Flat affect and social functioning: A 10 year follow-up study of first episode psychosis patients

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Abstract

Background: Affective flattening has been described as enduring, but long term follow-up studies of first episode psychosis patients are lacking.

Objective: The aim of this study was to follow the symptom development of flat affect (FA), over a 10 year follow-up period, with focus on prevalence, predictors and outcome factors including social functioning.

Methods: Three-hundred-and-one patients with FEP were included at baseline, 186 participated in the 10 year follow-up. These were followed on PANSS item N1 (FA) from baseline through 5 follow-up assessments over 10 years. Patients were grouped as having never-present, improving, deteriorating, or enduring FA. The groups were compared on baseline variables, variables at 10 year follow-up, and social functioning throughout the follow-up period.

Results: Twenty nine percent never displayed FA, 66% had improving, deteriorating, or enduring FA. The groups were compared at affect. Factor analyses of the negative symptom dimension have indicated two separate factors: avolition/apathy and flat affect (Blanchard and Cohen, 2006; Messinger et al., 2011). Recent studies have emphasized the role of apathy in short and long-term outcomes including general functioning (Kiang et al., 2013; Faerden et al., 2009, 2010; Foussias et al., 2009; Foussias and Remington, 2010). Flat affect (FA) has received less specific attention.

Flat affect is described as unchanging facial expression, paucity of emotion, and apathetic affect. Factor analyses of the negative symptom dimension have indicated two separate factors: avolition/apathy and flat affect (Blanchard and Cohen, 2006; Messinger et al., 2011). Recent studies have emphasized the role of apathy in short and long-term outcomes including general functioning (Kiang et al., 2013; Faerden et al., 2009, 2010; Foussias et al., 2009; Foussias and Remington, 2010). Flat affect (FA) has received less specific attention.

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of Negative Symptoms (SANS) at baseline and four points of follow-up over one year in both a chronic and a first episode schizophrenia sample. The study concluded that levels of FA were largely stable over 1 year, in contrast with the other negative symptoms that followed a more fluctuating course.

Long-term longitudinal studies of schizophrenia and FEP populations generally focus on the negative symptom dimension rather than individual symptoms, and report cross-sectional results rather than longitudinal symptom profiles (Eaton et al., 1995; Milev et al., 2005; Siegel et al., 2006; Bertelsen et al., 2009; White et al., 2009). Harrow and colleagues, however, studied the longitudinal symptom trajectory of 42 young patients with schizophrenia and schizoaffective disorder and found that 19% had enduring, 41% episodic and 40% no negative symptoms over a 10 year follow-up period. Enduring symptoms was defined as being above threshold level (>1 on ≥1 item, Pogue-Geile and Harrow’s Negative Symptom Scale) at 3 follow-up assessments (Herbener and Harrow, 2001). This study did not look at specific negative symptoms. To our knowledge no FEP study has followed the symptom development of FA for longer than 1 year.

Studies have shown a significant association between negative symptoms and reduced social functioning over time (Shtasel et al., 1992; Ho et al., 1998; Lysaker and Davis, 2004). A 1 year follow-up study of patients with schizophrenia found that patients with FA had poorer social outcome compared to patients without FA (Gur et al., 2006). We do not know the relationship between FA and social functioning beyond one year.

This study aims to explore symptom development of PANSS rated FA in FEP patients. We followed patients over a 10 year period and identified patients with never-present, improving, deteriorating, fluctuating and enduring FA. We wished to address the following questions:

1. What is the prevalence and stability of FA in a FEP sample followed over a 10 year period?
2. Do the FA trajectory groups differ with regard to baseline variables, and do any of these variables predict enduring FA affect?
3. Do patients with different FA trajectories differ on outcome measures with regard to remission and recovery?
4. Do the FA trajectory groups differ in social functioning over the 10 year follow-up period?

2. The TIPS study

The TIPS (Early Treatment and Intervention in Psychosis) project is a large, longitudinal study of consecutively admitted FEP patients. The overall study design, samples, and assessment instruments are detailed in other reports (Larsen et al., 2001; Melle et al., 2004). Briefly, the study was designed to identify and follow-up clinical, epidemiologic samples of FEP patients from four Scandinavian catchment sites. Patients were assessed at baseline, 3 months, 1, 2, 5 and 10 years.

2.1. Study participants

The study was carried out within the specialist psychiatric healthcare services of four Scandinavian health care sectors (North and South sector, Rogaland County, Norway, Ullevaal Sector, Oslo, Norway, and Fjorden mid-sector, Roskilde, Denmark).

Inclusion criteria were as follows:

1. A first episode psychosis (PANSS score ≥ 4 on one or more of positive subscale items 1, 3, 5 or 6 or on general subscale ≥ 7 days).
2. Meeting the DSM-IV criteria for schizophrenia, schizophreniform disorder, schizoaffective disorder, brief psychotic episode (BPE), delusional disorder (DD), affective psychosis with mood-incongruent psychotic features (MDE) or psychotic disorder not otherwise specified (Psychosis NOS).
3. Age 18–65 years (15–65 in Rogaland).
4. IQ > 70.
5. Enduring (item scores ≤ 3 as threshold for FA).
6. Deteriorating (item scores ≤ 2, and ≥ 3).
7. Fluctuating (≥ 2 fluctuations across threshold for FA).
8. Never-present (item score ≤ 2 on all assessments).
9. Improving (starts ≥ 3, ends ≤ 2).

The diagnostic distribution at 10 year follow-up was schizophrenia 96 (52%), schizoaffective disorder 9 (5%), schizoaffective disorder 34 (18%), BPE 3 (2%), DD 7 (4%), psychosis NOS 11 (6%), and MDE 24 (13%).

2.2. Instruments and measures

The structured clinical interview for the DSM-IV (SCID) was used for diagnostic purposes (Spitzer et al., 1992). Duration of untreated psychosis (DUP) was measured as the time in weeks from the first positive psychotic symptoms (PANSS score ≥ 4 on Positive scale items 1, 3, 5 or 6 or General scale item 9) to the start of the first adequate treatment of psychosis. Premorbid functioning was measured by the Premorbid Assessment of Functioning Scale (PAS) (Larsen et al., 2004). Symptom levels were measured by the Positive and Negative Syndrome Scale (PANSS) (Kay et al., 1987), and symptom domains were represented by the corresponding PANSS components (positive, negative, excitatory, cognitive and depressive) (Bentsen et al., 1996). Global functioning was measured by the Global Assessment of Functioning Scale (GAF-F) (Endicott et al., 1976). Employment and ability to live independently were measured with the Strauss Carpenter Level of Functioning Scale (SCLFS) (Strauss and Carpenter, 1974). Objective social functioning was measured using Lehman’s Quality of Life Interview (L-QoLI) (Lehman, 1988). Antipsychotic medication, Defined Daily Dose (DDD), was measured using the World Health Organization Collaborating Center for Drugs statistics methodology (WHO, Collaborating Centre for Drug Statistics Methodology, 2008). Symptom remission was defined according to international standardized criteria (Andreasen et al., 2005), including PANSS score ≤ 4 on Positive scale items 1, 2, 3, 5 and 6, Negative scale items 1, 4, 6, and General scale items 5 and 9. Recovery was operationalized as a combination of symptom remission and 3 functional dimensions from the SCLFS: Independent living, Role functioning (work, academic, or full-time homemaking) and Social Interaction. A score of 0 indicated poor, and 4 indicated good functioning. Patients in recovery had, during the last 12 months, fulfilled the symptom remission criteria above and scored 4 on all functional dimensions.

The above test-battery was used at baseline and repeated at 1, 2, 5 and 10 years, excluding DUP and PAS. At 3 months only PANSS and GAF were used.

Good reliability for major variables (GAF, DUP and diagnosis) has been documented for earlier assessments (Friis et al., 2003). For the
10 year follow-up 26 video-taped patient interviews were rated by an experienced psychologist not involved in the project and blind to all ratings. For GAF the ICCs were .83 (symptoms) and 0.88 (function). For the five PANSS components the ICCs ranged from 0.61 to 0.82 with a median of 0.67. ICC for PANSS item N1 was .76.

### 2.3. Statistical analysis

The analyses were performed with the SPSS Statistical Program (version 18: SPSS Inc., Chicago, IL, USA). Mean and standard deviations are reported for continuous variables and percentages for categorical variables. DUP had a markedly left skewed distribution and was transformed to its natural logarithm (ln(DUP + 1)). One-way ANOVA was used to compare the FA groups on parametric data (Tukey post hoc test), and Kruskal–Wallis test was used on non-parametric and unevenly distributed data. Binary logistic regression was performed to assess baseline predictors of enduring FA. The model contained 3 independent variables: 1. PANSS baseline positive, depressive, cognitive and excitative components, 2. baseline GAF-F, and 3. PAS last social function. Baseline variables where the FA groups showed statistically significant differences were chosen. Independent sample t-test was used to compare the enduring group to the other groups on objective social functioning from baseline to 10 year follow-up.

### 3. Results

Out of a total of 184 patients 10 patients (5%) showed enduring flat affect (FA) over the course of the ten year follow up period, 53 (29%) patients never displayed FA, while 18 (10%) patients had initial FA that resolved over the course of follow-up (the improving group). Twenty-nine patients (16%) developed FA in the follow-up period (the deteriorating group). The fluctuating group was the largest group, containing 74 patients (40%). This group was heterogeneous: approximately 1/3 moved from above to below to above threshold FA, 1/3 moved from below to above below threshold FA, and 1/3 experienced several fluctuations in FA. A total of 76 out of 184 patients (41%) had clinically significant FA at 10 years. Fig. 1 describes the symptom development in FA in the 5 groups over the 10 year follow-up period.

**Table 1** describes the 5 FA trajectory groups on baseline characteristics and premorbid function (PAS). On most clinical and functional variables the never-present group had the best scores, while the enduring group scored poorest. This trend was most pronounced for premorbid social function (last score), and PANSS negative symptoms where the differences between the groups reached statistical significance.

Binary logistic regression was performed to assess possible baseline predictors of enduring FA (Table 2). The model contained three blocks of independent variables: 1. PANSS baseline positive, depressive, cognitive and excitative components, 2. baseline GAF-F, and 3. PAS last social function. The model as a whole explained between 8.7% (Cox and Snell square) and 26.7% (Nagelkerke R Square) of the variance. As shown in Table 2 the only significant contributors to the model were GAF-F and PAS last social function. The strongest predictor of enduring FA was PAS last social function (OR of 1.9, Wald 7.17, p = .007).

### Table 1

Baseline variables and PAS differences between the 5 flat affect trajectory groups.

<table>
<thead>
<tr>
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<tbody>
<tr>
<td><strong>Males (%)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(N=53)</td>
<td>(N=18)</td>
<td>(N=29)</td>
<td>(N=74)</td>
<td>(N=10)</td>
</tr>
<tr>
<td>Age baseline (years)</td>
<td>28.5 (9.37)</td>
<td>29.2 (8.72)</td>
<td>28.1 (10.70)</td>
<td>26.2 (9.07)</td>
<td>28.6 (9.86)</td>
</tr>
<tr>
<td>SZP spectrum (%)</td>
<td>55</td>
<td>61</td>
<td>66</td>
<td>64</td>
<td>80</td>
</tr>
<tr>
<td>Years of education</td>
<td>12.5 (2.46)</td>
<td>11.8 (2.53)</td>
<td>11.9 (2.00)</td>
<td>12.1 (2.51)</td>
<td>12.6 (4.21)</td>
</tr>
<tr>
<td>DU (weeks, median, range)</td>
<td>4 (0–235)</td>
<td>18 (0–450)</td>
<td>5 (0–140)</td>
<td>6 (0–520)</td>
<td>10 (1–87)</td>
</tr>
<tr>
<td>PAS soc. childhood</td>
<td>.70 (.98)</td>
<td>1.35 (1.31)</td>
<td>.91 (1.08)</td>
<td>1.11 (1.22)</td>
<td>1.17 (.81)</td>
</tr>
<tr>
<td>PAS soc. last score</td>
<td>1.12 (1.30)</td>
<td>1.88 (1.14)</td>
<td>1.66 (1.57)</td>
<td>2.02 (1.53)</td>
<td>3.17 (1.52)</td>
</tr>
<tr>
<td>PAS ac. childhood</td>
<td>1.54 (1.05)</td>
<td>2.00 (1.12)</td>
<td>1.83 (1.21)</td>
<td>1.64 (1.10)</td>
<td>2.22 (1.02)</td>
</tr>
<tr>
<td>PAS ac. last score</td>
<td>2.38 (1.52)</td>
<td>2.68 (1.50)</td>
<td>2.16 (1.18)</td>
<td>2.21 (1.34)</td>
<td>2.61 (1.14)</td>
</tr>
<tr>
<td>PANSS pos. comp.</td>
<td>14.1 (4.27)</td>
<td>15.7 (3.03)</td>
<td>15.2 (4.01)</td>
<td>15.69 (4.40)</td>
<td>17.40 (5.13)</td>
</tr>
<tr>
<td>PANSS neg. comp.</td>
<td>16.0 (4.52)</td>
<td>26.7 (7.80)</td>
<td>17.5 (5.01)</td>
<td>22.24 (9.68)</td>
<td>30.4 (10.14)</td>
</tr>
<tr>
<td>PANSS N1</td>
<td>1.09 (.30)</td>
<td>3.6 (.78)</td>
<td>1.17 (.38)</td>
<td>2.23 (.41)</td>
<td>3.75 (1.32)</td>
</tr>
<tr>
<td>PANSS dep. comp.</td>
<td>11.1 (3.84)</td>
<td>14.2 (3.92)</td>
<td>12.10 (3.82)</td>
<td>11.9 (3.95)</td>
<td>12.10 (5.26)</td>
</tr>
<tr>
<td>PANSS cog. comp.</td>
<td>7.2 (3.09)</td>
<td>8.3 (3.44)</td>
<td>6.8 (3.27)</td>
<td>7.1 (3.62)</td>
<td>8.4 (3.27)</td>
</tr>
<tr>
<td>PANSS exc. comp.</td>
<td>10.5 (4.84)</td>
<td>10.3 (4.00)</td>
<td>8.1 (2.00)</td>
<td>8.72 (3.89)</td>
<td>11.5 (7.44)</td>
</tr>
<tr>
<td>GAF-F</td>
<td>31.9 (11.20)</td>
<td>29.7 (8.50)</td>
<td>34.0 (11.20)</td>
<td>32.8 (10.55)</td>
<td>23.9 (8.63)</td>
</tr>
</tbody>
</table>

Note: Stat. sign. diff. p = .05.

PAS social last score: Kruskal–Wallis test: p = .05.
PANSS neg. comp.: 1=2, 4 and 5.
PANSS N1: 1 and 3=2, 4 and 5.
PANSS dep. comp.: 1=2.

SZP spectrum disorder equals a diagnosis of schizophrenia, schizophreniform disorder or schizoaffective disorder.

DUP = duration of untreated psychosis.

PAS = Premorbid Assessment of Functioning Scale.
PANSS = Positive and Negative Syndrome Scale Score.
GAF-F = Global Assessment of Functioning Scale, functional component.
**Table 2**
Binary logistic regression analysis with enduring flat affect vs. not enduring flat affect as dependent variable and baseline scores as independent variables.

<table>
<thead>
<tr>
<th>Model variable</th>
<th>O.R.</th>
<th>95% C.I.</th>
<th>p value</th>
<th>S.E.</th>
<th>Wald</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stg. 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PANSS Pos.</td>
<td>1.1</td>
<td>.93–1.3</td>
<td>.257</td>
<td>.08</td>
<td>1.28</td>
</tr>
<tr>
<td>PANSS Cog.</td>
<td>.93</td>
<td>.73–1.2</td>
<td>.579</td>
<td>.13</td>
<td>.31</td>
</tr>
<tr>
<td>PANSS Dep.</td>
<td>1.01</td>
<td>.85–1.21</td>
<td>.891</td>
<td>.09</td>
<td>.02</td>
</tr>
<tr>
<td>PANSS Exc.</td>
<td>1.02</td>
<td>.87–1.19</td>
<td>.836</td>
<td>.08</td>
<td>.08</td>
</tr>
<tr>
<td>Stg. 2: GAF-F</td>
<td>.90</td>
<td>.78–1.0</td>
<td>.042</td>
<td>.05</td>
<td>4.12</td>
</tr>
<tr>
<td>Stg. 3: PAS soc. last score</td>
<td>1.9</td>
<td>1.19–3.03</td>
<td>.007</td>
<td>.24</td>
<td>7.17</td>
</tr>
</tbody>
</table>

Logistic regression model for enduring flat affect (n = 10) vs. not (n = 174). For overall model including PANSS pos., cog. dep. and exc. components, GAF-F and PAS social last score: $\chi^2 = 16.5, df = 6, p = .01, \text{Nagelkerke } R^2 = 26.7$.

PAS = Premorbid Assessment of Functioning Scale.

PANSS = Positive and Negative Syndrome Scale Score.

GAF-F = Global Assessment of Functioning Scale, functional component.

**Table 3**
Variables at 10 year follow-up, differences between the 5 flat affect trajectory groups.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Never-present (N=53)</th>
<th>Improving (N=18)</th>
<th>Deteriorating (N=29)</th>
<th>Fluctuating (N=74)</th>
<th>Enduring (N=10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean (S.D.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time psychotic (%)</td>
<td>12.2 (7.7)</td>
<td>27</td>
<td>46.6</td>
<td>40.9</td>
<td>48.7</td>
</tr>
<tr>
<td>In remission (%)</td>
<td>77.4 (4.5)</td>
<td>61.1</td>
<td>31</td>
<td>39.2</td>
<td>20</td>
</tr>
<tr>
<td>Recovered (%)</td>
<td>52.8 (3.0)</td>
<td>27.8</td>
<td>6.9</td>
<td>13.5</td>
<td>0</td>
</tr>
<tr>
<td>Unable to live independently (%)</td>
<td>3.8 (3.0)</td>
<td>11.1</td>
<td>48.3</td>
<td>23</td>
<td>60</td>
</tr>
<tr>
<td>Employment</td>
<td>2.38 (1.76)</td>
<td>1.53 (1.33)</td>
<td>.90 (1.47)</td>
<td>1.08 (1.43)</td>
<td>.70 (1.49)</td>
</tr>
<tr>
<td>Obj. social function</td>
<td>3.6 (7.8)</td>
<td>1.0 (3.6)</td>
<td>2.5 (1.14)</td>
<td>3.1 (1.00)</td>
<td>2.0 (0.85)</td>
</tr>
<tr>
<td>PANSS pos. comp.</td>
<td>61.8 (16.0)</td>
<td>55.0 (14.5)</td>
<td>43.1 (10.84)</td>
<td>47.6 (14.41)</td>
<td>41.5 (8.73)</td>
</tr>
<tr>
<td>PANSS neg. comp.</td>
<td>7.4 (3.5)</td>
<td>8.1 (3.04)</td>
<td>11.1 (4.46)</td>
<td>11.1 (6.04)</td>
<td>9.7 (4.99)</td>
</tr>
<tr>
<td>PANSS dep. comp.</td>
<td>11.5 (2.57)</td>
<td>12.3 (2.4)</td>
<td>22.9 (9.43)</td>
<td>17.6 (6.36)</td>
<td>25.2 (6.36)</td>
</tr>
<tr>
<td>PANSS N1</td>
<td>11.1 (3.0)</td>
<td>1.2 (3.8)</td>
<td>3.3 (0.61)</td>
<td>2.2 (1.24)</td>
<td>3.6 (0.52)</td>
</tr>
<tr>
<td>PANSS cog. comp.</td>
<td>8.5 (3.64)</td>
<td>9.2 (3.47)</td>
<td>10.45 (3.89)</td>
<td>9.5 (3.7)</td>
<td>8.9 (4.25)</td>
</tr>
<tr>
<td>PANSS exc. comp.</td>
<td>3.8 (1.5)</td>
<td>4.4 (1.7)</td>
<td>5.7 (2.6)</td>
<td>5.2 (2.76)</td>
<td>6.0 (3.02)</td>
</tr>
<tr>
<td>Antipsychotic medication (DDD)</td>
<td>7.0 (2.8)</td>
<td>7.6 (2.2)</td>
<td>8.5 (3.16)</td>
<td>8.2 (4.0)</td>
<td>6.9 (1.66)</td>
</tr>
<tr>
<td>SZP spectrum (%)</td>
<td>31 (64)</td>
<td>.57 (61)</td>
<td>1.32 (.90)</td>
<td>1.37 (1.1)</td>
<td>1.06 (0.46)</td>
</tr>
</tbody>
</table>

Note: Stat. sign. diff. p = .05.

Time psychotic (% baseline to ten years): Kruskal–Wallis test: p = .05.
In remission (%): Kruskal–Wallis test: p = .05.
Recovered (%): Kruskal–Wallis test: p = .05.
Unable to live independently (%): SCLFS: 1 and 2+3, 4 and 5.
Employment (SCLFS): 1>3, 4 and 5.
Obj. social function (1-Qol): 1 and 2>3 and 5.
GAF-F: 1>3, 4 and 5.
PANSS pos. comp.: 1–3 and 4.
PANSS neg. comp.: 1 and 2<3, 4 and 5.
PANSS N1: 1 and 2<3, 4 and 5.
PANSS cog. comp.: 1<3 and 4.
SZP spectrum (%): Kruskal–Wallis test p = .05.
DDD: 1–3 and 4.
GAF-F = Global Assessment of Functioning Scale, functional component.
PANSS = Positive and Negative Syndrome Scale Score.
DDD = Defined daily Dose (WHO criteria).
SZP spectrum disorder equals a diagnosis of schizophrenia, schizophreniform disorder and schizoaffective disorder.

4. Discussion

Of a total of 184 patients 71% had clinically significant flat affect (PANSS N1 ≥ 3) at least one point of measure over the 10 year follow-up.
schizophrenia (Walker et al., 1993). The combination of FA and developed schizophrenia compared to their siblings who did not develop schizophrenia have found increasing prevalence and severity of negative symptoms over time, some studies indicate a more fluid symptom picture (Edwards et al., 1999). A recent 3 year long follow-up study of FEP patients found enduring negative symptoms in 23.7% in the last year of the follow-up period, but only in 6.5% of patients in the first year of follow-up (Chang et al., 2011). By following patients longitudinally from the first psychotic episode we were able to show that the degree of flat affect changes over time to a much greater extent than anticipated.

The prevalence of enduring FA found in our study is lower than the reported 15% prevalence of deficit psychopathology in FEP samples (Kirkpatrick et al., 2001). The definition of deficit psychopathology emphasizes the stability of negative symptoms and includes having a diagnosis of schizophrenia (Kirkpatrick et al., 1989; Kirkpatrick and Galderisi, 2008). In our study the enduring FA group was similar to patients with deficit psychopathology in that they had poorer premorbid function. Also, by 10 year follow-up, all the patients in the enduring group had a diagnosis within the schizophrenia spectrum.

Identifying patients with enduring FA early seems important as this group appears particularly vulnerable. We found that the enduring group was similar to the remaining patients on most baseline variables, but differed significantly in premorbid social functioning. Reduced display of affect has been found in the children who later developed schizophrenia compared to their siblings who did not develop schizophrenia (Walker et al., 1993). The combination of FA and poor social functioning could potentially be present from early stages in life of a child vulnerable to psychotic illness.

Earlier studies of the longitudinal course of negative symptoms in schizophrenia have found increasing prevalence and severity of negative symptoms over the course of follow-up (Fenton and McGlashan, 1991). We found an increase from below to above clinical threshold in 16% of the sample. Most of the patients that developed FA (deteriorating group) did so in the latter part of the follow-up period, and by 10 years had levels of FA similar to those of the enduring group. Furthermore, the deteriorating group was similar to the never-present group on symptom and functional measures at baseline. However, by 10 year follow-up these patients had developed symptom and functional levels close to those of the enduring group. We also identified a somewhat smaller group (10%) whose FA remitted during the follow-up. Most of these patients showed no sign of FA after 1 year, and in this group FA must be considered as secondary.

We found a clear association between FA and poor functioning. The patients with enduring FA performed poorest on all functional outcome variables, while the fluctuating and deteriorating FA groups scored closer to the enduring group at 10 years. In the improving and deteriorating groups we found that as FA decreased functioning increased and vice versa. These findings could imply that FA is a possible marker of active illness, reflecting a more profound and chronic disease process in the enduring group. Alternatively, FA could be directly related to functioning, and to social functioning in particular. FA may be viewed as an expressive deficit with a specific impact on social communication and interaction. Laboratory studies of patients with schizophrenia have reported reduced facial expressions during social interaction (Krause et al., 1989) and watching emotional films (Berenbaum and Oltmanns, 1992) and cartoons (Dworkin, 1992). A failure to respond to social stimuli could reduce the likelihood of establishing and maintaining friendships and other relationships. FA may also be related to poor social cognition. Social cognition is defined as the ability to process and apply social information, and includes the ability to recognize facial expressions of emotion. Impaired performance on affect perception tasks is an established finding in patients with schizophrenia (Kohler et al., 2010). Though results are not unequivocal, most studies have found that negative symptoms correlate with affect perception (Kohler et al., 2010), and facial expression recognition and unfamiliar face matching have been found to be poorer in schizophrenia patients with FA compared to patients without FA (Gur et al., 2006). A failure to respond to and interpret verbal and nonverbal stimuli is likely to affect social abilities and contacts over time. We found that the enduring FA group scored poorer than the remaining patients on social function at baseline and throughout the follow-up period. Our findings indicate that in patients where FA is more trait than state, social function is most likely to be negatively affected.

In a recently published article we reported on clinical apathy in the patient sample described here (Evensen et al., 2012). We found that nearly 30% of patients displayed clinical apathy at 10 year follow-up, i.e. a lower prevalence than FA at 10 years. Similar to the current study we found that apathy was significantly related to functioning. The correlation, however, was stronger between apathy and general functioning \( r = .49 \), than between apathy and social contacts \( r = .30 \). We assessed apathy, using the self-report Apathy Evaluation Scale (AES-S-apathy), only at the 10 year follow-up, and thus could not describe the same symptom trajectory groups as in the current article. This makes comparisons between the studies difficult. However, the difference in prevalence, and to some degree symptom correlates, supports the two factor model of the negative symptom construct.

This study is unique in that it explores a large and representative group of FEP patients 10 years after their first psychotic episode with a particular focus on different FA trajectories. The study was not designed to separate primary from secondary negative symptoms. Previous studies on FEP samples have, however, found that FA is not significantly influenced by positive and depressive symptoms (Malla et al., 2002) or medication (Kelley et al., 2008). A further limitation of the study was the use of a single item measure of FA. A strength of the TIPS study, however, is the strict focus on reliability testing throughout the follow-up period (Friis et al., 2003; Hegelstad et al., 2012). The assessment of PANSS item N1 (FA) came out favorably (ICC = .76).

In conclusion, this study indicates that flat affect is a more fluent symptom than anticipated. FA, especially when enduring, is related to poorer functioning, and particularly to poorer social functioning, both premorbidly and throughout the 10 year follow-up period. Identifying patients with enduring or developing FA challenges clinicians to target, track, and engage those particularly vulnerable groups within a first episode psychosis sample.
Role of funding source
The project has been approved by the Regional Committee for Medical Research Ethics Health Region II (# 5-5819) and the Regional Committee for Medical Research Ethics Health Region II (# 5-5777). Data Inspectorate (License # 96/2007-2 and # 2003/2052).

Biological data collection was approved by Norwegian Directory of Health (# 200403453) and the Regional Committee for Medical Research Ethics Health Region East (# 493-03-01179). The Regional Committee for Science Ethics region Sjælland, Denmark (# 1-01-83-0002-07).

Supported by Health West (# 911369), Norway (Wenche ten Velden Hegelstad); supported by the Norwegian National Research Council (# 133897/320 and # 154642/320), the Norwegian Department of Health and Social Affairs, the National Council for Mental Health/Health and Rehabilitation (# 1997/41 and # 2002/306), Rogaland County and Oslo County (Drs Vaglum, Johannesen, Friis, Larsen, Melle, Opjordsmoen). Also funded by the Theodor and Vada Stanley Foundation, the Regional Health Research Foundation for Eastern Region, Denmark; Roskilde County, Helsefonden, Lundbeck Pharma, Eli Lilly and Jansen-Cilag Pharmaceuticals, Denmark (Dr(Simonsen and Haahr). Also supported by a National Alliance for Research on Schizophrenia and Depression (NARSAD) Distinguished Investigator Award and NIMH grant MH-01654 (Dr. McGlashan) and a NARSAD Young Investigator Award (Dr. Larsen), Health South East (# 20008001), Health West (# 2002027976-05) (Inge Joa) and # 911313 (Regional Centre for Clinical Research in Psychosis).

Contributors
Authors SF, TM, PM, SO, BJR, JGJ, TKL, JF and UEH took part in designing the study. Authors JE, WTVH and UEH collected the data. Authors JHJE, JIR, WTVH and SF undertook the statistical analysis. Author JE wrote the first draft of the manuscript. All authors contributed to and have approved of the manuscript.

Conflict of interest
All authors declare that they have no conflicts of interest.

Acknowledgements
Many thanks to all the patients who have contributed to this study.

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