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## Association between social contact frequency and negative symptoms, psychosocial functioning and quality of life in patients with schizophrenia

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## ABSTRACT

The lack of social contacts may be an important element in the presumed vicious circle aggravating, or at least stabilising negative symptoms in patients with schizophrenia. A European 2-year cohort study collected negative symptom scores, psychosocial functioning scores, objective social contact frequency scores and quality of life scores every 6 months. Bivariate analyses, correlation analyses, multivariate regressions and random effects regressions were conducted to describe relations between social contact and outcomes of interest and to gain a better understanding of this relation over time. Using data from 1208 patients with schizophrenia, a link between social contact frequency and negative symptom scores, functioning and quality of life at baseline was established. Regression models confirmed the significant association between social contact and negative symptoms as well as psychosocial functioning. This study aimed at demonstrating the importance of social contact for deficient behavioural aspects of schizophrenia.

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## 1. Introduction

Schizophrenia is a multidimensional disorder that prevents people from having a normal social life. Integration in the labour market is rare; participation in social networks is low as is psychosocial functioning (Fleury et al., 2013). There is evidence that social deficits are closely related to negative symptoms of schizophrenia and both may lead to reduced quality of life (Breier et al., 1991; Fenton and McGlashan, 1991; Katschnig, 2000; Norman et al., 2000). Low frequency of social contacts is one aspect of low participation in social networks; and this, combined with negative symptoms, may be an important therapeutic domain (Kirkpatrick et al., 2006). Different dimensions of the disorder and emotional/social concomitants form a complex network of inter-related factors. Some of these converge in impaired role function performance. Patients with schizophrenia find themselves caught in a vicious circle, as all the elements of the disease reinforce each other. Low frequency of social contacts is similar to the negative symptom “social withdrawal”, yet it has a different focus. Whereas

“social withdrawal” relies upon different aspects of social integration as estimated by the interviewer, frequency of social contact items ask the patient for facts concerning contact only. Solely based on rare social contact, the process of social construction of reality (Berger and Luckmann, 1966) – necessary to share concepts of reality with other people – is disturbed. Patients’ concepts of reality become more and more idiosyncratic as they grow farther apart from other people’s interpretations of the world. More social contact would imply more chance of developing socially shared concepts of reality (Fig. 1).

Poor social contact implies poor emotional exchange. Socio-emotional functioning, one aspect of psychosocial functioning requires emotional exchange. In patients with schizophrenia, deficits in social interaction are related to problems in the domain of handling emotions as communicative signals (Csukly et al., 2013). More social contact would train the ability of interpreting other people’s emotions. This would be a step toward less emotional withdrawal.

Although several studies have assessed the relationship between psychotic symptoms and functioning or quality of life (Smith et al., 2002; Rocca et al., 2009; Weinberg et al., 2009; Brüne et al., 2011; Corcoran et al., 2011), little information is available on the role of social contact in this area. Since the elements are interrelated in a multidirectional way it is important to make the

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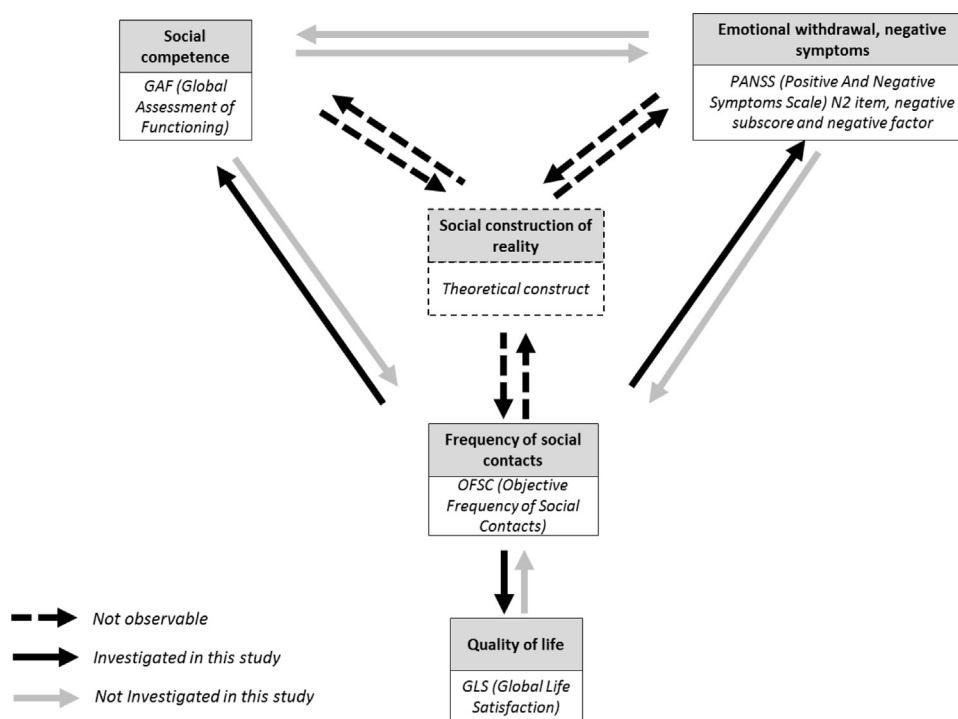


Fig. 1. Presumed vicious circle.

circle explicit, as the reasoning also tends to be circular.

The starting point of this analysis is the key role of negative symptoms in the course of the disease, their chronicity and their relation to poor functional outcome and poor quality of life. The research question was defined as follows: “is social contact an element in the presumed vicious circle, associated with more negative symptoms and particularly more emotional withdrawal, and with deterioration of psychosocial functioning and quality of life?” As there is no real therapeutic option today (Buchanan, 2007; Kring et al., 2013), it would be important to identify a means toward reintegration of patients with schizophrenia and improvement of their socio-emotional functioning. Reinforcement of social contact may be considered as such, if lack of (or very low frequency of) social contact is shown to predict aggravation of negative symptoms.

The objective of this study is to describe the pre-supposed association between social contact frequency and negative symptoms, particularly emotional withdrawal, as well as with psychosocial functioning and subjective quality of life. It was deemed crucial to evaluate both cross-sectional and longitudinal associations between these elements. As anxiety and depression – two symptoms often accompanying schizophrenic disorders – are also related to poor psychosocial functioning and poor quality of life, they should be controlled (Katschnig, 2000; Buchanan, 2007).

## 2. Methods

### 2.1. Data source

EuroSC is a naturalistic follow-up of a cohort of people with schizophrenia over a period of two years, with five visits at 6-month intervals. A detailed description of the cohort was published earlier (Bebbington et al., 2005). The principle objective of this cohort was to identify and describe the types of treatment and methods of care for people with schizophrenia and to correlate these with clinical outcomes, states of health, and quality of life. The subjects were selected to provide a representative sample of patients treated in each catchment area. The centres and sampling procedures were chosen to suit the national organisation of mental health care and the information systems that could be exploited for the study. In France, the selected locations included northern France (Lille), central France (Lyon

and Clermont-Ferrand), and southern France (Marseille and Toulon). Each of these areas covers an urban centre of approximately 1 million inhabitants living in the city or in medium-size towns. The study in Germany was carried out in four catchment areas: Leipzig and Altenburg in former East Germany, and Hemer and the County of Heilbronn in former West Germany. In the UK, the selected locations included two centres, Islington, a socially deprived inner-city area of London, and a reasonably affluent semi-rural area of Leicestershire. For each country, the specific locations were chosen because they are socio-demographically distinct and have different styles of service delivery. In each centre, a cohort of patients with schizophrenia and in contact with secondary psychiatric services was identified and assessed. One thousand two hundred and eight patients with schizophrenia were included in the study, 288 in France, 618 in Germany, and 302 in the UK. Where possible, random sampling was used (all the French centres and in London), otherwise the exhaustive inclusion approach was used. This involved the definition of a smaller catchment area, with the aim of including all patients with schizophrenia in the area. All mental health services in the area were contacted in order to identify patients previously or currently treated by them. Patients were screened to establish informed consent, and whether they met the inclusion/exclusion criteria.

This project was conducted in accordance with the Declaration of Helsinki (WMA, 2008). Subjects were aged between 18 and 64 years at the time of enrolment in the study, had a diagnosis of schizophrenia according to DSM IV criteria (APA (American Psychiatric Association), 1994), and had provided a signed informed consent.

### 2.2. Data collection

After consent was obtained, patients were interviewed by a trained independent psychiatrist, and the initial battery of assessments was completed. The data collected included socio-demographic information, and clinical information. Socio-demographic information included country, gender, age, length of illness, family situation and diagnosis. All were collected at the baseline visit. Clinical information included the Positive and Negative Symptoms Scale (PANSS) (Kay et al., 1989; Bell et al., 1992), the Calgary Depression Scale for Schizophrenia (CDSS) (Addington et al., 1990), the Global Assessment of Functioning (GAF) (Endicott et al., 1976) and the Quality of Life Interview (QoLI) (Lehman, 1983). All these measures were collected at each visit by the interviewer.

The PANSS evaluates the level of psychiatric symptoms in patients with schizophrenia. Several subscores of interest in this study were used, including item N2 (relative to emotional withdrawal), item G2 (relative to anxiety), the negative factor (as mean of items N1, N2, N3, N4, N6, G7 and G16) and the negative subscore (as mean of items N1, N2, N3, N4, N5, N6 and N7) (Kay et al., 1989). The negative subscore includes cognitive aspects (deficits in abstract thinking and stereotyped thinking) which the factor leaves out, and instead includes motor retardation and active social avoidance. The item N4, estimating social withdrawal, takes into account behavioural aspects of social integration inferred from other data assessed

**Table 1**  
Demographic and main clinical characteristics at baseline (N=1208).

Variable		Result (N=1208)
Country	Missing values	0
	Germany (N, %)	618 (51.1%)
	France (N, %)	288 (23.8%)
	UK (N, %)	302 (29.4%)
Gender	Missing values	6
	Male (N, %)	743 (61.8%)
	Female (N, %)	459 (38.2%)
Age	Missing values	2
	Mean (SD)	41.0 (10.9)
Length of illness	Missing values	0
	Mean (SD)	13.7 (10.3)
Family situation (N, %)	Missing values	1
	Single (N, %)	744 (61.6%)
	Married (N, %)	181 (15.0%)
	Living as a couple (N, %)	73 (6.1%)
	Divorced/separated (N, %)	195 (16.2%)
	Widowed (N, %)	14 (1.2%)
Diagnosis (N, %)	Missing values	54
	Disorganised (N, %)	69 (5.98%)
	Catatonic (N, %)	17 (1.47%)
	Paranoid (N, %)	871 (75.48%)
	Undifferentiated (N, %)	87 (7.54%)
	Residual (N, %)	110 (9.53%)

during the interview and from patients' social behaviour in the interview situation. All items and subscores ranged from 1 to 7, with higher scores indicating more severe states.

The CDSS evaluates the level of depression in patients with schizophrenia. It consists of 9 items, and ranges from 0 to 27, with higher scores indicating more severe states.

The GAF evaluates the psychological, social, and occupational functioning. It ranges from 0 to 100, with higher scores indicating higher functioning level. "Socio-emotional competence", would have been an interesting element of "psychosocial functioning", but this was not measured directly. However, it is possible to relate GAF and emotional withdrawal to frequency of social contact, which was considered a necessary condition of normal social interaction.

The QoLI-brief version (Lehman, 1983), which is a patient-reported outcome questionnaire, assesses the quality of life of persons with chronic mental disorders, depending on both what they actually do and experience ("objective" quality of life) and their feelings about these experiences ("subjective" quality of life). The Global Life Satisfaction (GLS) is a subjective indicator of quality of life derived for the QoLI, and ranges from 0 to 7, higher values indicating a better quality of life. Several subscores can be derived from QoLI, including the objective frequency of social contact (OFSC) score. Information about basic facts of social life (people not in the same family) is obtained by the interviewer, who notes the facts as presented by the patient. Basic facts include visits ("about how often do you visit someone who does not live with you?"), telephone ("about how often do you telephone someone who does not live with you?"), organised activity ("about how often do you do something with another person that you planned ahead of time?") and spending time with a partner ("about how often do you spend time with someone you consider more than a friend, like a spouse, a boyfriend or a girlfriend?"), rated 1 ("not at all"), 2 ("less than once a month"), 3 ("at least once a month"), 4 ("at least once a week") or 5 ("at least once a day"). More details about the questionnaire including as its reliability and validity are provided elsewhere (Lehman et al., 1993).

Medication (antipsychotics, antidepressants, etc.) was also collected at each visit in UK and France. Nevertheless, the data was unobtainable in Germany. Therefore it was decided not to include any medication parameter as a potential confounder in the analysis.

If the participant withdrew consent at any time or if the participant was lost to follow-up, data collected up to this point were used in analysis.

### 2.3. Statistical analysis

In this study, the outcomes of interest included emotional withdrawal (PANSS N2 item, PANSS negative subscore and PANSS negative factor), functioning (GAF

and quality of life (GLS). All analyses were conducted using potential confounding factors as controls, including country, age, gender, depression level (CDSS) and anxiety level (G2).

First, descriptive analyses of socio-demographic variables were performed at the baseline visit, while clinical characteristics were described at each visit.

Secondly, correlations between outcomes of interest and social contact frequency (OFSC) were computed (Spearman correlations) using controls.

Thirdly, linear regression analysis was used to evaluate whether little social contact (OFSC) at the baseline visit would result in either more emotional withdrawal, negative symptoms (N2, negative subscore, negative factor), or less functioning and quality of life after 2 years. The change from baseline for each outcome of interest was modelled as a function of the associated baseline value, OFSC baseline value and controls. The coefficient for OFSC baseline value was checked for significance.

Finally, several generalised linear mixed models (random effects regression analysis) were conducted, taking into account several assessments per patient. These models enabled the test for a correlation in OFSC score and outcomes of interest, controlling for repeated measures on the same subjects. In addition, age, gender, depression level (CDSS) and anxiety level (G2) at relevant time point were included in the model as potential confounding factors, and a random effect on country was implemented. The coefficient for OFSC value at the preceding visit was checked for significance.

All regression analyses were performed using SAS version 9.3.

## 3. Results

A total of 1208 patients were recruited for EuroSC and interviewed every 6 months for 2 years ( $n=1024$  at visit 2,  $n=962$  at visit 3,  $n=860$  at visit 4 and  $n=810$  at visit 5).

### 3.1. Descriptive analysis

Demographic and main clinical characteristics of patients at each visit are presented in Tables 1 and 2.

Most patients were male (62%) with a mean age of 41, and had suffered from schizophrenia for about 14 years on average. More than half of the sample was single when entering in the cohort. The majority of cases (75%) were of the paranoid subtype of schizophrenia.

The mean PANSS total score ranged between 53 and 57 over the 2 years. The PANSS negative subscore reached 15.7 and the negative factor reached 13.1. Both anxiety (PANSS G2 item) and emotional withdrawal (PANSS N2 item) were scored on average 2.2–2.3, corresponding to an assessment between minimal and mild, in line with the score of depression (CDSS), being on average 2.5. The functioning level was moderate (GAF: on average 52). On average, quality of life scores (GLS) reached 4.7, and social contact frequency scores reached 2.7.

### 3.2. Correlation analysis

As shown in Table 3, highly significant correlations between OFSC and emotional withdrawal or negative symptoms were found. The correlations between social contact frequency and each of the negative symptoms outcomes ranged between  $-0.30$  and  $-0.20$ , being significantly negative (less social contact associated to higher severity of symptoms). The correlations between OFSC and GAF and GLS also reached significance, being positive (less social contact associated to lower quality of life and functioning level).

### 3.3. Multivariate models

Table 4 presents the results of the linear regressions, analysing the change in each of the outcomes of interest between baseline and 24 months. Independent from the outcome considered, lower baseline social contact frequency was significantly associated with a deterioration of all outcomes 2 years later, except for quality of life ( $p=0.24$ ).

**Table 2**  
Outcomes values at each visit.

Variable		Visit 1 (N=1208)	Visit 2 (N=1024)	Visit 3 (N=962)	Visit 4 (N=860)	Visit 5 (N=810)
PANSS total score	Missing values	5	185	252	351	399
	Mean (SD)	57.43 (20.8)	55.73 (19.8)	55.48 (19.0)	54.07 (19.1)	53.00 (18.7)
PANSS negative subscore	Missing values	3	185	251	351	398
	Mean (SD)	15.78 (7.66)	15.54 (7.17)	15.46 (7.27)	15.23 (7.06)	15.06 (7.19)
PANSS negative factor	Missing values	19	194	256	353	399
	Mean (SD)	13.14 (6.81)	12.79 (6.44)	12.76 (6.55)	12.57 (6.33)	12.55 (6.51)
PANSS G2 item (anxiety)	Missing values	4	185	254	350	399
	Mean (SD)	2.34 (1.34)	2.35 (1.36)	2.26 (1.33)	2.15 (1.32)	2.06 (1.26)
PANSS N2 item (emotional withdrawal)	Missing values	3	185	252	351	399
	Mean (SD)	2.20 (1.31)	2.11 (1.26)	2.13 (1.30)	2.12 (1.24)	2.12 (1.28)
CDSS (depression)	Missing values	3	4	7	4	0
	Mean (SD)	2.87 (3.53)	2.48 (3.52)	2.37 (3.33)	2.26 (3.23)	2.08 (3.23)
GAF (functioning)	Missing values	1	3	2	5	1
	Mean (SD)	51.34 (16.02)	52.01 (16.36)	52.22 (15.8)	52.59 (15.59)	51.81 (16.41)
GLS (quality of life)	Missing values	21	22	23	19	15
	Mean (SD)	4.59 (1.33)	4.72 (1.31)	4.78 (1.29)	4.76 (1.28)	4.88 (1.25)
OFSC (objective frequency of social contact)	Missing values	5	10	17	15	9
	Mean (SD)	2.69 (1.02)	2.69 (1.04)	2.72 (1.04)	2.72 (1.06)	2.75 (1.06)

**Table 3**  
Spearman correlations between OFSC and other outcomes of interest.

Outcome of interest	Visit 1 (N=1208)	Pooling visits (N=4864)
	Spearman correlation	Spearman correlation
PANSS N2 item (emotional withdrawal)	-0.23 (p < 0.0001)	-0.22 (p < 0.0001)
PANSS negative subscore	-0.28 (p < 0.0001)	-0.27 (p < 0.0001)
PANSS negative factor	-0.28 (p < 0.0001)	-0.28 (p < 0.0001)
GAF (functioning)	0.25 (p < 0.0001)	0.18 (p < 0.0001)
GLS (quality of life)	0.09 (p=0.0017)	0.11 (p < 0.0001)

3.4. Multivariate repeated models

When running multivariate repeated models on the change from the preceding visit, all the outcomes of interest were significantly related to the social contact frequency score. This is shown in Table 5. Higher social contact frequency was significantly associated with a lower severity of emotional withdrawal (p < 0.0001) and negative symptoms (p < 0.0001) and a higher

functioning level (p < 0.0001). A non-significant association was found for quality of life (p = 0.11).

4. Discussion

The burden of schizophrenia is strongly related to negative symptoms, and lack of social contact was thought to be an important element in a vicious circle, aggravating negative symptoms, and deteriorating psychosocial functioning and quality of life. The purpose of the present study was to examine whether the social contact frequency of patients with schizophrenia had an impact on negative symptoms, both from a cross-sectional perspective and over time. In addition, the relationships between social contact frequency and the health indicators psychosocial functioning and quality of life were also explored.

Data were taken from EuroSC, a large naturalistic prognostic cohort study carried out in UK, France and Germany. The broad information collected, the large sample size (N=1208) and the 24-month follow-up encourage analyses of longitudinal associations

**Table 4**  
Multivariate regression models (baseline - 24 months).

	N2 item (emotional withdrawal)	Negative subscore	Negative factor	GAF	GLS	
Intercept	1.574 (p < 0.0001)	7.863 (p < 0.0001)	7.633 (p < 0.0001)	23.591 (p < 0.0001)	2.946 (p < 0.0001)	
Country	France	0.036 (p=0.739)	0.31 (p=0.557)	0.251 (p=0.62)	5.587 (p < 0.0001)	-0.027 (p=0.807)
	UK	-0.468 (p < 0.0001)	-1.893 (p < 0.0001)	-1.429 (p=0.001)	7.839 (p < 0.0001)	-0.034 (p=0.709)
Age	0.005 (p=0.135)	0.02 (p=0.245)	0.013 (p=0.442)	-0.124 (p=0.005)	0 (p=0.944)	
Female	-0.358 (p < 0.0001)	-1.579 (p < 0.0001)	-1.526 (p < 0.0001)	0.817 (p=0.413)	-0.002 (p=0.985)	
Baseline CDSS score	0.038 (p=0.0008)	0.058 (p=0.296)	0.088 (p=0.102)	-0.1 (p=0.483)	-0.027 (p=0.042)	
Baseline value	-0.592 (p < 0.0001)	-0.417 (p < 0.0001)	-0.464 (p < 0.0001)	-0.492 (p < 0.0001)	-0.591 (p < 0.0001)	
<b>Baseline OFSC score</b>	<b>-0.132 (p=0.0008)</b>	<b>-0.566 (p=0.004)</b>	<b>-0.607 (p=0.001)</b>	<b>1.411 (p=0.004)</b>	<b>0.047 (p=0.24)</b>	

Regression coefficient estimate (p value).

**Table 5**  
Multivariate repeated regression models (each visit).

	N2 item (emotional withdrawal)	Negative subscore	Negative factor	GAF	GLS
Intercept	1.127 ( $p < 0.0001$ )	5.021 ( $p < 0.0001$ )	5.013 ( $p < 0.0001$ )	32.983 ( $p < 0.0001$ )	2.516 ( $p < 0.0001$ )
Age	0.001 ( $p = 0.738$ )	0.01 ( $p = 0.164$ )	0.006 ( $p = 0.365$ )	-0.145 ( $p = 0$ )	0.001 ( $p = 0.629$ )
Female	-0.188 ( $p < 0.0001$ )	-0.716 ( $p < 0.0001$ )	-0.765 ( $p < 0.0001$ )	1.376 ( $p = 0.11$ )	0.018 ( $p = 0.639$ )
Country (France)	0.2 ( $p < 0.0001$ )	0.679 ( $p = 0.002$ )	0.567 ( $p = 0.007$ )	5.418 ( $p < 0.0001$ )	-0.012 ( $p = 0.821$ )
Country (UK)	-0.263 ( $p < 0.0001$ )	-1.11 ( $p < 0.0001$ )	-1.052 ( $p < 0.0001$ )	5.507 ( $p < 0.0001$ )	-0.086 ( $p = 0.049$ )
CDSS score (preceding visit)	0.015 ( $p = 0.006$ )	0.031 ( $p = 0.216$ )	0.04 ( $p = 0.103$ )	-0.34 ( $p = 0.011$ )	-0.025 ( $p = 0.0002$ )
PANSS item G2 (preceding visit)	-0.001 ( $p = 0.923$ )	-0.04 ( $p = 0.564$ )	-0.047 ( $p = 0.474$ )	-0.85 ( $p = 0.02$ )	-0.043 ( $p = 0.009$ )
Outcome of interest (preceding visit)	-0.414 ( $p < 0.0001$ )	-0.273 ( $p < 0.0001$ )	-0.305 ( $p < 0.0001$ )	-0.645 ( $p < 0.0001$ )	-0.505 ( $p < 0.0001$ )
<b>OFSC score (preceding visit)</b>	<b>-0.069 (<math>p &lt; 0.0001</math>)</b>	<b>-0.277 (<math>p = 0.001</math>)</b>	<b>-0.332 (<math>p &lt; 0.0001</math>)</b>	<b>2.472 (<math>p &lt; 0.0001</math>)</b>	<b>0.03 (<math>p = 0.109</math>)</b>

Regression coefficient estimate ( $p$  value).

between patients' social life and aspects of the disease. As expected, social isolation is widespread in the study population, having one's own family is rare, and there is little participation in the labour market (Bebbington et al., 2005). Such a high degree of social exclusion may be explained by the typical and quite common negative symptomatology of schizophrenia, which is an important obstacle to social inclusion; it keeps patients with schizophrenia away from meaningful social interaction and simultaneously, from socially shared concepts of reality.

As part of the large battery of questionnaires used in the EuroSC study, several were patient-reported outcomes (PROs), such as the QOLI questionnaire. Despite the ongoing clinical debate regarding whether or not PROs should be used in clinical trials to assess treatment efficacy, PROs in schizophrenia are widely used.

Cross-sectional analyses were undertaken as a first step. Results were in line with the assumptions: significant negative correlations between social contact frequency and negative symptoms, and significant positive correlations between social contact frequency and psychosocial functioning were found. In a second step, the linear regression models added the perspective of time: a low frequency of social contact at the baseline visit was found to lead to higher emotional withdrawal and negative symptoms, and lower psychosocial functioning two years later.

Comparing short term and long term effects of social contact frequency on the indicators of negative symptoms evidence for an ongoing process of amelioration was found, as the long term effect is the stronger one. Results are different for psychosocial functioning. The weaker long term coefficient indicates a lack of continuity concerning the impact of social contact frequency on psychosocial functioning. This is in line with research that found psychosocial functioning a multiply determined outcome (Rocca et al., 2009) with clinical factors as its main determinants (Gaite et al., 2005).

As a non-negligible proportion of the population was lost in the follow-up phase (20% after 12 months and 33% after 24 months), it was important to conduct repeated measures models. Indeed, these lost patients are usually patients with poor outcomes, and it was likely that patients with low OFSC at the baseline were more likely to drop out. The multivariate longitudinal perspective underlined the importance of social contact as a factor in the course of the negative symptoms side of schizophrenia. The elements of the presumed vicious circle, negative symptoms including emotional withdrawal and psychosocial functioning, were found to be closely and significantly related to social contact score over follow-up time.

The meaning of low social contact frequency was simplified by Hansen in 2009 (Hansen et al., 2009). He and other authors proposed a distinction between passive social withdrawal as part of the negative symptoms and active social avoidance related to positive symptoms. This distinction has therapeutic implications.

Passive social withdrawal with low frequency of social contact, an issue the present study deals with, might be overcome by low threshold offers of group therapy. A certain frequency of social contacts would be a prerequisite of contacts that could be qualified as friendship. In 2012, Giacco et al. evaluated which symptom dimensions of schizophrenia are associated with the lack of friendships (Giacco et al., 2012): a pooled analysis allowed authors to show that higher levels of negative symptoms and hostility are specifically associated with the lack of friendships in patients with psychotic disorders. Here again, the bidirectional or circular character of relations becomes evident. Interventions might focus either on negative symptoms or on social contact, which would be a precondition of friendship. In 2014, Jelastopulu et al. estimated the correlation between the Personal and Social Performance (PSP) and the PANSS in patients with schizophrenia during routine clinical practice (Jelastopulu et al., 2014). An analysis of a longitudinal study with a six-month follow-up of 2010 Greek patients revealed that the PSP score showed a high association to PANSS score. The study underlines the close relationship between psychopathology and psychosocial functioning that was demonstrated in the present analysis.

In this analysis, only non-significant results were found for the relation between frequency of social contact and quality of life. This may be due to the fact that it was not possible to include any measure of emotional wellbeing, which might be an important link between social contacts and quality of life, as was suggested in a recent study (Boyer et al., 2014).

Several limitations should be acknowledged. First, the representativeness of the sample may be questioned. Indeed, as a consequence of the inclusion and exclusion criteria, the most severely ill patients are underrepresented, whereas the chronically ill patients are overrepresented (Bebbington et al., 2005). However, EuroSC large and multinational sample size, together with the 5-point measurements over the 2-year follow-up should be considered a strength. In addition, the large variety of scales allowed including the most important confounders in our analyses. Second, a problem of measurement should be mentioned: there is an overlap between the OFSC score and aspects of the negative symptoms outcome, as one item of PANSS negative subscore and PANSS negative factor, namely social withdrawal, a component of negative symptoms (Puig et al., 2008), at first glance seems to be a measure similar to frequency of social contact. The frequency items however ask the patient for facts only, whereas the PANSS item "social withdrawal" relies upon different aspects of social integration as estimated by the interviewer. His estimation will take into account behavioural aspects of social integration inferred from other data assessed during the interview and from patients' social behaviour in the interview situation. Moreover, PANSS negative subscore and factor assess various aspects of non-participation in social exchange including cognitive and emotional. Altogether, there is a clear difference between *explanans* and

*explanandum*. Third, the study is based on interviewer ratings, and the problem of common method variance, increasing the chance of correlations, was not avoidable. This is an unsolved problem in social psychiatric research in schizophrenia. Nevertheless all the scales considered in these analyses are widely approved and validated. Fourth, the reliance on self-report data of social contact may be questioned, as PROs in schizophrenia face a major limitation: psychiatric symptoms, such as hallucinations and delusions, may impact the patient's judgment and make it unreliable. In spite of the potential difficulties in obtaining outcome information from patients with certain types of mental illness, evidence suggests that even among those with chronic and severe mental illness, patients are able to evaluate their condition, and the information they provide is unique and invaluable (Schmidt et al., 2000). A recent study has demonstrated that it is feasible to routinely collect mental health outcomes data from patients with schizophrenia in maintenance phase (Hunter et al., 2009). Fifth, we postulated bi-directionality of relations, mainly between social contact frequency and negative symptoms, yet we tested for only one direction. The reason being the practical implications would be the same, independent of the result. Finally, given that medication data were lacking in the large German subsample, it was decided not to include medication parameters as a potential confounder in the analysis. At the time of the data collection, no specific antipsychotic was available to treat negative symptoms. Therefore the impact of not including medication was thought to be limited. Nevertheless future studies should incorporate the effect of medication on level of negative symptoms.

#### 4.1. Clinical implication

A practical implication of the findings of this study is the need for interventions that promote the development of a stimulating and supportive social network (Fleury et al., 2013). Reinforcing and encouraging social contact in therapeutic groups offering psychosocial and socio-emotional skills training might prove effective in achieving less negative symptomatology, improved psychosocial functioning and better quality of life. Suggestions for specific interventions to increase social contacts are not easy to make, as per the composite nature of the social contact measure used in this analysis. Nevertheless any social interaction (e.g. visits, phone, organised activity) is thought to act as a bottom-up anti-stigma measure and to facilitate social inclusion of patients with schizophrenia.

It would be insightful exploring the importance of social network indicators for the course of the disease in more detail. Questions to be answered by cohort studies may concern the relation of social contact: their frequency, the type of contact (family, partner, friend, neighbour, and colleague), and emotional closeness (i.e. friendship yes or no), with aspects of functioning and quality of life over time. One objective of such studies would be to find starting points for therapeutic interventions focusing on different groups of patients. It is likely that not all patients would equally profit from interventions promoting social contacts.

#### 4.2. Conclusion

Using data from a large European cohort of patients with schizophrenia, it was shown that a lack of social contact is predictive of more severe negative symptoms, worse psychosocial functioning and worse quality of life, both from a cross-sectional perspective and over time. There is a need for interventions that promote the development of a stimulating and supportive social network.

#### Contributors

KS and AM contributed to the study design. AM and IA conducted the statistical analyses. KS, AM and IA contributed to the draft manuscript. All authors approved the final article.

#### Conflict of interest

None of the authors had any conflict of interest. No medical writing or editorial assistance was used for the preparation of the article.

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