis; **L-c:** No follow-up; **L-d:** No observational design; **L-e:** No data for meta-analysis; **L-f:** Overlapping dataset;

Fig. DS1. PRISMA flow charts. Selection of articles comparing cross-sectional functioning (a, meta-analysis 1) and quality of life (b, meta-analysis 2) in HR subject vs. healthy comparisons and comparisons with psychosis; selection of longitudinal studies comparing baseline functioning in HR subjects who did and did not develop psychosis at follow-up (c, meta-analysis 3).

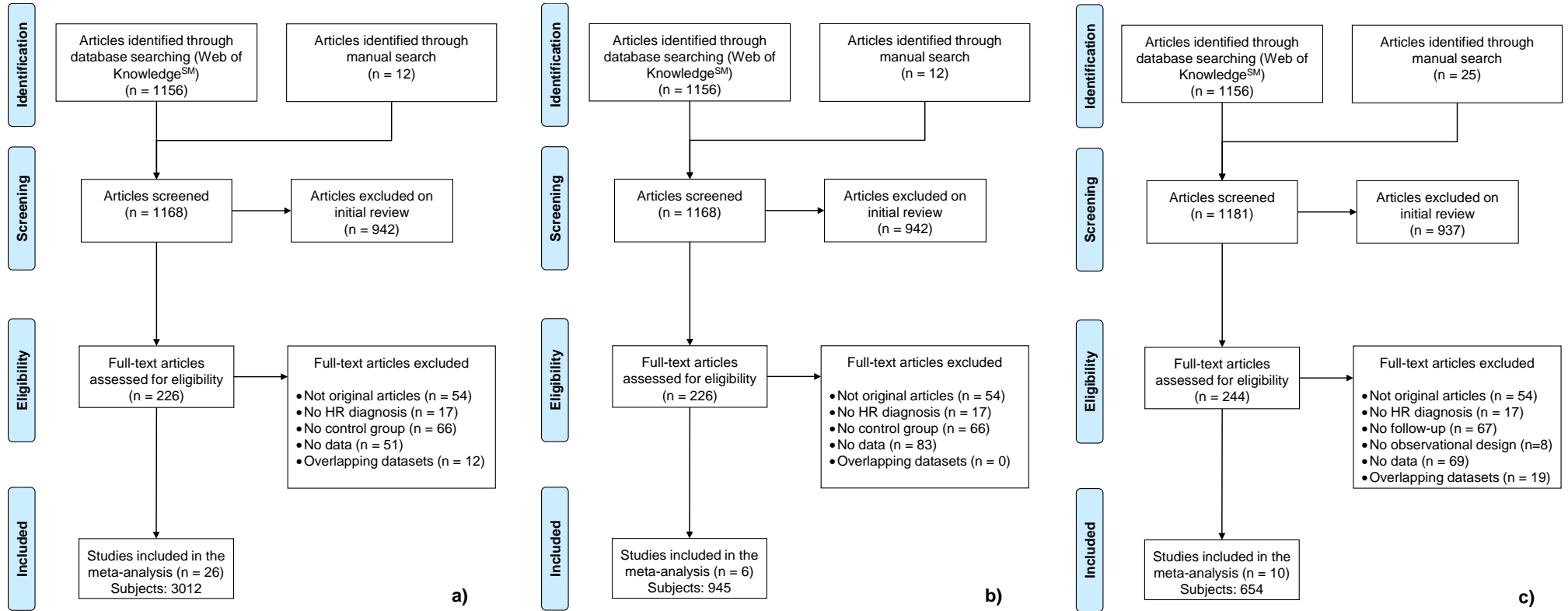


Fig. DS2. Meta-regressions of standardised difference in functioning between HR and psychosis (PS) and proportion of females, in the HR (a) or PS group (b).

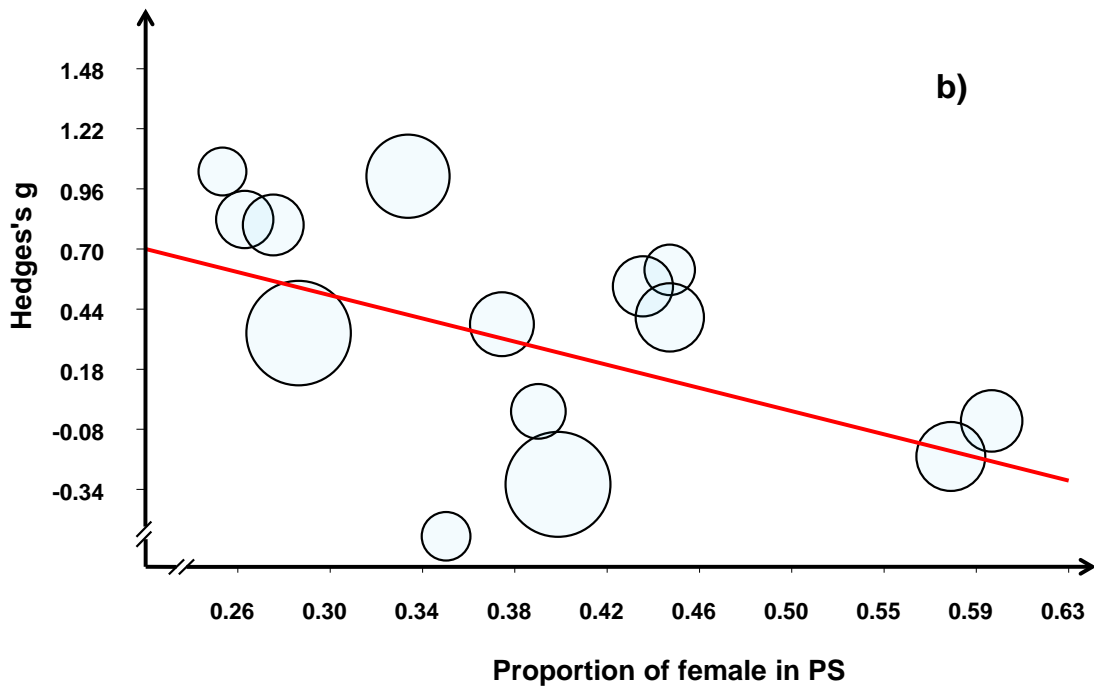
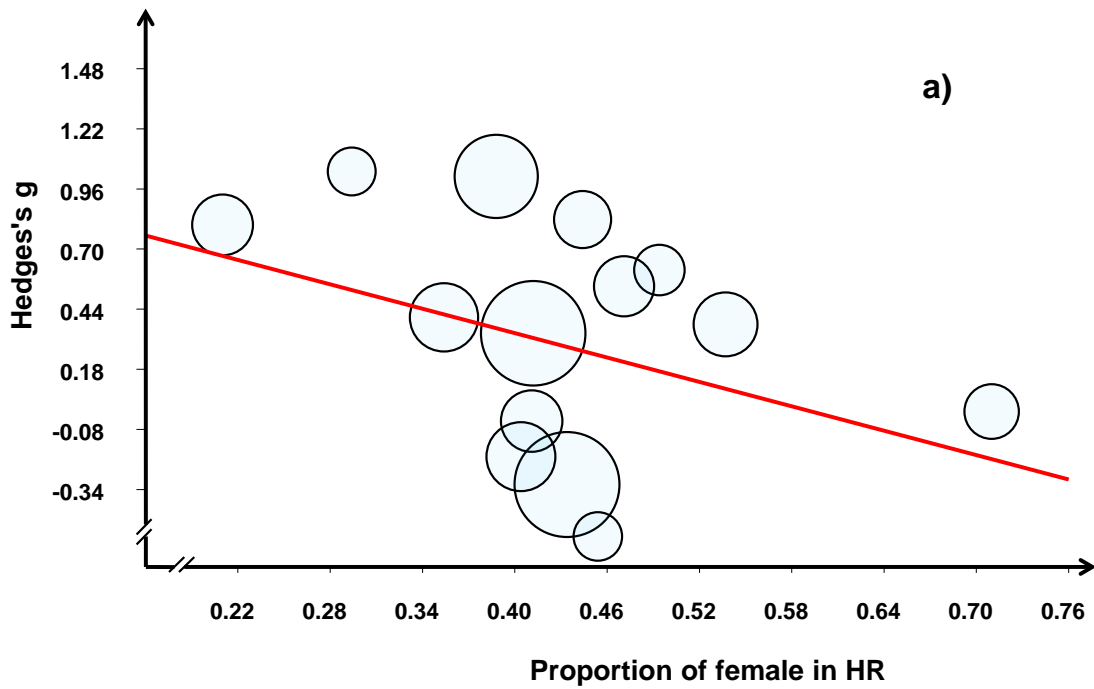


Fig. DS3. Supplementary meta-analysis of mean GAF score in HR, healthy (HC) and psychotic subjects (PS). HR mean GAF=50.38 (95% CI from 47.03 to 53.73, sample size=830); HC mean GAF=79.46 (95% CI from 73.40 to 85.52, sample size=391); PS mean GAF=44.72 (95% CI from 40.21 to 49.23, sample size=368).

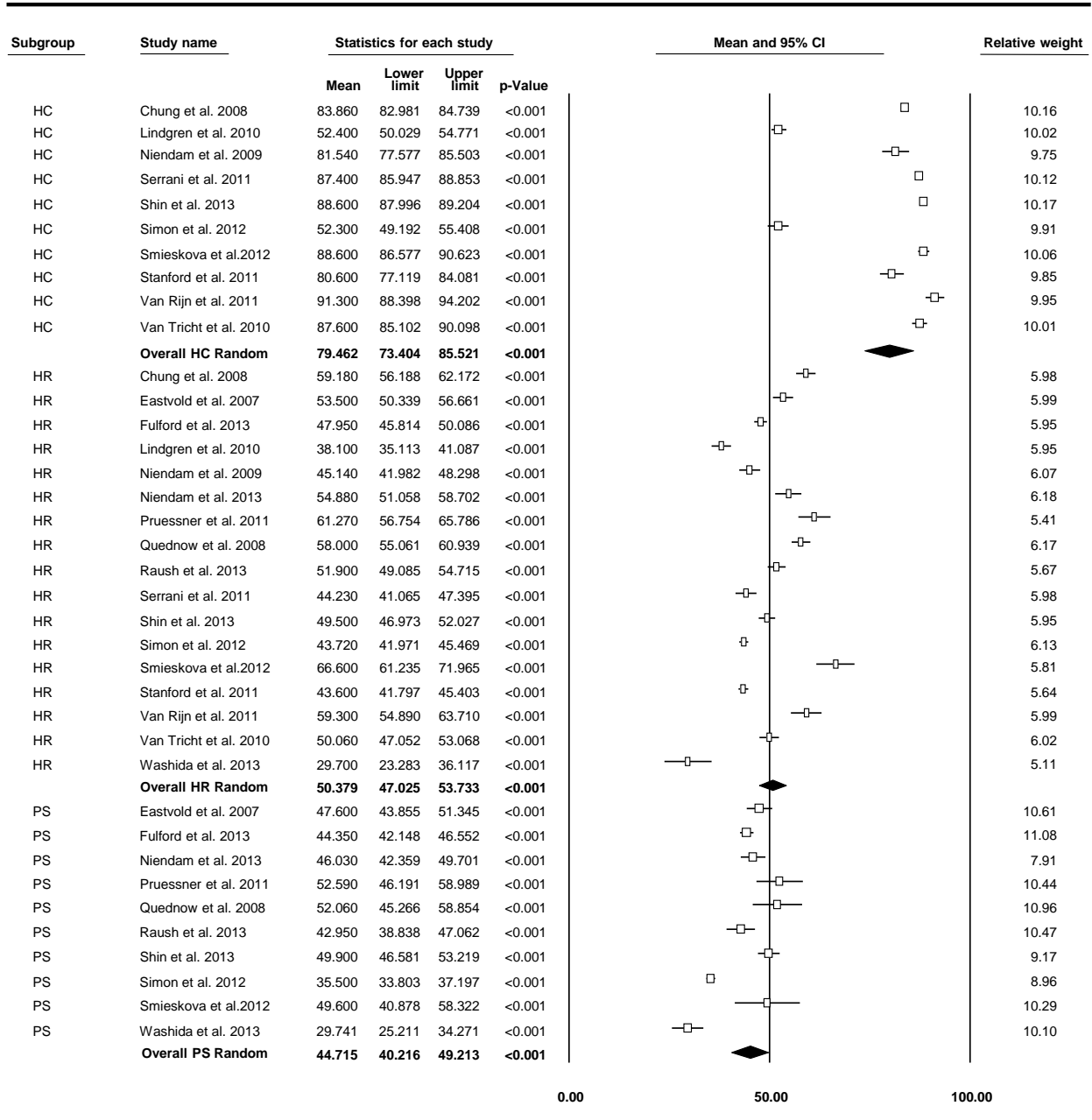
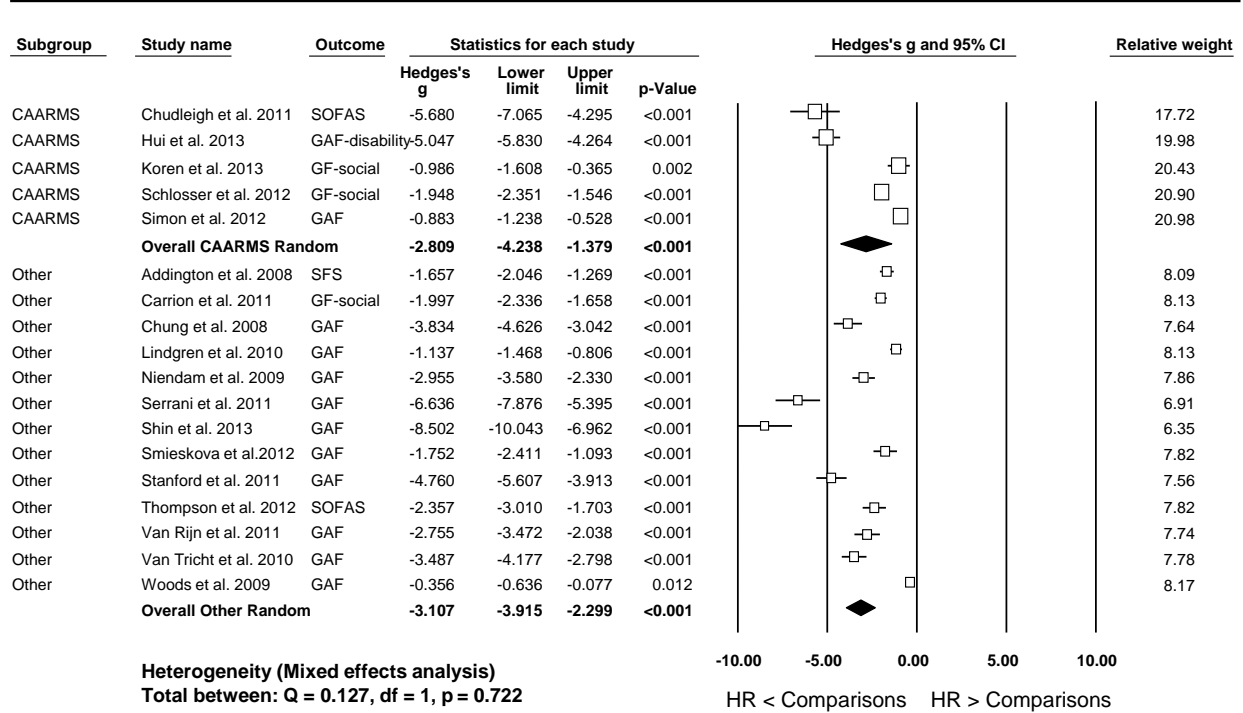
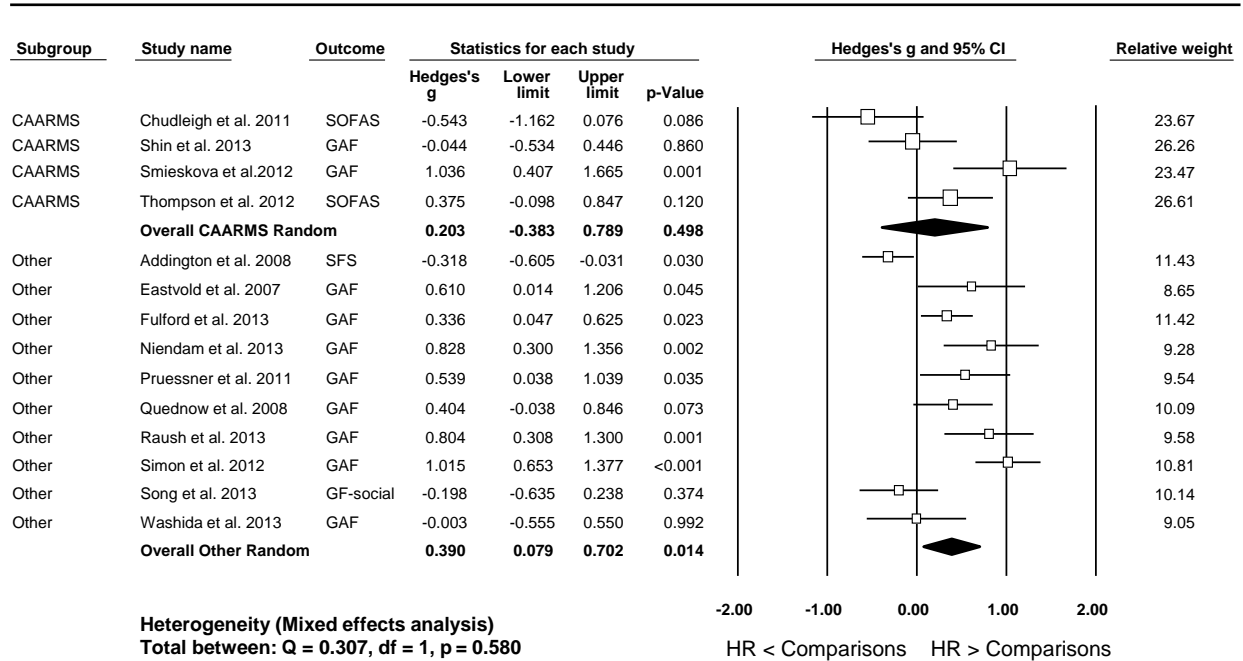


Fig. DS4. Supplementary meta-analysis comparing the Comprehensive Assessment of At Risk Mental State (CAARMS) and other HR assessment tools. In each analysis (HR vs healthy or psychotic comparison) no significant between subgroup heterogeneity emerged (HR vs healthy: $Q=0.127$, $p=0.722$; HR vs psychosis: $Q=0.307$, $p=0.580$) thus, the findings are not modulated by the HR diagnostic tool.

HR vs. healthy comparisons



HR vs. comparisons with psychosis



References

1. Association AP. *Diagnostic and statistical manual of mental disorders: DSM-IV-TR®*. American Psychiatric Publishing, 2000.
2. Cornblatt BA, Auther AM, Niendam T, Smith CW, Zinberg J, Bearden CE, et al. Preliminary Findings for Two New Measures of Social and Role Functioning in the Prodromal Phase of Schizophrenia. *Schizophr Bull.* 2007; **33**(3): 688-702.
3. Heinrichs DW, Hanlon TE, Carpenter WT, Jr. The Quality of Life Scale: an instrument for rating the schizophrenic deficit syndrome. *Schizophr Bull.* 1984; **10**(3): 388-98.
4. Pukrop R, Moller HJ, Steinmeyer EM. Quality of life in psychiatry: a systematic contribution to construct validation and the development of the integrative assessment tool "modular system for quality of life". *Eur Arch Psychiatry Clin Neurosci.* 2000; **250**(3): 120-32.
5. Hui C, Morcillo C, Russo DA, Stochl J, Shelley GF, Painter M, et al. Psychiatric morbidity, functioning and quality of life in young people at clinical high risk for psychosis. *Schizophr Res.* 2013; **148**(1-3): 175-80.
6. Yung A, Philips L, Simmons M, Ward J, Thompson K, French P. *CAARMS: Comprehensive Assessment of At Risk Mental States*. The PACE Clinic, 2006.
7. Higgins JP, Green S, Collaboration C. *Cochrane handbook for systematic reviews of interventions*. Wiley Online Library, 2008.
8. Addington J, Penn D, Woods SW, Addington D, Perkins DO. Social functioning in individuals at clinical high risk for psychosis. *Schizophr Res.* 2008; **99**(1-3): 119-24.
9. Bechdolf A, Pukrop R, Kohn D, Tschinkel S, Veith V, Schultze-Lutter F, et al. Subjective quality of life in subjects at risk for a first episode of psychosis: A comparison with first episode schizophrenia patients and healthy controls. *Schizophr Res.* 2005; **79**(1): 137-43.
10. Carrion RE, Goldberg TE, McLaughlin D, Auther AM, Correll CU, Cornblatt BA. Impact of neurocognition on social and role functioning in individuals at clinical high risk for psychosis. *Am J Psychiatry.* 2011; **168**(8): 806-13.
11. Chudleigh C, Naismith SL, Blaszczynski A, Hermens DF, Hodge MA, Hickie IB. How does social functioning in the early stages of psychosis relate to depression and social anxiety? *Early Interv Psychiatry.* 2011; **5**(3): 224-32.
12. Chung YS, Kang D-H, Shin NY, Yoo SY, Kwon JS. Deficit of theory of mind in individuals at ultra-high-risk for schizophrenia. *Schizophr Res.* 2008; **99**(1-3): 111-8.
13. Eastvold AD, Heaton RK, Cadenhead KS. Neurocognitive deficits in the (putative) prodrome and first episode of psychosis. *Schizophr Res.* 2007; **93**(1-3): 266-77.
14. Francey SM, Jackson HJ, Phillips LJ, Wood SJ, Yung AR, McGorry PD. Sustained attention in young people at high risk of psychosis does not predict transition to psychosis. *Schizophr Res.* 2005; **79**(1): 127-36.

15. Fulford D, Niendam TA, Floyd EG, Carter CS, Mathalon DH, Vinogradov S, et al. Symptom dimensions and functional impairment in early psychosis: More to the story than just negative symptoms. *Schizophr Res*. 2013; **147**(1): 125-31.
16. Kim KR, Song YY, Park JY, Lee EH, Lee M, Lee SY, et al. The relationship between psychosocial functioning and resilience and negative symptoms in individuals at ultra-high risk for psychosis. *Aust N Z J Psychiatry*. 2013; **47**(8): 762-71.
17. Koren D, Reznik N, Adres M, Scheyer R, Apter A, Steinberg T, et al. Disturbances of basic self and prodromal symptoms among non-psychotic help-seeking adolescents. *Psychol Med*. 2013; **43**(7): 1365-76.
18. Lindgren M, Manninen M, Laajasalo T, Mustonen U, Kalska H, Suvisaari J, et al. The relationship between psychotic-like symptoms and neurocognitive performance in a general adolescent psychiatric sample. *Schizophr Res*. 2010; **123**(1): 77-85.
19. Niendam TA, Berzak J, Cannon TD, Bearden CE. Obsessive compulsive symptoms in the psychosis prodrome: Correlates of clinical and functional outcome. *Schizophr Res*. 2009; **108**(1-3): 170-5.
20. Niendam TA, Lesh TA, Yoon J, Westphal AJ, Hutchison N, Daniel Ragland J, et al. Impaired context processing as a potential marker of psychosis risk state. *Psychiatry Res*. 2014; **221**(1): 13-20.
21. Pruessner M, Iyer SN, Faridi K, Joobor R, Malla AK. Stress and protective factors in individuals at ultra-high risk for psychosis, first episode psychosis and healthy controls. *Schizophr Res*. 2011; **129**(1): 29-35.
22. Quednow BB, Frommann I, Berning J, Kuehn K-U, Maier W, Wagner M. Impaired Sensorimotor Gating of the Acoustic Startle Response in the Prodrome of Schizophrenia. *Biol Psychiatry*. 2008; **64**(9): 766-73.
23. Rausch F, Eifler S, Esser A, Esslinger C, Schirmbeck F, Meyer-Lindenberg A, et al. The Early Recognition Inventory ERIraos detects at risk mental states of psychosis with high sensitivity. *Compr Psychiatry*. 2013; **54**(7): 1068-76.
24. Ruhrmann S, Paruch J, Bechdolf A, Pukrop R, Wagner M, Berning J, et al. Reduced subjective quality of life in persons at risk for psychosis. *Acta Psychiatr Scand*. 2008; **117**(5): 357-68.
25. Schlosser DA, Jacobson S, Chen Q, Sugar CA, Niendam TA, Li G, et al. Recovery From an At-Risk State: Clinical and Functional Outcomes of Putatively Prodromal Youth Who Do Not Develop Psychosis. *Schizophr Bull*. 2012; **38**(6): 1225-33.
26. Serrani D. Neurocognitive assessment of ultra high risk of psychosis states using the MATRICS battery (Measurement and Treatment Research to Improve Cognition in Schizophrenia). *Rev Psiquiatr Clín*. 2011; **38**(4): 130-4.
27. Shin YS, Kim SN, Shin NY, Jung WH, Hur JW, Byun MS, et al. Increased intra-individual variability of cognitive processing in subjects at risk mental state and schizophrenia patients. In: PLoS One: e783542013.
28. Simon AE, Graedel M, Cattapan-Ludewig K, Gruber K, Ballinari P, Roth B, et al. Cognitive functioning in at-risk mental states for psychosis and 2-year clinical outcome. *Schizophr Res*. 2012; **142**(1-3): 108-15.
29. Smieskova R, Fusar-Poli P, Aston J, Simon A, Bendfeldt K, Lenz C, et al. Insular volume abnormalities associated with different transition probabilities to psychosis. *Psychol Med*. 2012; **42**(8): 1613-25.

30. Song YY, Kang JI, Kim SJ, Lee MK, Lee E, An SK. Temperament and character in individuals at ultra-high risk for psychosis and with first-episode schizophrenia: Associations with psychopathology, psychosocial functioning, and aspects of psychological health. *Compr Psychiatry*. 2013; **54**(8): 1161-8.
31. Stanford AD, Messinger J, Malaspina D, Corcoran CM. Theory of Mind in patients at clinical high risk for psychosis. *Schizophr Res*. 2011; **131**(1-3): 11-7.
32. Thompson A, Papas A, Bartholomeusz C, Allott K, Amminger GP, Nelson B, et al. Social cognition in clinical "at risk" for psychosis and first episode psychosis populations. *Schizophr Res*. 2012; **141**(2-3): 204-9.
33. van Rijn S, Aleman A, de Sonnevile L, Sprong M, Ziermans T, Schothorst P, et al. Misattribution of facial expressions of emotion in adolescents at increased risk of psychosis: the role of inhibitory control. *Psychol Med*. 2011; **41**(3): 499-508.
34. van Tricht MJ, Nieman DH, Koelman JHTM, van der Meer JN, Bour LJ, de Haan L, et al. Reduced Parietal P300 Amplitude is Associated with an Increased Risk for a First Psychotic Episode. *Biol Psychiatry*. 2010; **68**(7): 642-8.
35. Washida K, Takeda T, Habara T, Sato S, Oka T, Tanaka M, et al. Efficacy of second-generation antipsychotics in patients at ultra-high risk and those with first-episode or multi-episode schizophrenia. *Neuropsychiatr Dis Treat*. 2013; **9**: 861-8.
36. Woods SW, Addington J, Cadenhead KS, Cannon TD, Cornblatt BA, Heinssen R, et al. Validity of the Prodromal Risk Syndrome for First Psychosis: Findings From the North American Prodrome Longitudinal Study. *Schizophr Bull*. 2009; **35**(5): 894-908.
37. Bearden CE, Wu KN, Caplan R, Cannon TD. Thought Disorder and Communication Deviance as Predictors of Outcome in Youth at Clinical High Risk for Psychosis. *J Am Acad Child Adolesc Psychiatry*. 2011; **50**(7): 669-80.
38. Bechdolf A, Thompson A, Nelson B, Cotton S, Simmons MB, Amminger GP, et al. Experience of trauma and conversion to psychosis in an ultra-high-risk (prodromal) group. *Acta Psychiatr Scand*. 2010; **121**(5): 377-84.
39. Becker HE, Nieman DH, Wiltink S, Dingemans PM, de Fliert JRv, Velthorst E, et al. Neurocognitive functioning before and after the first psychotic episode: does psychosis result in cognitive deterioration? *Psychol Med*. 2010; **40**(10): 1599-606.
40. Brewer WJ, Francey SM, Wood SJ, Jackson HJ, Pantelis C, Phillips LJ, et al. Memory impairments identified in people at ultra-high risk for psychosis who later develop first-episode psychosis. *Am J Psychiatry*. 2005; **162**(1): 71-8.
41. Kim HS, Shin NY, Jang JH, Kim E, Shim G, Park HY, et al. Social cognition and neurocognition as predictors of conversion to psychosis in individuals at ultra-high risk. *Schizophr Res*. 2011; **130**(1-3): 170-5.
42. Koutsouleris N, Davatzikos C, Bottlender R, Patschurek-Kliche K, Scheuerecker J, Decker P, et al. Early Recognition and Disease Prediction in the At-Risk Mental States for Psychosis Using Neurocognitive Pattern Classification. *Schizophr Bull*. 2012; **38**(6): 1200-15.
43. Lam MML, Hung SF, Chen EYH. Transition to psychosis: 6-month follow-up of a Chinese high-risk group in Hong Kong. *Aust N Z J Psychiatry*. 2006; **40**(5): 414-20.

44. Lemos-Giraldez S, Vallina-Fernandez O, Fernandez-Iglesias P, Vallejo-Seco G, Fonseca-Pedrero E, Paino-Pineiro M, et al. Symptomatic and functional outcome in youth at ultra-high risk for psychosis: A longitudinal study. *Schizophr Res.* 2009; **115**(2-3): 121-9.
45. Thompson A, Nelson B, Yung A. Predictive validity of clinical variables in the "at risk" for psychosis population: International comparison with results from the North American Prodrome Longitudinal Study. *Schizophr Res.* 2011; **126**(1-3): 51-7.
46. Ziermans TB, Schothorst PF, Sprong M, van Engeland H. Transition and remission in adolescents at ultra-high risk for psychosis. *Schizophr Res.* 2011; **126**(1-3): 58-64.
47. McGorry PD, Edwards J, Mihalopoulos C, Harrigan SM, Jackson HJ. EPPIC: An evolving system of early detection and optimal management. *Schizophr Bull.* 1996; **22**(2): 305-26.
48. Klosterkotter J, Hellmich M, Steinmeyer EM, Schultze-Lutter F. Diagnosing schizophrenia in the initial prodromal phase. *Arch Gen Psychiatry.* 2001; **58**(2): 158-64.
49. McGorry PD, Yung AR, Phillips LJ, Yuen HP, Francey S, Cosgrave EM, et al. Randomized controlled trial of interventions designed to reduce the risk of progression to first-episode psychosis in a clinical sample with subthreshold symptoms. *Arch Gen Psychiatry.* 2002; **59**(10): 921-8.
50. Miller TJ, McGlashan TH, Rosen JL, Cadenhead K, Ventura J, McFarlane W, et al. Interview for prodromal syndromes and the scale of prodromal symptoms: Predictive validity, interrater reliability, and training to reliability. *Schizophr Bull.* 2003; **29**(4): 703-15.
51. Ruhrmann S, Schultze-Lutter F, Klosterkotter J. Early detection and intervention in the initial prodromal phase of schizophrenia. *Pharmacopsychiatry.* 2003; **36 Suppl 3**: S162-7.
52. Yung AR, Phillips LJ, Yuen HP, Francey SM, McFarlane CA, Hallgren M, et al. Psychosis prediction: 12-month follow up of a high-risk ("prodromal") group. *Schizophr Res.* 2003; **60**(1): 21-32.
53. Addington J, Zipursky R, Perkins D, Woods SW, Miller TJ, McGlashan TH. Decline in social functioning for those with an "at risk mental state". *Schizophr Res.* 2004; **70**(1): 37-.
54. Francey S, Brewer W, Wood S, Phillips L, Proffitt I, Jackson H, et al. Neuropsychological functioning in young people at ultra-high-risk of developing psychosis: Findings from the PACE Clinic. *Schizophr Res.* 2004; **70**(1): 26-.
55. Hawkins KA, Addington J, Keefe RSE, Christensen B, Perkins DO, Zipursky R, et al. Neuropsychological status of subjects at high risk for a first episode of psychosis. *Schizophr Res.* 2004; **67**(2-3): 115-22.
56. Mason O, Startup M, Halpin S, Schall U, Conrad A, Carr V. Risk factors for transition to first episode psychosis among individuals with 'at-risk mental states'. *Schizophr Res.* 2004; **71**(2-3): 227-37.
57. Morrison AP, French P, Walford L, Lewis SW, Kilcommons A, Green J, et al. Cognitive therapy for the prevention of psychosis in people at ultra-high risk - Randomised controlled trial. *Br J Psychiatry.* 2004; **185**: 291-7.
58. Phillips L, Thompson K, Komesaroff P, Yuen HP, Jones S, Kelly D, et al. HPA-axis functioning and the onset of psychosis in an 'ultra' high-risk group. *Schizophr Res.* 2004; **70**(1): 15-6.
59. Yung AR, Phillips LJ, Yuen HP, McGorry PD. Risk factors for psychosis in an ultra high-risk group: psychopathology and clinical features. *Schizophr Res.* 2004; **67**(2-3): 131-42.

60. Barnett JH, Sahakian BJ, Werners U, Hill KE, Brazil R, Gallagher O, et al. Visuospatial learning and executive function are independently impaired in first-episode psychosis. *Psychol Med.* 2005; **35**(7): 1031-41.
61. Cannon TD. Clinical and genetic high-risk strategies in understanding vulnerability to psychosis. *Schizophr Res.* 2005; **79**(1): 35-44.
62. Hunt SA, Schall U, Halpin SA, Beckmann CJ, Carr V. Neurocognitive profiles of prodromal psychosis. *Schizophr Bull.* 2005; **31**(2): 326-7.
63. Amminger GP, Leicester S, Yung AR, Phillips LJ, Berger GE, Francey SM, et al. Early-onset of symptoms predicts conversion to non-affective psychosis in ultra-high risk individuals. *Schizophr Res.* 2006; **84**(1): 67-76.
64. Becker HE, Nieman DH, van de Fliert JR, Dingemans PM, Linszen DH. Cognitive functioning in patients at ultra high risk for psychosis: Relation with daily life functioning. *Schizophr Res.* 2006; **86**: S90-S.
65. Becker HE, Nieman DH, Van De Fliert JR, Dingemans PM, Linszen DH. Cognitive functioning in patients at ultra high risk for developing psychosis. *Schizophr Res.* 2006; **81**: 259-.
66. Becker HE, Nieman DH, Van De Fliert JR, Dingemans PM, Linszen DH. Cognitive functioning in patients at ultra high risk for a first episode of psychosis: Relation to daily life functioning. *Schizophr Res.* 2006; **81**: 259-.
67. Brewer WJ, Wood SJ, Phillips LJ, Francey SM, Pantelis C, Yung AR, et al. Generalized and specific cognitive performance in clinical high-risk cohorts: A review highlighting potential vulnerability markers for psychosis. *Schizophr Bull.* 2006; **32**(3): 538-55.
68. Klaassen MC, Nieman DH, Becker HE, Linszen DH. Is there any point in detecting high risk factors prior to a first psychosis? *Tijdschrift voor psychiatrie.* 2006; **48**(6): 467-76.
69. Lencz T, Smith CW, McLaughlin D, Auther A, Nakayama E, Hovey L, et al. Generalized and specific neurocognitive deficits in prodromal schizophrenia. *Biol Psychiatry.* 2006; **59**(9): 863-71.
70. Macedo G, Azevedo Y, Furrier A, Monteiro LC, Xavier JCM, Castro LSL, et al. Demographic characteristics of subjects at risk for psychosis in Sao Paulo, Brazil: First results. *Schizophr Res.* 2006; **81**: 266-.
71. McGlashan TH, Zipursky RB, Perkins D, Addington J, Miller T, Woods SW, et al. Randomized, double-blind trial of olanzapine versus placebo in patients prodromally symptomatic for psychosis. *Am J Psychiatry.* 2006; **163**(5): 790-9.
72. Niendam TA, Bearden CE, Johnson JK, McKinley M, Loewy R, O'Brien M, et al. Neurocognitive performance and functional disability in the psychosis prodrome. *Schizophr Res.* 2006; **84**(1): 100-11.
73. Nordentoft M, Thorup A, Petersen L, Ohlenschlaeger J, Melau M, Christensen TO, et al. Transition rates from schizotypal disorder to psychotic disorder for first-contact patients included in the OPUS trial. A randomized clinical trial of integrated treatment and standard treatment. *Schizophr Res.* 2006; **83**(1): 29-40.
74. Silverstein S, Uhlhaas PJ, Essex B, Halpin S, Schall U, Carr V. Perceptual organization in first episode schizophrenia and ultra-high-risk states. *Schizophr Res.* 2006; **83**(1): 41-52.
75. Simon AE, Dvorsky DN, Boesch J, Roth B, Isler E, Schueler P, et al. Defining subjects at risk for psychosis: A comparison of two approaches. *Schizophr Res.* 2006; **81**(1): 83-90.

76. Trotman H, McMillan A, Walker E. Cognitive function and symptoms in adolescents with schizotypal personality disorder. *Schizophr Bull.* 2006; **32**(3): 489-97.
77. Wood SJ, Berger GE, Lambert M, Conus P, Velakoulis D, Stuart GW, et al. Prediction of functional outcome 18 months after a first psychotic episode - A proton magnetic resonance spectroscopy study. *Arch Gen Psychiatry.* 2006; **63**(9): 969-76.
78. Yung AR, Stanford C, Cosgrave E, Killackey E, Phillips L, Nelson B, et al. Testing the Ultra High Risk (prodromal) criteria for the prediction of psychosis in a clinical sample of young people. *Schizophr Res.* 2006; **84**(1): 57-66.
79. Yung AR, Buckby JA, Cotton SM, Cosgrave EM, Killackey EJ, Stanford C, et al. Psychotic-like experiences in nonpsychotic help-seekers: Associations with distress, depression, and disability. *Schizophr Bull.* 2006; **32**(2): 352-9.
80. Addington J, Cadenhead KS, Cannon TD, Cornblatt B, McGlashan TH, Perkins DO, et al. North American Prodrome Longitudinal Study: A collaborative multisite approach to prodromal schizophrenia research. *Schizophr Bull.* 2007; **33**(3): 665-72.
81. Ballon JS, Kaur T, Marks, II, Cadenhead KS. Social functioning in young people at risk for schizophrenia. *Psychiatry Res.* 2007; **151**(1-2): 29-35.
82. Berger G, Dell'Olio M, Amminger P, Cornblatt B, Phillips L, Yung A, et al. Neuroprotection in emerging psychotic disorders. *Early Interv Psychiatry.* 2007; **1**(2): 114-27.
83. Cannon TD, Cornblatt B, McGorry P. Editor's introduction: The empirical status of the ultra high-risk (prodromal) research paradigm. *Schizophr Bull.* 2007; **33**(3): 661-4.
84. Cornblatt BA, Lencz T, Smith CW, Olsen R, Auther AM, Nakayama E, et al. Can antidepressants be used to treat the schizophrenia prodrome? Results of a prospective, naturalistic treatment study of adolescents. *J Clin Psychiatry.* 2007; **68**(4): 546-57.
85. Czernikiewicz A, Szulc A. Pre-psychotic states - contemporary diagnostic and therapeutic issues. Part I. Clinical identification of pre-psychotic states. *Psychiatr Pol.* 2007; **41**(1): 5-15.
86. Jabben N, van Os J, Janssen I, Versmissen D, Krabbendam L. Cognitive alterations in groups at risk for psychosis: neutral markers of genetic risk or indicators of social disability? *Acta Psychiatr Scand.* 2007; **116**(4): 253-62.
87. Killackey E, Yung AR, Mc Gorry PD. Early psychosis: Where we've been, where we still have to go. *Epidemiologia E Psichiatria Sociale-an International Journal for Epidemiology and Psychiatric Sciences.* 2007; **16**(2): 102-8.
88. Kok ET, Groeneveld FPMJ, Busschbach JJV, Hop WCJ, Bosch JLHR, Thomas S, et al. Influence of coping styles on quality of life in men with new and increasing lower urinary tract symptoms. *Urol Int.* 2007; **79**(3): 226-30.
89. Morrison AP, French P, Parker S, Roberts M, Stevens H, Bentall RP, et al. Three-year follow-up of a randomized controlled trial of cognitive therapy for the prevention of psychosis in people at ultrahigh risk. *Schizophr Bull.* 2007; **33**(3): 682-7.
90. Myles-Worsley M, Ord LM, Ngiralmu H, Weaver S, Blailles F, Faraone SV. The Palau Early Psychosis Study: Neurocognitive functioning in high-risk adolescents. *Schizophr Res.* 2007; **89**(1-3): 299-307.

91. Nieman D, Becker H, van de Fliert R, Plat N, Bour L, Koelman H, et al. Antisaccade task performance in patients at ultra high risk for developing psychosis. *Schizophr Res.* 2007; **95**(1-3): 54-60.
92. Niendam TA, Horwitz J, Bearden CE, Cannon TD. Ecological assessment of executive dysfunction in the psychosis prodrome: A pilot study. *Schizophr Res.* 2007; **93**(1-3): 350-4.
93. Niendam TA, Bearden CE, Zinberg J, Johnson JK, O'Brien M, Cannon TD. The course of neurocognition and social functioning in individuals at ultra high risk for psychosis. *Schizophr Bull.* 2007; **33**(3): 772-81.
94. Niendam TA, Zinberg J, Bearden CE, O'Brien M, Daley M, Cannon TD. Relationship between adolescent cognitive functioning and family environment in the psychosis prodrome. *Biol Psychiatry.* 2007; **61**(8): 77S-S.
95. Patel V, Flisher AJ, Hetrick S, McGorry P. Adolescent Health 3 - Mental health of young people: a global public-health challenge. *Lancet.* 2007; **369**(9569): 1302-13.
96. Phillips LJ, McGorry PD, Yuen HP, Ward J, Donovan K, Kelly D, et al. Medium term follow-up of a randomized controlled trial of interventions for young people at ultra high risk of psychosis. *Schizophr Res.* 2007; **96**(1-3): 25-33.
97. Pinkham AE, Penn DL, Perkins DO, Graham KA, Siegel M. Emotion perception and social skill over the course of psychosis: a comparison of individuals "at-risk" for psychosis and individuals with early and chronic schizophrenia spectrum illness. *Cogn Neuropsychiatry.* 2007; **12**(3): 198-212.
98. Sanderson S, Tatt ID, Higgins JP. Tools for assessing quality and susceptibility to bias in observational studies in epidemiology: a systematic review and annotated bibliography. *Int J Epidemiol.* 2007; **36**(3): 666-76.
99. Schultze-Lutter F, Klosterkötter J, Picker H, Steinmeyer E-M, Ruhrmann S. Predicting first-episode psychosis by basic symptom criteria. *Clin Neuropsychiatry.* 2007; **4**(1): 11-22.
100. Simon AE, Cattapan-Ludewig K, Zmilacher S, Arbach D, Gruber K, Dvorsky DN, et al. Cognitive functioning in the schizophrenia prodrome. *Schizophr Bull.* 2007; **33**(3): 761-71.
101. Svirskis T, Korkeila J, Heinimaa M, Huttunen J, Ilonen T, Ristkari T, et al. Quality of life and functioning ability in subjects vulnerable to psychosis. *Compr Psychiatry.* 2007; **48**(2): 155-60.
102. Thompson KN, Phillips LJ, Komesaroff P, Yuen HP, Wood SJ, Pantelis C, et al. Stress and HPA-axis functioning in young people at ultra high risk for psychosis. *J Psychiatr Res.* 2007; **41**(7): 561-9.
103. Thompson KN, Berger G, Phillips LJ, Komesaroff P, Purcell R, McGorry PD. HPA axis functioning associated with transition to psychosis: Combined DEX/CRH test. *J Psychiatr Res.* 2007; **41**(5): 446-50.
104. Yung AR, Yuen HP, Berger G, Francey S, Hung T-C, Nelson B, et al. Declining transition rate in ultra high risk (prodromal) services: Dilution or reduction of risk? *Schizophr Bull.* 2007; **33**(3): 673-81.
105. Cannon TD, Cadenhead K, Cornblatt B, Woods SW, Addington J, Walker E, et al. Prediction of psychosis in youth at high clinical risk. *Arch Gen Psychiatry.* 2008; **65**(1): 28-37.
106. Corcoran CM, Kimhy D, Stanford A, Khan S, Walsh J, Thompson J, et al. Temporal association of cannabis use with symptoms in individuals at clinical high risk for psychosis. *Schizophr Res.* 2008; **106**(2-3): 286-93.
107. De Masi S, Sampaolo L, Mele A, Morciano C, Cappello S, Meneghelli A, et al. The Italian guidelines for early intervention in schizophrenia: development and conclusions. *Early Interv Psychiatry.* 2008; **2**(4): 291-302.

108. Hurlemann R, Jessen F, Wagner M, Frommann I, Ruhrmann S, Brockhaus A, et al. Interrelated neuropsychological and anatomical evidence of hippocampal pathology in the at-risk mental state. *Psychol Med*. 2008; **38**(6): 843-51.
109. Karlsgodt KH, Niendam TA, Poldrack RA, Bearden CE, Cannon TD. White matter integrity and prediction of social and role functioning in subjects at ultra-high risk for psychosis. *Biol Psychiatry*. 2008; **63**(7): 256S-S.
110. O'Brien MP, Zinberg JL, Bearden CE, Lopez SR, Kopelowicz A, Daley M, et al. Parent attitudes and parent adolescent interaction in families of youth at risk for psychosis and with recent-onset psychotic symptoms. *Early Interv Psychiatry*. 2008; **2**(4): 268-76.
111. Oezguerdal S, Gudlowski Y, Witthaus H, Kawohl W, Uhl I, Hauser M, et al. Reduction of auditory event-related P300 amplitude in subjects with at-risk mental state for schizophrenia. *Schizophr Res*. 2008; **105**(1-3): 272-8.
112. Shim G, Kang D-H, Choi J-S, Jung MH, Kwon SJ, Jang GE, et al. Prospective outcome of early intervention for individuals at ultra-high-risk for psychosis. *Early Interv Psychiatry*. 2008; **2**(4): 277-84.
113. Shim G, Kang D-H, Chung YS, Yoo SY, Shin NY, Kwon JS. Social functioning deficits in young people at risk for schizophrenia. *Aust N Z J Psychiatry*. 2008; **42**(8): 678-85.
114. Tarbox SI, Pogue-Geile MF. Development of social functioning in preschizophrenia children and adolescents: A systematic review. *Psychol Bull*. 2008; **134**(4): 561-83.
115. Willhite RK, Niendam TA, Bearden CE, Zinberg J, O'Brien MP, Cannon TD. Gender differences in symptoms, functioning and social support in patients at ultra-high risk for developing a psychotic disorder. *Schizophr Res*. 2008; **104**(1-3): 237-45.
116. Yung AR, Nelson B, Stanford C, Simmons MB, Cosgrave EM, Killackey E, et al. Validation of "prodromal" criteria to detect individuals at ultra high risk of psychosis: 2 year follow-up. *Schizophr Res*. 2008; **105**(1-3): 10-7.
117. Fusar-Poli P, Meneghelli A, Valmaggia L, Allen P, Galvan F, McGuire P, et al. Duration of untreated prodromal symptoms and 12-month functional outcome of individuals at risk of psychosis. *Br J Psychiatry*. 2009; **194**(2): 181-2.
118. Grano N, Karjalainen M, Anto J, Itkonen A, Edlund V, Roine M. Intervention to improve level of overall functioning and mental condition of adolescents at high risk of developing first-episode psychosis in Finland. *Early Interv Psychiatry*. 2009; **3**(2): 94-8.
119. Hauser M, Lautenschlager M, Gudlowski Y, Oezguerdal S, Witthaus H, Bechdolf A, et al. Psychoeducation with patients at-risk for schizophrenia-An exploratory pilot study. *Patient Educ Couns*. 2009; **76**(1): 138-42.
120. Karlsgodt KH, Niendam TA, Bearden CE, Cannon TD. White Matter Integrity and Prediction of Social and Role Functioning in Subjects at Ultra-High Risk for Psychosis. *Biol Psychiatry*. 2009; **66**(6): 562-9.
121. Keri S, Kiss I, Kelemen O. Effects of a neuregulin 1 variant on conversion to schizophrenia and schizophreniform disorder in people at high risk for psychosis. *Mol Psychiatry*. 2009; **14**(2): 118-9.
122. Koutsouleris N, Schmitt GJE, Gaser C, Bottlender R, Scheuerecker J, McGuire P, et al. Neuroanatomical correlates of different vulnerability states for psychosis and their clinical outcomes. *Br J Psychiatry*. 2009; **195**(3): 218-26.

123. Niendam TA, Jalbrzikowski M, Bearden CE. Exploring Predictors of Outcome in the Psychosis Prodrome: Implications for Early Identification and Intervention. *Neuropsychol Rev*. 2009; **19**(3): 280-93.
124. O'Brien MP, Zinberg JL, Ho L, Rudd A, Kopelowicz A, Daley M, et al. Family problem solving interactions and 6-month symptomatic and functional outcomes in youth at ultra-high risk for psychosis and with recent onset psychotic symptoms: A longitudinal study. *Schizophr Res*. 2009; **107**(2-3): 198-205.
125. Oezguerdal S, Littmann E, Hauser M, von Reventlow H, Gudlowski Y, Witthaus H, et al. Neurocognitive performances in participants of at-risk mental state for schizophrenia and in first-episode patients. *J Clin Exp Neuropsychol*. 2009; **31**(4): 392-401.
126. Phillips LJ, Nelson B, Yuen HP, Francey SM, Simmons M, Stanford C, et al. Randomized controlled trial of interventions for young people at ultra-high risk of psychosis: study design and baseline characteristics. *Aust N Z J Psychiatry*. 2009; **43**(9): 818-29.
127. Riecher-Roessler A, Pflueger MO, Aston J, Borgwardt SJ, Brewer WJ, Gschwandtner U, et al. Efficacy of Using Cognitive Status in Predicting Psychosis: A 7-Year Follow-Up. *Biol Psychiatry*. 2009; **66**(11): 1023-30.
128. Simon AE, Cattapan-Ludewig K, Gruber K, Ouertani J, Zimmer A, Roth B, et al. Subclinical hallucinations in adolescent outpatients: An outcome study. *Schizophr Res*. 2009; **108**(1-3): 265-71.
129. Velthorst E, Nieman DH, Becker HE, van de Fliert R, Dingemans PM, Klaassen R, et al. Baseline differences in clinical symptomatology between ultra high risk subjects with and without a transition to psychosis. *Schizophr Res*. 2009; **109**(1-3): 60-5.
130. Yung AR, Nelson B, Baker K, Buckby JA, Baksheev G, Cosgrave EM. Psychotic-like experiences in a community sample of adolescents: implications for the continuum model of psychosis and prediction of schizophrenia. *Aust N Z J Psychiatry*. 2009; **43**(2): 118-28.
131. Amminger GP, Schafer MR, Papageorgiou K, Klier CM, Cotton SM, Harrigan SM, et al. Long-Chain omega-3 Fatty Acids for Indicated Prevention of Psychotic Disorders A Randomized, Placebo-Controlled Trial. *Arch Gen Psychiatry*. 2010; **67**(2): 146-54.
132. Armando M, Nelson B, Yung AR, Ross M, Birchwood M, Girardi P, et al. Psychotic-like experiences and correlation with distress and depressive symptoms in a community sample of adolescents and young adults. *Schizophr Res*. 2010; **119**(1-3): 258-65.
133. Chung Y-C, Jung H-Y, Kim S-W, Lee S-H, Shin S-E, Shin Y-M, et al. What factors are related to delayed treatment in individuals at high risk for psychosis? *Early Interv Psychiatry*. 2010; **4**(2): 124-31.
134. Compton MT, Goulding SM, Walker EF. Characteristics of the Retrospectively Assessed Prodromal Period in Hospitalized Patients With First-Episode Nonaffective Psychosis: Findings From a Socially Disadvantaged, Low-Income, Predominantly African American Population. *J Clin Psychiatry*. 2010; **71**(10): 1279-85.
135. Fusar-Poli P, Broome MR, Matthiasson P, Woolley JB, Johns LC, Tabraham P, et al. Spatial working memory in individuals at high risk for psychosis: Longitudinal fMRI study. *Schizophr Res*. 2010; **123**(1): 45-52.
136. Fusar-Poli P, Byrne M, Valmaggia L, Day F, Tabraham P, Johns L, et al. Social dysfunction predicts two years clinical outcome in people at ultra high risk for psychosis. *J Psychiatr Res*. 2010; **44**(5): 294-301.

137. Ilonen T, Heinimaa M, Korkeila J, Svirskis T, Salokangas RKR. Differentiating adolescents at clinical high risk for psychosis from psychotic and non-psychotic patients with the Rorschach. *Psychiatry Res.* 2010; **179**(2): 151-6.
138. Jang JH, Hur JW, Shim G, Kwon SJ, Park HY, Kim E, et al. Change in social functioning in individuals at ultra-high-risk for psychosis: 1-year longitudinal study. *Int J Neuropsychopharmacol.* 2010; **13**: 222-.
139. Korver N, Nieman DH, Becker HE, van de Fliert JR, Dingemans PH, de Haan L, et al. Symptomatology and neuropsychological functioning in cannabis using subjects at ultra-high risk for developing psychosis and healthy controls. *Aust N Z J Psychiatry.* 2010; **44**(3): 230-6.
140. Koutsouleris N, Patschurek-Kliche K, Scheuerecker J, Decker P, Bottlender R, Schmitt G, et al. Neuroanatomical correlates of executive dysfunction in the at-risk mental state for psychosis. *Schizophr Res.* 2010; **123**(2-3): 160-74.
141. Linszen D, Korver N, Nieman D, Becker H, van de Fliert J, Dingemans P, et al. Symptomatology and neuropsychological functioning in cannabis using subjects at ultra high risk for developing psychosis and healthy controls. *Schizophr Res.* 2010; **117**(2-3): 164-5.
142. Luebbe AM, Bell DJ, Allwood MA, Swenson LP, Early MC. Social Information Processing in Children: Specific Relations to Anxiety, Depression, and Affect. *J Clin Child Adolesc Psychol.* 2010; **39**(3): 386-99.
143. Machielsen M, van der Sluis S, de Haan L. Cannabis use in patients with a first psychotic episode and subjects at ultra high risk of psychosis: impact on psychotic and pre-psychotic symptoms. *Aust N Z J Psychiatry.* 2010; **44**(8): 721-8.
144. Mittal VA, Walker EF, Bearden CE, Walder D, Trottman H, Daley M, et al. Markers of Basal Ganglia Dysfunction and Conversion to Psychosis: Neurocognitive Deficits and Dyskinesias in the Prodromal Period. *Biol Psychiatry.* 2010; **68**(1): 93-9.
145. Nelson B, Yung AR. Can clinicians predict psychosis in an ultra high risk group? *Aust N Z J Psychiatry.* 2010; **44**(7): 625-30.
146. Romano DM, McCay E, Goering P, Boydell K, Zipursky R. Treatment history in the psychosis prodrome: characteristics of the North American Prodrome Longitudinal Study Cohort. *Early Interv Psychiatry.* 2010; **4**(3): 243-50.
147. Ruhrmann S, Schultze-Lutter F, Klosterkoetter J. Probably at-risk, but certainly ill - Advocating the introduction of a psychosis spectrum disorder in DSM-V. *Schizophr Res.* 2010; **120**(1-3): 23-37.
148. Ruhrmann S, Schultze-Lutter F, Salokangas RKR, Heinimaa M, Linszen D, Dingemans P, et al. Prediction of Psychosis in Adolescents and Young Adults at High Risk Results From the Prospective European Prediction of Psychosis Study. *Arch Gen Psychiatry.* 2010; **67**(3): 241-51.
149. Sabb FW, van Erp TGM, Hardt ME, Dapretto M, Caplan R, Cannon TD, et al. Language network dysfunction as a predictor of outcome in youth at clinical high risk for psychosis. *Schizophr Res.* 2010; **116**(2-3): 173-83.
150. Schlosser DA, Zinberg JL, Loewy RL, Casey-Cannon S, O'Brien MP, Bearden CE, et al. Predicting the longitudinal effects of the family environment on prodromal symptoms and functioning in patients at-risk for psychosis. *Schizophr Res.* 2010; **118**(1-3): 69-75.

151. Seidman LJ, Giuliano AJ, Meyer EC, Addington J, Cadenhead KS, Cannon TD, et al. Neuropsychology of the Prodrome to Psychosis in the NAPLS Consortium Relationship to Family History and Conversion to Psychosis. *Arch Gen Psychiatry*. 2010; **67**(6): 578-88.
152. Shim G, Oh JS, Jung WH, Jang JH, Choi C-H, Kim E, et al. Altered resting-state connectivity in subjects at ultra-high risk for psychosis: an fMRI study. *Behavioral and Brain Functions*. 2010; **6**.
153. Simon AE, Umbricht D. High remission rates from an initial ultra-high risk state for psychosis. *Schizophr Res*. 2010; **116**(2-3): 168-72.
154. Velthorst E, Nieman DH, Linszen D, Becker H, de Haan L, Dingemans PM, et al. Disability in people clinically at high risk of psychosis. *Br J Psychiatry*. 2010; **197**(4): 278-84.
155. Woodberry KA, Seidman LJ, Giuliano AJ, Verdi MB, Cook WL, McFarlane WR. Neuropsychological profiles in individuals at clinical high risk for psychosis: Relationship to psychosis and intelligence. *Schizophr Res*. 2010; **123**(2-3): 188-98.
156. Addington J, Cornblatt BA, Cadenhead KS, Cannon TD, McGlashan TH, Perkins DO, et al. At Clinical High Risk for Psychosis: Outcome for Nonconverters. *Am J Psychiatry*. 2011; **168**(8): 800-5.
157. Addington J, Epstein I, Liu L, French P, Boydell KM, Zipursky RB. A randomized controlled trial of cognitive behavioral therapy for individuals at clinical high risk of psychosis. *Schizophr Res*. 2011; **125**(1): 54-61.
158. Bechdolf A, Mueller H, Stuetzer H, Wagner M, Maier W, Lautenschlager M, et al. Rationale and Baseline Characteristics of PREVENT: A Second-Generation Intervention Trial in Subjects At-Risk (Prodromal) of Developing First-Episode Psychosis Evaluating Cognitive Behavior Therapy, Aripiprazole, and Placebo for the Prevention of Psychosis. *Schizophr Bull*. 2011; **37**: S111-S21.
159. Bruene M, Oezguerdal S, Ansorge N, von Reventlow HG, Peters S, Nicolas V, et al. An fMRI study of "theory of mind" in at-risk states of psychosis: Comparison with manifest schizophrenia and healthy controls. *Neuroimage*. 2011; **55**(1): 329-37.
160. Collip D, Nicolson NA, Lardinois M, Lataster T, van Os J, Myin-Germeys I, et al. Daily cortisol, stress reactivity and psychotic experiences in individuals at above average genetic risk for psychosis. *Psychol Med*. 2011; **41**(11): 2305-15.
161. Corcoran CM, Kimhy D, Parrilla-Escobar MA, Cressman VL, Stanford AD, Thompson J, et al. The relationship of social function to depressive and negative symptoms in individuals at clinical high risk for psychosis. *Psychol Med*. 2011; **41**(2): 251-61.
162. Fontenelle LF, Lin A, Pantelis C, Wood SJ, Nelson B, Yung AR. A longitudinal study of obsessive-compulsive disorder in individuals at ultra-high risk for psychosis. *J Psychiatr Res*. 2011; **45**(9): 1140-5.
163. Frommann I, Pukrop R, Brinkmeyer J, Bechdolf A, Ruhrmann S, Berning J, et al. Neuropsychological Profiles in Different At-Risk States of Psychosis: Executive Control Impairment in the Early-and Additional Memory Dysfunction in the Late-Prodromal State. *Schizophr Bull*. 2011; **37**(4): 861-73.
164. Fusar-Poli P, Broome MR, Woolley JB, Johns LC, Tabraham P, Bramon E, et al. Altered brain function directly related to structural abnormalities in people at ultra high risk of psychosis: longitudinal VBM-fMRI study. *J Psychiatr Res*. 2011; **45**(2): 190-8.
165. Fusar-Poli P, Broome MR, Matthiasson P, Woolley JB, Mechelli A, Johns LC, et al. Prefrontal Function at Presentation Directly Related to Clinical Outcome in People at Ultrahigh Risk of Psychosis. *Schizophr Bull*. 2011; **37**(1): 189-98.

166. Gee DG, Cannon TD. Prediction of conversion to psychosis: review and future directions. *Revista brasileira de psiquiatria (Sao Paulo, Brazil: 1999)*. 2011; **33 Suppl 2**: s129-42.
167. Grano N, Karjalainen M, Anto J, Itkonen A, Edlund V, Roine M. Associations between number of different type of care meetings with social network and improvement in mental well-being in adolescents at risk of first-episode psychosis. *Early Interv Psychiatry*. 2011; **5**(3): 212-8.
168. Grano N, Karjalainen M, Suominen K, Roine M. Poor functioning ability is associated with high risk of developing psychosis in adolescents. *Nord J Psychiatry*. 2011; **65**(1): 16-21.
169. Jang JH, Shin NY, Shim G, Park HY, Kim E, Jang G-E, et al. Longitudinal patterns of social functioning and conversion to psychosis in subjects at ultra-high risk. *Aust N Z J Psychiatry*. 2011; **45**(9): 763-70.
170. Keshavan MS, DeLisi LE, Seidman LJ. Early and broadly defined psychosis risk mental states. *Schizophr Res*. 2011; **126**(1-3): 1-10.
171. Lin A, Wood SJ, Nelson B, Brewer WJ, Spiliotacopoulos D, Bruxner A, et al. Neurocognitive predictors of functional outcome two to 13 years after identification as ultra-high risk for psychosis. *Schizophr Res*. 2011; **132**(1): 1-7.
172. Mees L, Zdanowicz N, Reynaert C, Jacques D. Adolescents and young adults at ultrahigh risk of psychosis: detection, prediction and treatment. A review of current knowledge. *Psychiatria Danubina*. 2011; **23**: S118-S22.
173. Mittal VA, Jalbrzikowski M, Daley M, Roman C, Bearden CE, Cannon TD. Abnormal movements are associated with poor psychosocial functioning in adolescents at high risk for psychosis. *Schizophr Res*. 2011; **130**(1-3): 164-9.
174. Munkkala S, Ilonen T, Nordstrom T, Miettunen J, Loukkola J, Barnett JH, et al. Different vulnerability indicators for psychosis and their neuropsychological characteristics in the Northern Finland 1986 Birth Cohort. *J Clin Exp Neuropsychol*. 2011; **33**(4): 385-94.
175. Niendam TA, Ragland JD, Dean YM, Westphal AJ, Auther A, Cornblatt BA, et al. Impaired Prefrontal Functioning as a Marker of Psychosis Risk State. *Schizophr Bull*. 2011; **37**: 222-.
176. Raballo A, Nelson B, Thompson A, Yung A. The Comprehensive Assessment of At-Risk Mental States: From mapping the onset to mapping the structure. *Schizophr Res*. 2011; **127**(1-3): 107-14.
177. Rauchensteiner S, Kawohl W, Ozgurda S, Littmann E, Gudlowski Y, Witthaus H, et al. Test-performance after cognitive training in persons at risk mental state of schizophrenia and patients with schizophrenia. *Psychiatry Res*. 2011; **185**(3): 334-9.
178. Rietdijk J, Hogerzeil SJ, van Hemert AM, Cuijpers P, Linszen DH, van der Gaag M. Pathways to psychosis: Help-seeking behavior in the prodromal phase. *Schizophr Res*. 2011; **132**(2-3): 213-9.
179. Simeonova DI, Attalla A, Trotman H, Esterberg M, Walker EF. Does a parent-report measure of behavioral problems enhance prediction of conversion to psychosis in clinical high-risk adolescents? *Schizophr Res*. 2011; **130**(1-3): 157-63.
180. Song YY, Kim KR, Park JY, Lee SY, Kang JI, Lee E, et al. Associated factors of quality of life in first-episode schizophrenia patients. *Psychiatry Investig*. 2011; **8**(3): 201-6.
181. van Rijn S, Schothorst P, van 't Wout M, Sprong M, Ziermans T, van Engeland H, et al. Affective dysfunctions in adolescents at risk for psychosis: Emotion awareness and social functioning. *Psychiatry Res*. 2011; **187**(1-2): 100-5.

182. Velthorst E, Nieman DH, Klaassen RMC, Becker HE, Dingemans PM, Linszen DH, et al. Three-year course of clinical symptomatology in young people at ultra high risk for transition to psychosis. *Acta Psychiatr Scand*. 2011; **123**(1): 36-42.
183. Yung AR, Phillips LJ, Nelson B, Francey SM, PanYuen H, Simmons MB, et al. Randomized Controlled Trial of Interventions for Young People at Ultra High Risk for Psychosis: 6-Month Analysis. *J Clin Psychiatry*. 2011; **72**(4): 430-40.
184. Addington J, Barbato M. The role of cognitive functioning in the outcome of those at clinical high risk for developing psychosis. *Epidemiology and Psychiatric Sciences*. 2012; **21**(4): 335-42.
185. Amminger GP, Schaefer MR, Klier CM, Schloegelhofer M, Mossaheb N, Thompson A, et al. Facial and vocal affect perception in people at ultra-high risk of psychosis, first-episode schizophrenia and healthy controls. *Early Interv Psychiatry*. 2012; **6**(4): 450-4.
186. Armando M, Vicari S, Girardi P, Pontillo M, Saba R, Lin A, et al. A comparison of general functioning and prodromal positive and negative psychotic symptoms between adolescents at clinical ultra high risk with and without 22Q11 deletion syndrome. *Early Interv Psychiatry*. 2012; **6**: 40-.
187. Armando M, Girardi P, Vicari S, Menghini D, Digilio MC, Pontillo M, et al. Adolescents at ultra-high risk for psychosis with and without 22q11 deletion syndrome: A comparison of prodromal psychotic symptoms and general functioning. *Schizophr Res*. 2012; **139**(1-3): 151-6.
188. Bechdolf A, Wagner M, Ruhrmann S, Harrigan S, Putzfeld V, Pukrop R, et al. Preventing progression to first-episode psychosis in early initial prodromal states. *Br J Psychiatry*. 2012; **200**(1): 22-9.
189. Bowie CR, McLaughlin D, Carrion RE, Auther AM, Cornblatt BA. Cognitive changes following antidepressant or antipsychotic treatment in adolescents at clinical risk for psychosis. *Schizophr Res*. 2012; **137**(1-3): 110-7.
190. Cornblatt BA, Carrion RE, Addington J, Seidman L, Walker EF, Cannon TD, et al. Risk factors for psychosis: impaired social and role functioning. *Schizophr Bull*. 2012; **38**(6): 1247-57.
191. Demjaha A, Valmaggia L, Stahl D, Byrne M, McGuire P. Disorganization/Cognitive and Negative Symptom Dimensions in the At-Risk Mental State Predict Subsequent Transition to Psychosis. *Schizophr Bull*. 2012; **38**(2): 351-9.
192. Fusar-Poli P, Deste G, Smieskova R, Barlati S, Yung AR, Howes O, et al. Cognitive Functioning in Prodromal Psychosis A Meta-analysis. *Arch Gen Psychiatry*. 2012; **69**(6): 562-71.
193. Fusar-Poli P, Bonoldi I, Yung AR, Borgwardt S, Kempton MJ, Valmaggia L, et al. Predicting psychosis: meta-analysis of transition outcomes in individuals at high clinical risk. *Arch Gen Psychiatry*. 2012; **69**(3): 220-9.
194. Hur J-W, Shin NY, Jang JH, Shim G, Park HY, Hwang JY, et al. Clinical and neurocognitive profiles of subjects at high risk for psychosis with and without obsessive-compulsive symptoms. *Aust N Z J Psychiatry*. 2012; **46**(2): 161-9.
195. Jaracz J, Grzechowiak M, Raczowski L, Rataj K, Rybakowski J. Polish version of Comprehensive Assessment of At Risk Mental States (CAARMS) - the description of the method. *Psychiatr Pol*. 2012; **46**(1): 95-107.
196. Kelleher I, Murtagh A, Molloy C, Roddy S, Clarke MC, Harley M, et al. Identification and Characterization of Prodromal Risk Syndromes in Young Adolescents in the Community: A Population-Based Clinical Interview Study. *Schizophr Bull*. 2012; **38**(2): 239-46.

197. Lavoie S, Schaefer MR, Whitford TJ, Benninger F, Feucht M, Klier CM, et al. Frontal delta power associated with negative symptoms in ultra-high risk individuals who transitioned to psychosis. *Schizophr Res*. 2012; **138**(2-3): 206-11.
198. Lee DY, Smith GN, Su W, Honer WG, MacEwan GW, Lapointe JS, et al. White matter tract abnormalities in first-episode psychosis. *Schizophr Res*. 2012; **141**(1): 29-34.
199. Lin A, Nelson B, Yung AR. 'At-risk' for psychosis research: where are we heading? *Epidemiology and Psychiatric Sciences*. 2012; **21**(4): 329-34.
200. Marques TR, Smith S, Bonaccorso S, Gaughran F, Kolliakou A, Dazzan P, et al. Sexual dysfunction in people with prodromal or first-episode psychosis. *Br J Psychiatry*. 2012; **201**(2): 131-6.
201. Marshall C, Addington J, Epstein I, Liu L, Doughton S, Zipursky RB. Treating young individuals at clinical high risk for psychosis. *Early Interv Psychiatry*. 2012; **6**(1): 60-8.
202. Masillo A, Day F, Laing J, Howes O, Fusar-Poli P, Byrne M, et al. Interpersonal sensitivity in the at-risk mental state for psychosis. *Psychol Med*. 2012; **42**(9): 1835-45.
203. Morrison AP, French P, Stewart SLK, Birchwood M, Fowler D, Gumley AI, et al. Early detection and intervention evaluation for people at risk of psychosis: multisite randomised controlled trial. *Br Med J*. 2012; **344**.
204. Quijada Y, Tizon JL, Artigue J, Kwapil TR, Barrantes-Vidal N. Attachment style predicts 6-month improvement in psychoticism in persons with at-risk mental states for psychosis. *Early Interv Psychiatry*. 2012; **6**(4): 442-9.
205. Rao S, Poon LY, Verma S, Tay SA, Yuen S, Lim LK, et al. Prevalence and functioning in patients with at risk mental state and comorbid psychiatric disorders. *Early Interv Psychiatry*. 2012; **6**: 120-.
206. Remberk B, Namyslowska I, Rybakowski F. Cognition and communication dysfunctions in early-onset schizophrenia: Effect of risperidone. *Prog Neuropsychopharmacol Biol Psychiatry*. 2012; **39**(2): 348-54.
207. Rietdijk J, Klaassen R, Ising H, Dragt S, Nieman DH, van de Kamp J, et al. Detection of people at risk of developing a first psychosis: comparison of two recruitment strategies. *Acta Psychiatr Scand*. 2012; **126**(1): 21-30.
208. Schultze-Lutter F, Klosterkoetter J, Michel C, Winkler K, Ruhrmann S. Personality disorders and accentuations in at-risk persons with and without conversion to first-episode psychosis. *Early Interv Psychiatry*. 2012; **6**(4): 389-98.
209. Song YY, Kim KR, Lee EH, Park JY, Kang JI, Lee E, et al. Associated factors of quality of life in ultra-high risk for psychosis. *Early Interv Psychiatry*. 2012; **6**: 126-.
210. Stain H, Paulik G, Atkinson R, Carr V, Curtis J, Ehlkes T, et al. Clinical, social and neurocognitive functioning in youth at ultra high risk for psychosis: Baseline findings from the Minds in Transition (MINT) longitudinal cohort. *Early Interv Psychiatry*. 2012; **6**: 118-.
211. Strobl EV, Eack SM, Swaminathan V, Visweswaran S. Predicting the risk of psychosis onset: advances and prospects. *Early Interv Psychiatry*. 2012; **6**(4): 368-79.
212. Tomassini A, Roncone R, Verni L, Ortenzi R, Di Melchiorre G, Tosone A, et al. Use of cannabis and psychopathological risk in onset psychosis. *Rivista Di Psichiatria*. 2012; **47**(2): 170-7.

213. Valli I, Tognin S, Fusar-Poli P, Mechelli A. Episodic Memory Dysfunction in Individuals at High-Risk of Psychosis: A Systematic Review of Neuropsychological and Neurofunctional Studies. *Curr Pharm Des.* 2012; **18**(4): 443-58.
214. van der Gaag M, Nieman DH, Rietdijk J, Dragt S, Ising HK, Klaassen RMC, et al. Cognitive Behavioral Therapy for Subjects at Ultrahigh Risk for Developing Psychosis: A Randomized Controlled Clinical Trial. *Schizophr Bull.* 2012; **38**(6): 1180-8.
215. Verma S, Poon LY, Lee H, Rao S, Chong SA. Evolution of early psychosis intervention services in Singapore. *East Asian archives of psychiatry : official journal of the Hong Kong College of Psychiatrists = Dong Ya jing shen ke xue zhi : Xianggang jing shen ke yi xue yuan qi kan.* 2012; **22**(3): 114-7.
216. Addington J, Stowkowy J, Cadenhead KS, Cornblatt BA, McGlashan TH, Perkins DO, et al. Early traumatic experiences in those at clinical high risk for psychosis. *Early Interv Psychiatry.* 2013; **7**(3): 300-5.
217. Amminger GP, Chanen AM, Ohmann S, Klier CM, Mossaheb N, Bechdolf A, et al. Omega-3 fatty acid supplementation in adolescents with borderline personality disorder and ultra-high risk criteria for psychosis: a post hoc subgroup analysis of a double-blind, randomized controlled trial. *Can J Psychiatry.* 2013; **58**(7): 402-8.
218. Bugra H, Studerus E, Rapp C, Tamagni C, Aston J, Borgwardt S, et al. Cannabis use and cognitive functions in at-risk mental state and first episode psychosis. *Psychopharmacology (Berl).* 2013; **230**(2): 299-308.
219. Comparelli A, Pucci D, Savoja V, Kotzalidis GD, Falcone I, Angelone M, et al. Mental disorders diagnosed in childhood and at-risk mental state in a help-seeking population. *Early Interv Psychiatry.* 2013; **7**(2): 187-92.
220. De Herdt A, Wampers M, Vancampfort D, De Hert M, Vanhees L, Demunter H, et al. Neurocognition in clinical high risk young adults who did or did not convert to a first schizophrenic psychosis: A meta-analysis. *Schizophr Res.* 2013; **149**(1-3): 48-55.
221. Debbane M, Badoud D, Balanzin D, Eliez S. Broadly defined risk mental states during adolescence: Disorganization mediates positive schizotypal expression. *Schizophr Res.* 2013; **147**(1): 153-6.
222. Fusar-Poli P, Byrne M, Badger S, Valmaggia LR, McGuire PK. Outreach and support in South London (OASIS), 2001-2011: Ten years of early diagnosis and treatment for young individuals at high clinical risk for psychosis. *Eur Psychiatry.* 2013; **28**(5): 315-26.
223. Gerlinger G, Hauser M, De Hert M, Lacluyse K, Wampers M, Correll CU. Personal stigma in schizophrenia spectrum disorders: a systematic review of prevalence rates, correlates, impact and interventions. *World Psychiatry.* 2013; **12**(2): 155-64.
224. Grano N, Karjalainen M, Edlund V, Saari E, Itkonen A, Anto J, et al. Adolescents at risk of psychosis have higher level of hopelessness than adolescents not at risk of psychosis. *Nordic Journal of Psychiatry.* 2013; **67**(4): 258-64.
225. Hur J-W, Byun MS, Shin NY, Shin YS, Kim SN, Jang JH, et al. General intellectual functioning as a buffer against theory-of-mind deficits in individuals at ultra-high risk for psychosis. *Schizophr Res.* 2013; **149**(1-3): 83-7.

226. Jalbrzikowski M, Krasileva KE, Marvin S, Zinberg J, Andaya A, Bachman P, et al. Reciprocal social behavior in youths with psychotic illness and those at clinical high risk. *Dev Psychopathol.* 2013; **25**(4 Pt 1): 1187-97.
227. Kelleher I, Murtagh A, Clarke MC, Murphy J, Rawdon C, Cannon M. Neurocognitive performance of a community-based sample of young people at putative ultra high risk for psychosis: Support for the processing speed hypothesis. *Cogn Neuropsychiatry.* 2013; **18**(1-2): 9-25.
228. Kline E, Thompson E, Schimunek C, Reeves G, Bussell K, Pitts SC, et al. Parent-adolescent agreement on psychosis risk symptoms. *Schizophr Res.* 2013; **147**(1): 147-52.
229. Lecardeur L. Cognitive behavior therapy after first-episodes psychosis. *L'Encephale.* 2013; **39** Suppl 2: S115-20.
230. Lee J, Rekhi G, Mitter N, Bong YL, Kraus MS, Lam M, et al. The Longitudinal Youth at Risk Study (LYRIKS) - An Asian UHR perspective. *Schizophr Res.* 2013; **151**(1-3): 279-83.
231. Lin A, Wood SJ, Yung AR. Measuring psychosocial outcome is good. *Current Opinion in Psychiatry.* 2013; **26**(2): 138-43.
232. Lin A, Wigman JTW, Nelson B, Wood SJ, Vollebergh WAM, van Os J, et al. Follow-up factor structure of schizotypy and its clinical associations in a help-seeking sample meeting ultra-high risk for psychosis criteria at baseline. *Compr Psychiatry.* 2013; **54**(2): 173-80.
233. McGorry PD, Nelson B, Phillips LJ, Yuen HP, Francey SM, Thampi A, et al. Randomized Controlled Trial of Interventions for Young People at Ultra-High Risk of Psychosis: Twelve-Month Outcome. *J Clin Psychiatry.* 2013; **74**(4): 349-56.
234. Mossaheb N, Schaefer MR, Schloegelhofer M, Klier CM, Cotton SM, McGorry PD, et al. Effect of omega-3 fatty acids for indicated prevention of young patients at risk for psychosis: When do they begin to be effective? *Schizophr Res.* 2013; **148**(1-3): 163-7.
235. Mueller H, Bechdolf A. Psychological interventions in people at-risk for first episode psychosis. *Psychotherapeut.* 2013; **58**(4): 344-51.
236. Nelson B, Yuen HP, Wood SJ, Lin A, Spiliotacopoulos D, Bruxner A, et al. Long-term Follow-up of a Group at Ultra High Risk ("Prodromal") for Psychosis The PACE 400 Study. *JAMA Psychiatry.* 2013; **70**(8): 793-802.
237. Nieman DH, Velthorst E, Becker HE, de Haan L, Dingemans PM, Linszen DH, et al. The Strauss and Carpenter Prognostic Scale in subjects clinically at high risk of psychosis. *Acta Psychiatr Scand.* 2013; **127**(1): 53-61.
238. Niendam TA, Ragland JD, Floyd E, Auther A, Cornblatt B, Adelsheim S, et al. Multi-Site Investigation of Impaired Prefrontal Functioning as a Potential Marker of Long-Term Outcome in Psychosis Risk State. *Biol Psychiatry.* 2013; **73**(9): 273s-s.
239. Rapp C, Studerus E, Bugra H, Aston J, Tamagni C, Walter A, et al. Duration of untreated psychosis and cognitive functioning. *Schizophr Res.* 2013; **145**(1-3): 43-9.
240. Ratheesh A, Lin A, Nelson B, Wood SJ, Brewer W, Betts J, et al. Neurocognitive functioning in the prodrome of mania-an exploratory study. *J Affect Disord.* 2013; **147**(1-3): 441-5.
241. Riecher-Roessler A, Aston J, Borgwardt S, Bugra H, Fuhr P, Gschwandtner U, et al. Prediction of Psychosis by Stepwise Multilevel Assessment - The Basel FePsy (Early Recognition of Psychosis)-Project. *Fortschritte Der Neurologie Psychiatrie.* 2013; **85**(1): 265-75.

242. Stafford MR, Jackson H, Mayo-Wilson E, Morrison AP, Kendall T. Early interventions to prevent psychosis: systematic review and meta-analysis. *Bmj*. 2013; **346**: f185.
243. Stowkowy J, Addington J. Predictors of a clinical high risk status among individuals with a family history of psychosis. *Schizophr Res*. 2013; **147**(2-3): 281-6.
244. Sullivan S, Herzig D, Mohr C, Lewis G, Corcoran R, Drake R, et al. Theory of mind and social functioning in first episode psychosis. *Cogn Neuropsychiatry*. 2013; **18**(3): 219-42.
245. Taylor HE, Parker S, Mansell W, Morrison AP. Effects of Appraisals of Anomalous Experience on Distress in People at Risk of Psychosis. *Behav Cogn Psychother*. 2013; **41**(1): 24-33.
246. Teyssier JR. Prodromes of schizophrenia: Consensus or confusion? *Encephale-Revue De Psychiatrie Clinique Biologique Et Therapeutique*. 2013; **39**: S1-S7.
247. Thompson A, Papas A, Bartholomeusz C, Nelson B, Yung A. Externalized attributional bias in the Ultra High Risk (UHR) for psychosis population. *Psychiatry Res*. 2013; **206**(2-3): 200-5.
248. Tiffin PA, Welsh P. Practitioner Review: Schizophrenia spectrum disorders and the at-risk mental state for psychosis in children and adolescents - evidence-based management approaches. *Journal of child psychology and psychiatry, and allied disciplines*. 2013; **54**(11): 1155-75.
249. Tikka M, Luutonen S, Ilonen T, Tuominen L, Kotimaki M, Hankala J, et al. Childhood trauma and premorbid adjustment among individuals at clinical high risk for psychosis and normal control subjects. *Early Interv Psychiatry*. 2013; **7**(1): 51-7.
250. Valmaggia LR, Stahl D, Yung AR, Nelson B, Fusar-Poli P, McGorry PD, et al. Negative psychotic symptoms and impaired role functioning predict transition outcomes in the at-risk mental state: a latent class cluster analysis study. *Psychol Med*. 2013; **43**(11): 2311-25.
251. Velthorst E, Nelson B, Wiltink S, de Haan L, Wood SJ, Lin A, et al. Transition to first episode psychosis in ultra high risk populations: Does baseline functioning hold the key? *Schizophr Res*. 2013; **143**(1): 132-7.
252. Walder DJ, Holtzman CW, Addington J, Cadenhead K, Tsuang M, Cornblatt B, et al. Sexual dimorphisms and prediction of conversion in the NAPLS psychosis prodrome. *Schizophr Res*. 2013; **144**(1-3): 43-50.
253. Zaytseva Y, Korsakova N, Agius M, Gurovich I. Neurocognitive Functioning in Schizophrenia and during the Early Phases of Psychosis: Targeting Cognitive Remediation Interventions. *Biomed Res Intern*. 2013.

BJP The British Journal of Psychiatry Psych

Disorder, not just state of risk: meta-analysis of functioning and quality of life in people at high risk of psychosis

Paolo Fusar-Poli, Matteo Rocchetti, Alberto Sardella, Alessia Avila, Martina Brandizzi, Edgardo Caverzasi, Pierluigi Politi, Stephan Ruhrmann and Philip McGuire
BJP 2015, 207:198-206.

Access the most recent version at DOI: [10.1192/bjp.bp.114.157115](https://doi.org/10.1192/bjp.bp.114.157115)

Supplementary Material

Supplementary material can be found at:
<http://bjp.rcpsych.org/content/suppl/2015/09/10/207.3.198.DC1>

References

This article cites 86 articles, 6 of which you can access for free at:
<http://bjp.rcpsych.org/content/207/3/198#BIBL>

Reprints/permissions

To obtain reprints or permission to reproduce material from this paper, please write to permissions@rcpsych.ac.uk

You can respond to this article at

[/letters/submit/bjprcpsych;207/3/198](http://letters/submit/bjprcpsych;207/3/198)

Downloaded from

<http://bjp.rcpsych.org/> on September 9, 2017
Published by The Royal College of Psychiatrists
