



**Correlations between self- and observer-ratings of psychopathology in at-risk mental state and first episode psychosis patients - influence of disease stage, illness insight and gender**

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Rater-agreement in emerging psychosis

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## **Correlations between self- and observer-ratings of psychopathology in at-risk mental state and first episode psychosis patients - influence of disease stage, illness insight and gender**

Short running title: Rater-agreement in emerging psychosis

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## 1. Abstract

**Aim:** Research findings on the correlations between self- and observer-ratings of schizophrenic psychopathology are inconsistent and have rarely considered first episode psychosis (FEP) and at-risk mental state (ARMS) for psychosis patients. This study investigated these correlations in ARMS and FEP patients and how they are moderated by disease stage, illness insight, and gender.

**Methods:** In the Basel *Früherkennung von Psychosen (FePsy)* study, positive and negative psychotic and affective symptoms were rated in 126 ARMS and 94 FEP patients using two observer and three self-rating scales. The agreement between self- and observer-ratings and the moderating influence of disease stage, illness insight, and gender was quantified using Pearson correlation and multiple regression models.

**Results:** Correlations between self- and observer-rated subscales covering the same symptom dimension were low and mostly non-significant except for one correlation of positive and one of negative symptoms. There was no moderating influence of disease stage, illness insight, and gender on the correlations between self- and observer-ratings except for one higher association in positive symptoms in FEP compared to ARMS and in women compared to men.

**Conclusions:** This study suggest that the agreement between self- and observer-ratings in FEP and ARMS patients is rather low, similar across symptom dimensions, and not dependent of illness insight, but partially of disease stage and gender. However, low correlations between self- and observer-ratings must not necessarily mean that these patients have difficulties reporting their symptoms. They could also have occurred because the scales did not exactly cover the same symptom dimensions.

**Keywords:** gender, insight, observer-rating, psychosis, self-rating

## 2. Introduction

The coherence between self- and observer-ratings assessing psychopathology is an emerging topic in current research. Observer-rating scales are considered objective measures of the severity of psychopathological symptoms in patients with a psychotic disorder, but they need a well-trained professional and are time-consuming. Self-rating scales, on the other hand, are less time-consuming and can also be applied by less trained professionals. However, it is unclear whether self- and observer-rating scales measure similar constructs and whether psychosis patients are able to report their symptoms with sufficient accuracy.<sup>1</sup>

Since schizophrenia patients have many features (e.g. poor insight, denial, delusions, cognitive deficits) that could hinder an accurate self-rating of their symptoms, it has long been assumed that self-ratings – especially of positive psychotic symptoms – are unreliable in these patients.<sup>2, 3</sup> However, our literature research revealed that at least five studies found a good agreement between self- and observer-ratings of positive psychotic symptoms in psychosis patients<sup>3-7</sup> and only three studies found poor correlations.<sup>8-10</sup>

With respect to negative symptoms, the concordance between self- and observer-rating scales seems to be rather inconsistent. Some studies found negative symptoms to be more difficult to be accurately reported than positive symptoms,<sup>3, 4</sup> whereas other studies suggested that even patients with a schizophrenic, schizoaffective or acute psychotic disorder are able to accurately report them.<sup>5, 6</sup> A further study by Bottlender et al.<sup>11</sup> found equivocal results as it showed good agreement in the SANS total score but not in the subscales Apathy, Alogia, and Attention.

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Studies assessing the concordance between self- and observer-ratings of depressive symptomatology in psychosis patients mostly showed good agreements.<sup>8, 10, 12</sup> A recent study identified 49.2% of the patients to have equal self- and observer-ratings in depressive symptoms.<sup>13</sup> However, Lasalvia et al.<sup>9</sup> found significant correlations between affective symptoms only in non-psychosis but not in psychosis patients.

One explanation for these inconsistent results is that in many studies self- and observer-rating scales did not tap exactly the same symptom dimension. Additionally, existing studies vary in several factors that can potentially moderate the relationship between self- and observer-ratings, such as disease state, diagnostic group, degree of insight, and gender distribution. However, only few studies have investigated the influence of these moderating factors. Below, we will summarize the literature regarding the influence of disease stage, illness insight, and gender, as our study will focus specifically on these factors.

To our knowledge, no study has investigated whether the agreement between self- and observer-ratings differs between patients with a first episode psychosis (FEP) and those that have an at-risk mental state (ARMS) for psychosis. Existing studies have only focused on one of these disease stages. FEP patients were found to have a good association in positive, but not in negative symptoms,<sup>4</sup> whereas ARMS patients were shown to have more psychosis risk symptoms in self-reports than in clinical interviews.<sup>14</sup>

Another possible moderating factor is illness insight as 50-80% of patients with schizophrenia show an impaired insight in having a mental illness.<sup>15</sup> Furthermore, impaired insight has not only been found in FEP but also in ARMS patients, although

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4 with lower frequency.<sup>16-18</sup> A meta-analysis on the association between psychopathology  
5 and insight in schizophrenia patients found impaired insight to be correlated with higher  
6 levels of positive psychotic, negative and total symptom scores but with less depressive  
7 symptoms.<sup>19</sup> Although it seems likely that illness insight would also be associated with  
8 the agreement between self- and observer-ratings, only three studies<sup>5-7</sup> have directly  
9 addressed this question with only one finding a statistical significant association.<sup>7</sup>  
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18 Although gender differences in schizophrenia have been described in almost all  
19 aspects, including age of onset, incidence, symptomatology, treatment response, and  
20 outcome,<sup>20-22</sup> little is known about whether gender influences the agreement between  
21 self- and observer-ratings. Some studies showed a higher agreement of affective  
22 symptoms in women compared to men in mixed patient samples or patients with  
23 depression.<sup>23, 24</sup> However, other studies do not support these findings in samples with  
24 psychotic and a non-psychotic major depression.<sup>12, 25</sup> To our knowledge, only one study  
25 investigated the influence of gender on the agreement between self- and observer-  
26 ratings of positive psychotic symptoms in schizophrenia patients.<sup>7</sup> This study found no  
27 influence of gender.  
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40 To improve on previous studies, this study aimed to compare self- and observer-  
41 ratings of affective, negative and positive symptoms in both ARMS and FEP patients.  
42 Furthermore, we aimed to investigate whether the agreement was dependent on disease  
43 stage, illness insight, and gender. We hypothesized that the association between self-  
44 and observer-rating is higher in ARMS than in FEP patients, higher in patients with  
45 illness insight than in those without illness insight, and higher in women than in men.  
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### 3. Methods

#### 2.1 Setting and Recruitment

All data were collected as part of the Basel *Früherkennung von Psychosen* (*FePsy*) project, a prospective multilevel study, which aims to improve the early detection of psychosis.<sup>26, 27</sup> The study was approved by the ethics committee of the University of Basel, and all participants provided written informed consent. Patients were recruited from the 1<sup>st</sup> of March 2000 to the 31<sup>th</sup> of January, 2013 via the *FePsy* Clinic, which was specifically set up to identify, assess, and treat individuals in the early stages of psychosis.

#### 2.2 Screening procedure

Screening of ARMS and FEP patients was performed with the Basel Screening Instrument for Psychosis (BSIP), which has been shown to have a good interrater reliability ( $K=0.67$ ) and a high predictive validity.<sup>28</sup> Individuals were classified by the BSIP as being in an ARMS for psychosis, having an FEP, or being not at risk for psychosis using criteria corresponding to those of Yung et al.<sup>29</sup>

#### 2.3 Assessment of psychopathology

The Brief Psychiatric Rating Scale Expanded Version (BPRS-E)<sup>30</sup> and the Scale for the Assessment of Negative Symptoms (SANS)<sup>31</sup> were used as observer-ratings and the Frankfurt Complaint Questionnaire (FCQ)<sup>32</sup>, the Selfscreen-Prodrome (SSP)<sup>33</sup> and the Paranoid Scale (PS)<sup>34</sup> were used as self-ratings of psychopathological symptoms.

The BPRS-E is a widely used rating scale for assessing general psychopathology and consists of 24 items, which can be grouped to the four subscales

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4 Depression/Anxiety, Psychosis, Negative Symptoms and Activation.<sup>35</sup> All BPRS-E  
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6 items are rated on a 7-point severity scale.  
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9 The SANS is a 24 item scale for assessing negative symptoms. The items of the  
10  
11 SANS are rated on a five-point ordinal scale and are grouped to 5 subscales: Affective  
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13 Flattening, Alogia, Apathy/Avolition, Anhedonia/Asociality and Attention.  
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15 The FCQ contains 98 dichotomous items and is used to assess so called “basic  
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17 symptoms”, which are abnormal subjective experiences that can occur in a prodromal  
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19 state of psychosis and that seem to have a predictive validity for the onset of  
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21 psychosis.<sup>36</sup> These symptoms have been called “basic” to indicate their proximity to  
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23 hypothesized basic neural dysfunctions of schizophrenia.<sup>37</sup> The FCQ contains four  
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25 factors: Depression, Disturbances of automated responses, Perceptual disturbances and  
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27 Overinclusion.<sup>32</sup>  
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31 The PS consists of a subset of items of the Paranoid Depression Scale (PDS) that  
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33 contains paranoid and depressive symptoms. The PS comprises 14 items which can be  
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35 grouped into the three subscales Paranoid Tendencies, Test Motivation and Denial of  
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37 Illness.  
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39 The SSP is a screening instrument to identify patients with a risk for psychosis.  
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41 It consists of 32 dichotomous items regarding prodromal and pre-psychotic  
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43 symptomatology.  
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46 Insight was measured by the item “Illness Insight” of the Basel Interview for  
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48 Psychosis (BIP), a semi-structured interview which was specifically developed for the  
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50 early detection of psychosis<sup>38</sup>. This item measures illness insight on a three-point  
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52 ordinal scale with the categories “not existent”, “questionable” and “existent”. Due to  
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low endorsement frequencies of “not existent” and “questionable”, we combined these categories into one.

All observer measures were conducted by well-trained psychologists or psychiatrists.

### 2.3 Statistical analysis

Analyses were performed using the Statistical Package for the Social Sciences (SPSS) for Windows, version 19, and the R environment for statistical computing.<sup>39</sup> Differences in socio-demographic and clinical characteristics between ARMS and FEP patients were tested with *t* and  $\chi^2$  tests.

First we used Pearson correlations to compare the already existing and published subscales of the five self- and observer-rating instruments. However, because these rating-scales frequently differed in their item content, we also constructed new subscales from self-rating items that were as similar as possible with original scales in the BPRS and SANS. Specifically, by applying hierarchical item cluster analysis<sup>40</sup> and based on theoretical knowledge about the dimensional structure of psychopathology, we grouped the items of each self-rating scale to the subscales Affective Symptoms, Positive Symptoms and Negative Symptoms, in such a way that they were most similar to BPRS Depression/Anxiety, BPRS Psychosis, and SANS total score, respectively. For assessing negative symptoms, we used the SANS total score instead of the BPRS subscale for negative symptoms because it is covering this symptom dimension more completely and reliably. With the PS items, only the new subscale (“Positive Symptoms”) was formed. The items of each newly formed subscale are shown in Supplementary Table 1. To evaluate the internal consistency and homogeneity of the new subscales, Cronbach’s  $\alpha$ <sup>41</sup> and Revelle’s  $\beta$ <sup>40</sup> were calculated. In case of

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4 dichotomous and polytomous items, these measures were based on tetrachoric and  
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7 polychoric correlations, respectively.

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9 To evaluate the correlations between all self- and observer rated scales we  
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11 generated a Multitrait-multimethod matrix (MTMM). This is an approach to evaluate  
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13 the construct validity of measures of different concepts assessed by different methods.<sup>42</sup>  
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15 It shows how the correlations between different measures vary as a function of different  
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17 item content and method.

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20 Although all psychopathological assessments were obtained at baseline, they  
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22 were not always obtained at the same visit. Hence, in accordance with previous  
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24 studies,<sup>4, 11</sup> we correlated only those measures of each patient that were obtained within  
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26 a period of seven days.  
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29 To examine whether gender, disease stage and insight moderate the correlations  
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31 between self- and observer-ratings, multiple regression models with the observer-rating  
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33 scale as dependent variable, the self-rating scale as the first independent variable and  
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35 disease stage, gender or illness insight as the second independent variables and the  
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37 interactions between these variables were performed. To facilitate interpretation,  
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39 continuous variables were z-transformed.  
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## 4. Results

### 3.1 Sample description

Socio-demographic sample characteristics are presented in Table 1. ARMS did only differ from FEP patients regarding age ( $t(185) = -3.69, p < .001$ ).

\*\*\*\*\* Insert Table 1 about here. \*\*\*\*\*

Clinical characteristics of our sample are shown in Table 2. FEP patients more often showed questionable or inexistent illness insight ( $\chi^2(1, N = 128) = 13.37, p < .001$ ) Furthermore, FEP patients had higher scores in all scales assessing positive and basic symptoms. However, they did not differ in negative symptoms scales except for a higher score of FEP patients in the newly constructed self-rating SSP-Negative Symptom scale. With regard to affective symptoms, FEP scored higher in the BPRS Depression/Anxiety and self-rating FCQ-Affective Symptoms scale, but not in the self-rating SSP-Affective Symptoms scale.

\*\*\*\*\* Insert Table 2 about here. \*\*\*\*\*

### 3.3 Associations between self- and observer-ratings

Correlations of the original subscales between self- and observer-ratings are illustrated in Figure 1. The highest correlations between subscales with similar item content were between FCQ Perceptual disturbances and BPRS Psychosis ( $r(63) = .342, p = .005$ ) as well as between PS Paranoid Tendencies and BPRS Psychosis ( $r(70) = .455, p < .001$ ).

\*\*\*\*\* Insert Figure 1 about here. \*\*\*\*\*

Correlations between the self- and observer-ratings, internal consistencies, homogeneities, and sample sizes of the newly constructed subscales are illustrated in

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4 Table 3. The newly constructed subscales showed a good internal consistency ( $\alpha = .86 -$   
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Table 3. The newly constructed subscales showed a good internal consistency ( $\alpha = .86 - .96$ ) and homogeneity ( $\beta = .7 - .85$ ). However, internal consistencies of the BPRS Psychosis and Depression/Anxiety subscales were  $\alpha < .8$  and  $\alpha < .7$ , respectively. Heterotrait-monomethod correlations were higher than monotrait-heteromethod correlations, suggesting that there was more common variance due to the method than the content. There were only two significant correlations between self- and observer-rating scales covering the same symptom dimension. Specifically, the FCQ-Negative Symptoms subscale correlated significantly with the SANS scale ( $r(66) = .317, p = .009$ ) and the PS-Positive Symptoms correlated significantly with BPRS-Positive Symptoms subscale ( $r(70) = .454, p < .001$ ).

\*\*\*\*\* Insert Table 3 about here. \*\*\*\*\*

### 3.4 Influence of disease stage, illness insight and gender on the association between self- and observer-ratings

As shown in Figure 2, there were no Group  $\times$  Self-rating scale interactions in affective and negative symptomatology. However, in positive symptoms, there was one significant Disease stage  $\times$  Self-rating scale interaction with the FCQ-Positive Symptom scale,  $R^2 = .534, F(1,63) = 7.38, p = .009, \eta^2 = .108$ , which was due to a higher correlation between self- and observer-rating in FEP than in ARMS patients.

\*\*\*\*\* Insert Figure 2 about here. \*\*\*\*\*

Illness insight had no moderating influence on any self-observer-rating association (Figure 3). In the analyses including gender, there was only one statistically significant Gender  $\times$  Self-rating scale interaction, namely, with the SSP-Positive Symptoms subscale,  $R^2 = .168, F(1,53) = 6.009, p = .018, \eta^2 = .105$ , suggesting that

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women showed a higher correlation of this subscale with the BPRS-Positive Symptom scale than men (Figure 4).

\*\*\*\*\* Insert Figure 3 and 4 about here. \*\*\*\*\*

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## 5. Discussion

The aim of this study was to investigate the correlations of self and observer-ratings in ARMS and FEP patients and the influence of gender, disease stage, and illness insight on these correlations. Using the original subscales, we found relatively high correlations in positive symptom dimensions but not in the other symptom dimensions. When the scales were adapted to have better matching item contents, we found two significant correlations between self- and observer-ratings covering the same symptom dimension, namely, one with positive and one with negative symptoms. Furthermore, contrary to our hypotheses, we found that illness insight did not moderate these correlations, whereas disease stage and gender each moderated one pair of self-observer-ratings.

Although all seven pairs of subscales covering the same symptom dimension correlated positively, only two were statistically significant, indicating that the agreements between self- and observer-ratings were rather low. Furthermore, no clear pattern emerged with regard to strength of association and symptom dimension. Since we found statistically significant correlations with both positive and negative symptoms, our results do not confirm earlier findings of Hamera et al.<sup>3</sup> and Preston and Harrison<sup>4</sup> according to which negative symptoms are more difficult to be accurately reported than positive symptoms, but support earlier findings of Bell et al.<sup>6</sup> and Liraud et al.<sup>5</sup> The lack of association between scales measuring affective symptoms stands in contrast to previous studies, which reported good agreements in this dimension.<sup>10,13</sup>

With regard to the moderating influence of disease stage, we could not confirm that the association between self- and observer-rating is higher in ARMS than in FEP patients. However, there was one significant interaction, which was in the opposite

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4 direction of what we had expected. Specifically, FEP showed higher correlations than  
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6 ARMS patients between the BPRS and FCQ-Positive Symptom scale. One possible  
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8 explanation is that lower occurrence of positive psychotic symptoms in the ARMS  
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10 group led to a distribution of positive symptoms with a lower spread and higher positive  
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12 skew than in the FEP group which in turn might have led to a stronger attenuation of the  
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14 correlation.  
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18 Our finding that illness insight does not moderate the correlation between self-  
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20 and observer-rating is in line with the studies of Liraud et al.<sup>5</sup> and Bell et al.<sup>6</sup> One  
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22 possible reason why this and other studies could not confirm an influence of illness  
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24 insight is that insight is a multidimensional construct of which only some dimensions  
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26 are associated with the rating agreement. For instance, Amador & David<sup>2</sup> defined  
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28 insight as a construct including the general awareness of mental disorder, understanding  
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30 of social consequences, need for treatment, recognition of specific signs and symptoms  
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32 and the attribution of these symptoms to the disorder. Accordingly, it is conceivable that  
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34 some patients can accurately report their symptoms but are unable to grasp the  
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36 psychopathological significance of these symptoms. Similar to other studies,<sup>7, 16, 43-45</sup> we  
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38 used only a single item for assessing insight and therefore cannot distinguish between  
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40 different dimensions of insight, as it has been done in some other studies.<sup>18, 46-49</sup>  
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46 With regard to the moderating influence of gender, we found that women  
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48 showed a higher association between BPRS and SSP-Positive Symptoms than men,  
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50 suggesting that women are more accurate in reporting their positive psychotic  
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52 symptoms. This finding stands in contrast to the study of Lincoln et al.<sup>7</sup>, which did not  
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54 find an influence of gender on the rating of positive psychotic symptoms. However, our  
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56 gender effect should be interpreted with caution because there was no influence of  
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4 gender in the two other comparisons regarding positive symptoms (i.e. BPRS vs. FCQ-  
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6 Positive Symptoms and BPRS vs. PS-Positive Symptoms). Furthermore, our results did  
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8 not support earlier studies demonstrating that women report their affective symptoms  
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10 more accurately than men.<sup>23, 24</sup> However, these studies are difficult to compare with our  
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12 study because they were based on mixed patient samples.  
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16 Our study has some limitations. Firstly, even though we had improved the  
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18 comparability of the scales by forming new subscales, we were quite limited in the item  
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20 content and thus it is possible that our subscales still insufficiently covered the same  
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22 symptom dimensions. Other studies solved this problem using newly constructed self-  
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24 rating questionnaires,<sup>3</sup> modified observer-ratings to self-questionnaires<sup>11</sup> or  
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26 concentrated their analysis on a special symptom dimension.<sup>7</sup> Secondly, although we  
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28 reduced the number of comparisons by forming new subscales, there were still 21  
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30 interactions of interest. Due to this large number of tests, our results should be  
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32 interpreted with caution. Since our sample size was already limited, we did not want to  
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34 further reduce power by performing corrections for multiple testing. Thirdly, although  
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36 we had obtained self- and observer-ratings from 220 patients in total, a relatively large  
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38 proportion of these had to be excluded because the time difference between self- and  
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40 observer-rating was too large.  
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45 Taken together, we found that the associations between self- and observer-  
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47 ratings were rather low. Contrary to our expectations, they were neither higher in  
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49 ARMS than in FEP patients, nor higher in patients with illness insight than in patients  
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51 without illness insight, nor higher in women than in men, except for one higher  
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53 correlation in positive psychotic symptoms. The results of our study therefore imply that  
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55 self-rating scales cannot be a substitute for the more time-consuming observer-rating  
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Rater-agreement in emerging psychosis

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scales. Nevertheless, self-rating scales could still play an important role in clinical practice because they provide additional information about subjectively experienced symptoms and therefore can increase treatment compliance.<sup>1</sup>

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## 6. Acknowledgment

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All authors do not have any conflict interests that might be interpreted as influencing its content.

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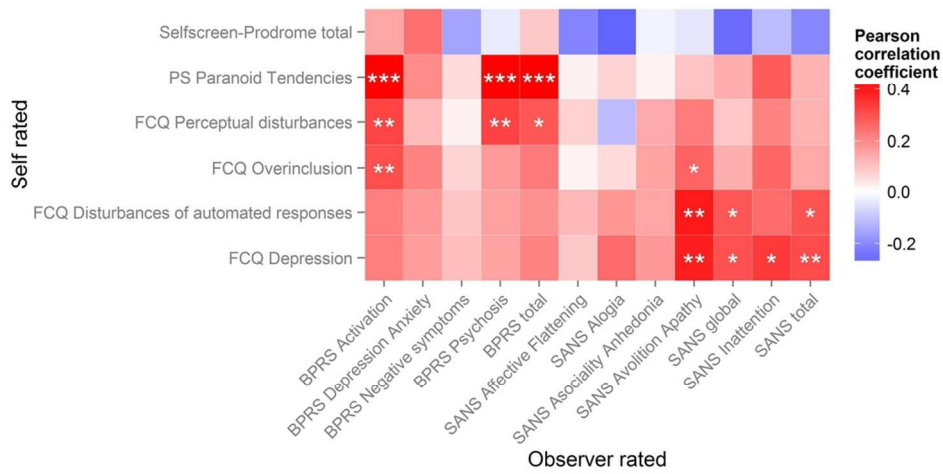


Figure 1. Correlations of original self- and observer-rating subscales

\*p < 0.05, \*\*p < 0.01, \*\*\*p < 0.001

BPRS = Brief Psychiatric Rating Scale; SANS = Scale for the Assessment of Negative symptoms; FCQ = Frankfurt Complaint Questionnaire; SSP = Selfscreen-Prodrome; PS = Paranoid Scale  
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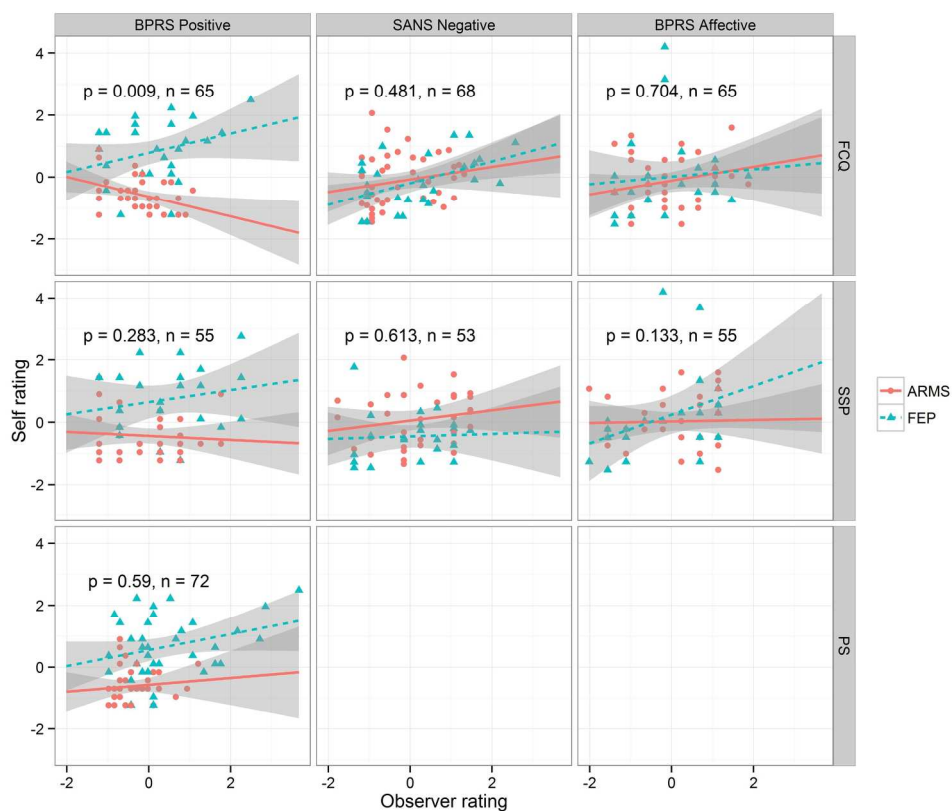


Figure 2. Diagnostic Group x Self-rating scale interactions  
 BPRS = Brief Psychiatric Rating Scale; SANS = Scale for the Assessment of Negative symptoms; FCQ = Frankfurt Complaint Questionnaire; SSP = Selfscreen-Prodrome; PS = Paranoid Scale, ARMS = At-risk mental state; FEP = First episode of psychosis; grey shaded area = confidence interval  
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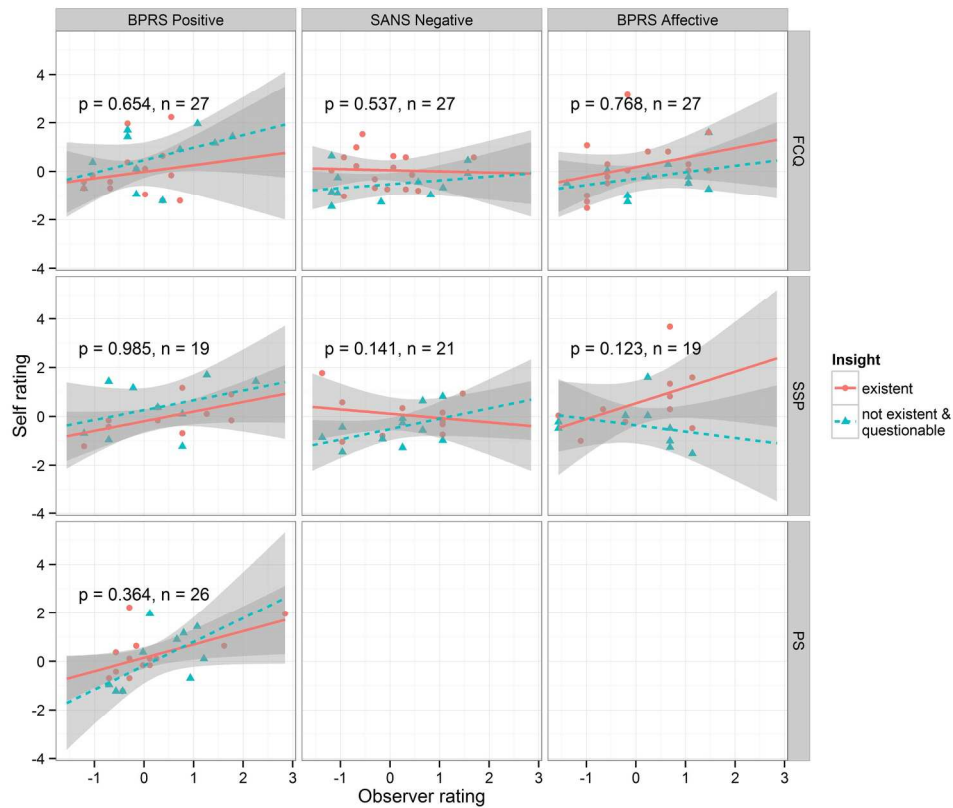


Figure 3. Insight x Self-rating scale interactions  
 BPRS = Brief Psychiatric Rating Scale; SANS = Scale for the Assessment of Negative symptoms; FCQ = Frankfurt Complaint Questionnaire; SSP = Selfscreen-Prodrome; PS = Paranoid Scale, ARMS = At-risk mental state; FEP = First episode of psychosis; grey shaded area = confidence interval  
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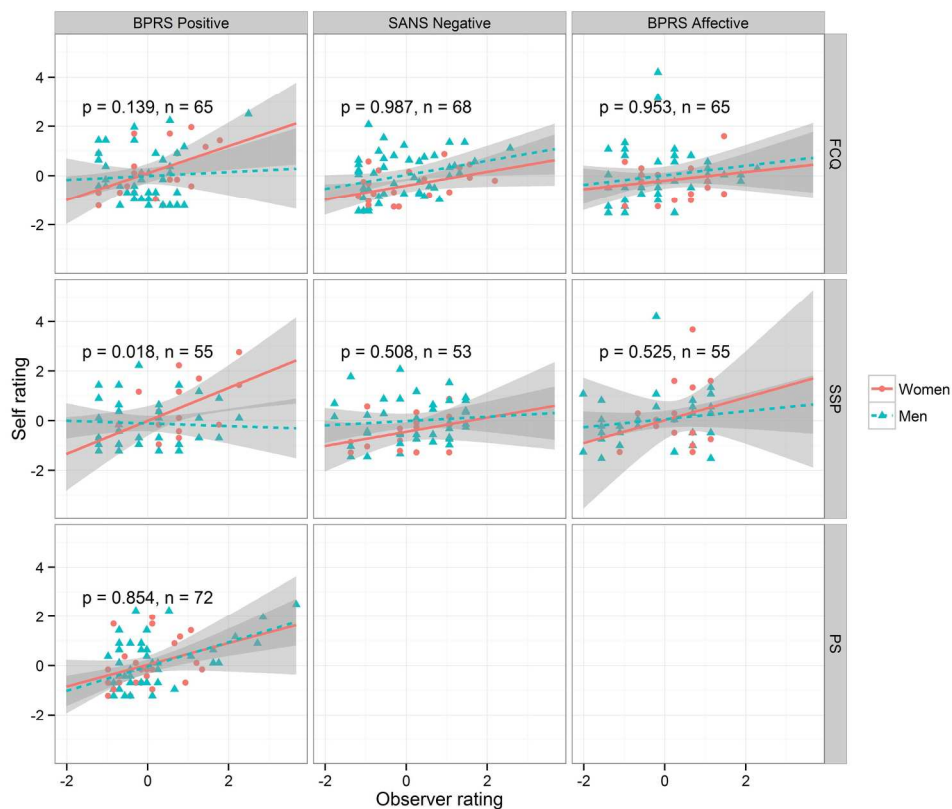


Figure 4. Gender × Self-rating scale interactions  
 BPRS = Brief Psychiatric Rating Scale; SANS = Scale for the Assessment of Negative symptoms; FCQ = Frankfurt Complaint Questionnaire; SSP = Selfscreen-Prodrome; PS = Paranoid Scale, ARMS = At-risk mental state; FEP = First episode of psychosis; grey shaded area = confidence interval  
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4 *Figure 1.* Correlations of original self- and observer-rating subscales

5 \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.01$

6 BPRS = Brief Psychiatric Rating Scale; SANS = Scale for the Assessment of Negative symptoms; FCQ =  
7 Frankfurt Complaint Questionnaire; SSP = Selfscreen-Prodrome; PS = Paranoid Scale

8  
9 *Figure 2.* Diagnostic Group  $\times$  Self-rating scale interactions

10 BPRS = Brief Psychiatric Rating Scale; SANS = Scale for the Assessment of Negative symptoms; FCQ =  
11 Frankfurt Complaint Questionnaire; SSP = Selfscreen-Prodrome; PS = Paranoid Scale, ARMS = At-risk  
12 mental state; FEP = First episode of psychosis; grey shaded area = confidence interval

13  
14 *Figure 3.* Insight  $\times$  Self-rating scale interactions

15 BPRS = Brief Psychiatric Rating Scale; SANS = Scale for the Assessment of Negative symptoms; FCQ =  
16 Frankfurt Complaint Questionnaire; SSP = Selfscreen-Prodrome; PS = Paranoid Scale, ARMS = At-risk  
17 mental state; FEP = First episode of psychosis; grey shaded area = confidence interval

18  
19 *Figure 4.* Gender  $\times$  Self-rating scale interactions

20 BPRS = Brief Psychiatric Rating Scale; SANS = Scale for the Assessment of Negative symptoms; FCQ =  
21 Frankfurt Complaint Questionnaire; SSP = Selfscreen-Prodrome; PS = Paranoid Scale, ARMS = At-risk  
22 mental state; FEP = First episode of psychosis; grey shaded area = confidence interval

Table 1

*Socio-demographic sample characteristics*

|                              | Total      | ARMS<br>(N=126) | FEP<br>(N=94) | <i>p</i> -value |
|------------------------------|------------|-----------------|---------------|-----------------|
| Gender                       |            |                 |               | 0.649           |
| Female                       | 81         | 48              | 33            |                 |
| Male                         | 139        | 78              | 61            |                 |
| Age mean (SD)                | 27.4       | 25.7 (7.5)      | 29.8 (8.6)    | < 0.001***      |
| Years of education mean (SD) | 11.4 (3.0) | 11.7 (3.1)      | 11.1 (3.0)    | 0.109           |

Note. \**p* < 0.05, \*\**p* < 0.01, \*\*\**p* < 0.001

T-tests for independent samples were used for continuous variables,  $\chi^2$  tests for categorical variables,

ARMS = At-risk mental state; FEP = First episode of psychosis

## Supplementary Table 1

*Items used for the adapted subscales*

## BPRS – Affective Symptoms

2. Anxiety
3. Depression
4. Suicidality
5. Guilt

## BPRS – Positive Symptoms

10. Hallucinations
11. Unusual thought content
12. Bizarre behaviour
15. Conceptual disorganization

## SANS – Negative Symptoms

1. Unchanging facial expression
2. Decreased spontaneous movements
3. Paucity of expressive gestures
4. Poor eye contact
5. Affective non-responsivity
6. Lack of vocal inflections
8. Poverty of speech
9. Poverty of content of speech
10. Blocking
11. Increased latency of response

13. Grooming and hygiene
14. Impersistence at work or school
15. Physical anergia
17. Recreational Interests and Activities
18. Sexual Interest and Activity
19. Ability to Feel Intimacy and Closeness
20. Relationships with Friends and Peers
22. Social Inattentiveness
23. Inattentiveness during mental status testing

#### FCQ – Affective Symptoms

1. I fear that my ability to think will decline increasingly.
15. My libido has decreased.
16. I can no longer feel truly happy anymore.
41. I cannot sleep as good as I used to.
55. I am afraid of almost everything that is happening to me daily.
56. Everything unusual troubles me but I cannot explain why.
72. Music does not sound like it used to.
87. If I get agitated I do not know whether I feel joy or anger.
98. I fear that my concentration decreases more and more.

#### FCQ – Negative Symptoms

5. Speaking does not always work out, although I have the words in my head which I would like to say.
8. There are large gaps in my memory, a lot of what I knew is gone.
10. Normal ambient noises which I never noticed before are now very distracting to me.

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3 27. Even if I see something in front of me it does not get into my mind and I remain uncertain.  
4  
5 30. I have to focus on a spot otherwise everything is blurred.  
6  
7 31. It is difficult for me to make long sentences.  
8  
9 37. When I read long texts, I often forget the beginning and do not understand the context.  
10  
11 39. It occurs to me that I cannot concentrate on something particular.  
12  
13 40. I often stop when I read a familiar word and have to think what it means.  
14  
15 42. When I speak, the word I wanted to say often disappears.  
16  
17 46. My daily routine often gets mixed up because I forgot my past habits.  
18  
19 48. I often start an activity and realize that I do not know why I wanted to do it.  
20  
21 52. When I want to remember something, I am not able to because something else crosses my  
22  
23 mind  
24  
25 60. I often do not know what happens around me.  
26  
27 61. Often it is too much for me when people move or talk around me. I then have to withdraw  
28  
29 to get my balance back.  
30  
31 65. When I speak with someone nothing should distract me, otherwise I cannot follow the  
32  
33 conversation.  
34  
35 66. Speaking does not work as well as it used to, the words do not cross my mind fast enough.  
36  
37 68. When I want to imagine something I am not able to recall all the details.  
38  
39 69. When someone talks to me, I hear the words but I do not understand the meaning.  
40  
41 70. It is uncomfortable that my thoughts often disappear.  
42  
43 71. Sometimes I want to talk, but I cannot as the words are suddenly gone.  
44  
45 73. I often notice that I do not remember what I did or said recently.  
46  
47 75. Everything is going much slower than before because I have to really concentrate on  
48  
49 everything.  
50  
51 78. My memory is not intact anymore. I notice all the time that there are gaps.  
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3 80. I have to concentrate on one thing, I cannot think of anything and at the same time notice  
4  
5 what is around me at the same time.  
6

7 82. I often read over the lines and do not understand their meaning.  
8

9 88. Sometimes I stop in the middle of a sentence without wanting to.  
10

11 90. I am reluctant to read as I struggle with comprehending the meaning.  
12

13 91. I cannot imagine faces of familiar persons properly.  
14

15 93. I withdraw from other people because I have difficulties following conversations.  
16

17 94. I have difficulties to get the meaning if someone says long sentences.  
18

19 97. I cannot watch TV anymore because I struggle with following pictures and sound at the  
20  
21 same time and with understanding the plot.  
22  
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26  
27 FCQ – Positive Symptoms  
28

29 2. It is confusing me if I have too many thoughts at the same time in my head.  
30

31 4. My thoughts are often intrusive as if something inside me is thinking loudly.  
32

33 13. I get often distracted while thinking because of inappropriate ideas.  
34

35 14. The faces of people have once looked like warped or displaced.  
36

37 18. Sometimes I have the feeling to be floating.  
38

39 19. Sometimes things looked like shifted and distorted.  
40

41 21. Often, I hear everything mixed as I cannot differentiate between noises.  
42

43 22. I cannot determine anymore what I am saying or doing.  
44

45 23. Sometimes it seems that the ground I walk on is swelling or bending.  
46

47 24. Sometimes the colours of familiar things look different.  
48

49 25. Sometimes sounds seem different as they usually do.  
50

51 29. Sometimes everything around me looks small.  
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53 32. When I look around me, some objects stand out conspicuously even though I do not  
54  
55 specifically look at them.  
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3 33. Often, I realize that I say different words than I want to.  
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5 35. It is always a big effort to organize my thoughts.  
6  
7 36. My concentration is getting worse because my thoughts always get mixed up and I have no  
8 control over it.  
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10  
11 45. Sometimes everything looks far away.  
12  
13 50. On the street or in a room it occurred to me as if walls and objects are moving towards me.  
14  
15 51. Sometimes I stay steady so that the objects around me stop to wiggle.  
16  
17 53. Any normal sound can suddenly appear very loud to me.  
18  
19 54. When I want to concentrate, inappropriate words that are crossing my mind are distracting  
20 me.  
21  
22 63. I often see only parts of a big picture.  
23  
24  
25 76. Sometimes I see something and it takes some time for me to see whether I imagined it or  
26 not.  
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28 79. It seems to me that objects are moving, even if I do not focus on them.  
29  
30  
31 84. Sometimes letters looked upside down, disarranged or changed when I was reading.  
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33 85. I cannot decide what I want to think.  
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35 89. I cannot protect me enough. Everything affects me too much.  
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37 92. I often looked so strange in a mirror that I got frightened.  
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39 96. I often notice that I behave differently than I want to: I cannot control my behaviour  
40 anymore.  
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#### 49 SSP – Affective Symptoms

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51 1. Increased sensitivity, more easily moved  
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53 2. Over-sensitivity, more easily hurt or upset  
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55 3. Irritability  
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58 5. Nervousness, feeling tense  
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1  
2  
3 9. Anxiety  
4

5 10. Feeling depressed  
6

7 15. Lower level of resilience  
8  
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10  
11 SSP – Negative Symptoms  
12

13  
14 7. Lack of energy, drive, initiative or interest  
15

16 11. Blunted emotions  
17

18 13. Difficulties concentrating  
19

20 14. More easily distracted  
21

22 22. Withdrawing from others, isolating oneself  
23

24 25. Marked decline in performance, possibly with difficulties at work or school  
25

26 26. Neglecting jobs and duties  
27

28 29. Increased problems with relationships (partner, family, work)  
29  
30  
31

32  
33 SSP – Positive Symptoms  
34

35 8. Suspiciousness  
36

37 16. Changes in interests (e.g. unusual interest in religion and supernatural matters)  
38

39 17. Changes in perception (e.g. hearing, seeing, smelling or tasting unusual things)  
40

41 18. Relating events to oneself  
42

43 19. Feeling observed, harmed or threatened  
44

45 20. Feeling controlled or influenced by others  
46

47 23. Changes in behaviour  
48  
49  
50

51  
52 PS – Positive Symptoms  
53

54 4. I am under the influence of other people against my will.  
55

56 5. I believe to already have experienced the end of the world.  
57  
58  
59  
60

- 1
- 2
- 3 8. Sometimes my body seems to move by itself.
- 4
- 5 9. Someone wants to destroy my mental well-being.
- 6
- 7 12. I am constantly observed or controlled by others.
- 8
- 9 13. I suffer from strange changes on or in my body.
- 10
- 11 14. There are people who are trying to steal my thoughts and ideas.
- 12
- 13 16. Some people seem to be jealous of my knowledge, my discoveries and of my special
- 14 experiences.
- 15
- 16 17. I have strange experiences like intuitions and visions.
- 17
- 18 19. Someone is seeking my life.
- 19
- 20 20. I have the feeling to be influenced by electric currents, radiation or hypnosis.
- 21
- 22 22. Sometimes I feel a superhuman and overflowing strength in me.
- 23
- 24 23. My thoughts are already known by others.
- 25
- 26 24. For some things I need to form my own, new words, which other people do not understand.
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Table 2

*Clinical sample characteristics*

|  | Total         | ARMS<br>(N=126) | FEP<br>(N=94) | <i>p</i> -value | N<br>ARMS/FEP |
|--|---------------|-----------------|---------------|-----------------|---------------|
| BPRS Depression/Anxiety                    | 9.86 (3.85)   | 9.23 (3.5)      | 10.66 (4.08)  | 0.008**         | 113/89        |
| BPRS Psychosis/Thought<br>Disturbance      | 8.61 (3.768)  | 6.44 (2.2)      | 11.38 (3.56)  | < 0.001***      | 114/89        |
| BPRS Negative Symptoms                     | 6.08 (2.87)   | 6.16 (2.93)     | 5.99 (2.79)   | 0.676           | 113/89        |
| BPRS Activation                            | 6.21 (2.65)   | 5.45 (1.89)     | 7.18 (3.14)   | 0.000***        | 113/89        |
| BPRS Total score                           | 45.64 (12.47) | 40.4 (9.35)     | 52.29 (12.8)  | < 0.000***      | 113/89        |
| SANS Affective Flattening                  | 5.75 (6.42)   | 5.81 (6.40)     | 5.67 (6.47)   | 0.878           | 112/85        |
| SANS Alogia                                | 3.39 (3.98)   | 3.27 (3.89)     | 3.55 (4.13)   | 0.624           | 113/84        |
| SANS Avolition-Apathy                      | 5.81 (3.28)   | 5.55 (2.98)     | 6.16 (3.62)   | 0.206           | 114/85        |
| SANS Asociality-Anhedonia                  | 7.7 (5.23)    | 7.7(5.18)       | 7.77(5.32)    | 0.923           | 110/84        |
| SANS Inattention                           | 1.87 (2.01)   | 1.59 (1.59)     | 2.22 (2.42)   | 0.049*          | 100/78        |
| SANS total score                           | 24.37 (16.76) | 23.77 (16.28)   | 25.18 (17.44) | 0.560           | 114/85        |
| FCQ Disturbances of<br>automated responses | 6.74 (5.68)   | 5.51 (4.64)     | 8.38 (6.51)   | 0.005**         | 77/58         |
| FCQ Perceptual disturbances                | 4.97 (5.22)   | 3.41 (3.03)     | 7.07 (6.65)   | < 0.001***      | 78/58         |
| FCQ Depression                             | 9.10 (6.52)   | 7.59 (5.82)     | 11.12 (6.90)  | 0.002**         | 78/58         |
| FCQ Overinclusion                          | 7.13 (4.65)   | 6.21 (4.00)     | 8.36 (5.17)   | 0.01*           | 77/58         |
| FCQ Total score                            | 28.32 (19.97) | 23.14 (15.39)   | 35.19 (23.19) | 0.001**         | 77/58         |
| SSP Total                                  | 15.61 (9.89)  | 15.33 (6.71)    | 16.05 (7.23)  | 0.611           | 63/39         |
| PS Paranoid Tendencies                     | 7.58 (7.50)   | 4.79 (4.60)     | 11.21 (8.91)  | < 0.001***      | 73/56         |

## Adapted subscales:

|                         |             |             |              |            |       |
|-------------------------|-------------|-------------|--------------|------------|-------|
| FCQ-Affective Symptoms  | 3.41 (2.44) | 2.94 (2.28) | 4.05 (2.54)  | 0.008**    | 78/58 |
| FCQ-Positive Symptoms   | 6.88 (5.67) | 5.29 (3.79) | 9.02 (6.98)  | < 0.001**  | 78/58 |
| FCQ-Negative Symptoms   | 9.44 (8.00) | 7.46 (6.28) | 12.10 (9.27) | 0.001**    | 78/58 |
| SSP-Affective Symptoms  | 3.98 (1.88) | 4.08 (1.86) | 3.82 (1.93)  | 0.503      | 65/93 |
| SSP-Positive Symptoms   | 2.44 (2.02) | 2.12 (1.88) | 2.97 (2.15)  | 0.037*     | 65/93 |
| SSP-Negative Symptoms   | 4.38 (2.47) | 4.60 (1.86) | 3.82 (1.93)  | 0.023*     | 65/93 |
| PS-Positive Symptoms    | 7.16 (7.32) | 4.35 (4.42) | 10.79 (8.65) | < 0.001*** | 75/58 |
| Illness insight         |             |             |              | < 0.001*** |       |
| existent                | 90          | 60          | 30           |            |       |
| inexistent/questionable | 38          | 12          | 26           |            |       |

Note. \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$

T-tests for independent samples were used for continuous variables,  $\chi^2$  tests for categorical variables, ARMS = At-risk mental state; FEP = First episode of psychosis; BPRS = Brief Psychiatric Rating Scale; SANS = Scale for the Assessment of Negative symptoms; FCQ = Frankfurt Complaint Questionnaire; SSP = Selfscreen-Prodrome; PS = Paranoid Scale.

Table 3

*MTMM matrix of the adapted subscales*

| Subscales       |             | Observer-rating |                               |                               | Self-rating                   |                               |                              |                               |                              |                              |                               |                              |
|-----------------|-------------|-----------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|------------------------------|-------------------------------|------------------------------|------------------------------|-------------------------------|------------------------------|
|                 |             | BPRS            |                               | SANS                          | FCQ                           |                               |                              | SSP                           |                              |                              | PS                            |                              |
|                 |             | A               | P                             | N                             | A                             | P                             | N                            | A                             | P                            | N                            | P                             |                              |
| Observer-rating | <u>BPRS</u> | A               | $\alpha=0.72$<br>$\beta=0.51$ | 203                           | 166                           | 65                            | 65                           | 65                            | 55                           | 55                           | 55                            | 72                           |
|                 |             | P               | 0.277**                       | $\alpha=0.63$<br>$\beta=0.51$ | 166                           | 65                            | 65                           | 65                            | 55                           | 55                           | 55                            | 72                           |
|                 | <u>SANS</u> | N               | 0.144                         | 0.073                         | $\alpha=0.95$<br>$\beta=0.77$ | 68                            | 68                           | 68                            | 53                           | 53                           | 53                            | 76                           |
| Self-rating     | <u>FCQ</u>  | A               | 0.210                         | 0.071                         | 0.344**                       | $\alpha=0.87$<br>$\beta=0.78$ | 136                          | 136                           | 57                           | 57                           | 57                            | 92                           |
|                 |             | P               | 0.222                         | 0.227                         | 0.249*                        | 0.659**                       | $\alpha=0.9$<br>$\beta=0.79$ | 136                           | 57                           | 57                           | 57                            | 92                           |
|                 |             | N               | 0.201                         | 0.271                         | 0.317**                       | 0.754**                       | 0.711**                      | $\alpha=0.96$<br>$\beta=0.85$ | 57                           | 57                           | 57                            | 92                           |
|                 | <u>SSP</u>  | A               | 0.192                         | -0.146                        | -0.035                        | 0.496**                       | 0.253                        | 0.280*                        | $\alpha=0.89$<br>$\beta=0.7$ | 104                          | 104                           | 56                           |
|                 |             | P               | 0.130                         | 0.201                         | -0.180                        | 0.268*                        | 0.247                        | 0.226                         | 0.443**                      | $\alpha=0.86$<br>$\beta=0.7$ | 104                           | 56                           |
|                 |             | N               | 0.236                         | -0.129                        | 0.138                         | 0.521**                       | 0.442**                      | 0.486**                       | 0.679**                      | 0.393**                      | $\alpha=0.88$<br>$\beta=0.75$ | 56                           |
|                 | <u>PS</u>   | P               | 0.246*                        | 0.454**                       | 0.185                         | 0.512**                       | 0.577**                      | 0.494**                       | 0.227                        | 0.577**                      | 0.077                         | $\alpha=0.92$<br>$\beta=0.8$ |

Note: \* $p < 0.05$ , \*\* $p < 0.01$

A = Affective Symptoms; P = Positive Symptoms; N = Negative Symptoms; BPRS = Brief Psychiatric Rating Scale; SANS = Scale for the Assessment of Negative symptoms; FCQ = Frankfurt Complaint Questionnaire; SSP = Selfscreen-Prodrom; PS = Paranoid Scale; below diagonal = correlation between symptom dimensions; above diagonal = sample size; grey = matching subscales (validity);  $\alpha$  = Cronbach's  $\alpha$ ;  $\beta$  = Revelle's  $\beta$