European Psychiatry 47 (2018) 35–41

Contents lists available at ScienceDirect

European Psychiatry

journal homepage: http://www.europsy-journal.com

Original article

Validation of a four items version of the Functional Remission of General Schizophrenia scale (the mini-FROGS) to capture the functional benefits of clinical remission

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ARTICLE INFO

Article history:
Received 4 July 2017
Received in revised form 31 August 2017
Accepted 5 September 2017
Available online 22 September 2017

Keywords:
Evaluation
FROGS
Functional remission
Recovery
Social functioning
Schizophrenia

ABSTRACT

Objectives: We previously developed the Functional Remission Of General Schizophrenia (FROGS) scale demonstrating first, reliable assessment in a cross-sectional study and second, good time-stability. The purpose of the present analysis was to propose a shorter version (mini-FROGS), more compatible with the limited time available in a psychiatric visit, focusing on the functional domains that have higher likelihood of being improved with higher and/or longer symptomatic remission in different cultural backgrounds.
Methods: We used multiple regressions to find the most informative items explaining increased length of symptomatic remission, using prospective data from a national observational multicenter survey. Then, the mini-FROGS was used in different European countries to test its between-center reliability, compared to other scales.
Results: Four domains were retained as capturing the maximum of symptomatic remission, namely (1) travel and communication, (2) management of illness and treatment, (3) self-esteem and sense of independence and (4) respect of biological rhythms. First, the mini-FROG was evaluated in 443 French patients with clinical remission and 22 without, and 12/18 months later in 140 patients still in clinical remission and 23 in relapse. In Europe, 295 schizophrenia patients were assessed with the mini-FROGS and other scales devoted to functional remission, allowing comparisons. The mini-FROGS showed good correlations with other scales in different countries and demonstrated good psychometric properties.
Conclusion: These results give evidence that a 4 items-only version of the FROGS scale may be useful to assess important aspects of functional remission, tightly linked to the length of clinical remission.

1. Introduction

Social functioning is severely damaged by schizophrenia [1], which is detrimental for both patients and their families [2]. Improving social functioning is recognized as an important treatment goal, beyond the alleviation of psychotic symptoms [3,4] and also ranked as important by patients and their families [5].

The major impact of antipsychotics is the reduction of symptoms, not necessarily correlated with the improvement of social functioning [6–8]. However, this clinical improvement may be difficult to acknowledge for patients. Usually patients are more interested in, and more able to assess, functional improvement. But the level of functional activity is a complex entity, with many instruments [9], no clear consensus on which scale to use [10], poor agreement between care givers [5], and many psychometric difficulties (for example between-gender or inter-cultural differences) [11]. The lack of standardized assessment methods impacts treatment and subsequently patient outcomes [9,12,13]. Furthermore, none of these

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http://dx.doi.org/10.1016/j.eurpsy.2017.09.001
0924-9338/

instruments was specifically designed to capture the benefice on functional activities of continuing the treatment when treatment response is observed and clinical remission is obtained. Moreover, they usually are not sensitive to the length of clinical remission and they are either too crude, either too detailed, making the functional assessment difficult for both clinicians and patients.

Developing such an instrument could have several advantages. First, it would help clinicians to have an accurate idea of the level of functioning of their patients, giving opportunity to have a window on the lives of patients out of their office, and potentially to adapt treatment strategies. Second, it would increase the quality of the assessment of each treatment strategy, potentially showing immediate benefit on symptoms reduction but also later benefit in everyday life. Third, such an instrument could be used to modify the message given to patients about the impact of their treatment, not only relying on symptoms, but with more obvious assessments of the improvement of functional activities of their everyday life.

Although rarely assessed, the functionality of patients seems paramount when considering recovery as an outcome [14]. Evidence exists that social functioning can predict long-term outcomes in patients with schizophrenia: changes in psychosocial factors are strong predictors of subjective quality of life at 10-year follow-up [15]; baseline impairments in social functioning is predictive of psychosis in Clinical High-Risk patients [16], higher social functioning score is predictive of remission at 1-year follow-up [17] and greater improvement in functioning over 1 year rehabilitation programs [18]. Still, there has not been adequate development of convenient and effective instruments for measuring functional improvement in drug treatment trials for these indications according to a NIMH workshop devoted to the assessment of Community Functioning in People With Schizophrenia [2].

The aim of the present research is to propose a short list of items assessing important domains of psychosocial functioning, reflecting as much as possible the length of clinical remission and to study its correlations with functionality scores from other established tools. This instrument could be used in different countries, with different types of patients and treatment settings, and could constitute a tool, able to quickly capture the benefit of long term compliance.

2. Subjects and methods

With the above mentioned aims, we used two sets of data: the first national one to depict the minimal number of items of the first version of our instrument FROGS [19], and a second one, mostly European, for replication on an independent sample, more specifically testing validity of the scale in different cultural backgrounds and treatment settings [20].

2.1. Study 1 (FROGS)

This was a national observational multicenter survey, involving 15 psychiatric departments across France as already described [19]. Inclusion criteria included: being older than 18 years, schizophrenia diagnosed [21] and having the symptomatic remission criteria [22] for at least 6 months using the Positive and Negative Syndrome Scale (PANSS) [23]. Patients who had been hospitalized full-time or were unable to provide informed consent were not included in the first evaluation. The assessment of patients included the FROGS and the Global Assessment of Functioning (GAF) [24]. A second assessment took place 12 to 18 months after [25], allowing prospective approaches, including the analysis of the "quantitative" impact of an additional year of remission on the mini-FROGS, and the "qualitative damage" of a clinical relapse during this follow-up.

2.2. Study 2 (EGOFORS)

The EGOFORS initiative was an international observational multicenter survey, initiated by a group of experts (the European Group On Functional Outcomes and Remission in Schizophrenia, EGOFORS) and well-described in Peuskens et al. [20]. Overall 11 centers across Europe were involved: two from France and Italy, and one from Belgium, England, Germany, Israel, Spain, Turkey and Sweden. This sample offered the opportunity to compare various questionnaires devoted to psychosocial functioning in different countries, therefore with variable patients, treatment settings, and cultural backgrounds. The inclusion criteria required the DSM-IV diagnosis of schizophrenia, with around half of the patients being in clinical remission for at least 6 months, according to Andreasen's criteria [22]. All patients were assessed with the PANSS, the GAF [24], and at least three instruments out of the Personal and Social Performance (PSP) scale [26], the Quality of Life Scale (QLS) [27], the FROGS [19], the UPSA-B (brief version of the UCSD Performances-based Skills Assessment [UPSA])[28], the Psycho-Social Remission in Schizophrenia scale (PSRS) [29] and the shortened "Subjective Well-being under Neuroleptic" (SWN) scale [30,31]. This open choice of instruments was proposed as a compromise, facilitating reliable assessments (as groups having expertise with specific instruments could choose them) and allowing comparisons (for more information, refer to [20]).

2.3. Ethical concerns

The assessment protocol was approved by the relevant ethical review board for each study and all patients provided informed consents to participate.

2.4. Instruments

The FROGS was developed using expert consensus [32], and comprises 19 items, as described previously [19]. Five domains are assessed (daily life, social activities, social functioning, quality of rehabilitation and general health and treatment) and three factors were observed (social functioning, daily life and treatment). The GAF was mandatory in the two studies, as the most well-known functional assessment [20,24]. The PSRS requires assessing impairment in 8 domains and was filled-in for 274 patients (93% of the EGOFORS Study), representing the only functional scale devoted to schizophrenia apart from the FROGS [29]. The PSP scale [26] was developed from the social functioning component of the DSM-IV, assessing four domains and was used in 76% of centers of the second sample ($n = 223$). The QLS [27] is a 21-items clinician-rated interview containing 4 domains, evaluating mostly quality of life but also providing information on symptoms or functioning. The shortened-SWN scale is a 20-item self-rating scale reflecting the subjective experience of well-being [31]. This scale suggests that five dimensions contribute to subjective well-being: emotional regulation, self-control, mental functioning, social integration and physical functioning. The UPSA-B [28] was developed to assess the capacity of patients to perform in daily functioning and consists of two tasks evaluating financial and communication skills (role play situations).

2.5. Statistical analyses

The variable « duration of remission », from the Study 1, was the variable we used to shortlist the FROGS. The "duration of remission" is here considered as the time being in remission for each patient. First, Spearman correlation coefficients were used to measure the link between this non-parametric variable and each item of the FROGS.

https://doi.org/10.1016/j.eurpsy.2017.09.001 Published online by Cambridge University Press

Table 1
Study 1 – Characteristics of 443 patients with schizophrenia in clinical remission.

Clinical and demographic characteristics	*n* (%)	Average (SD)
Gender (Female)	157 (35.4%)	
Age (years)		38.4 (11.2)
Marital status		
Living with partner	85 (19.2%)	
Single	314 (70.9%)	
Divorced/widowed/separated	44 (9.9%)	
Presently working (or student status)	161 (37.1%)	
Duration of illness (years)		14.5 (9.8)
Schizophrenia subtypes		
Paranoïd	247 (55.8%)	
Disorganized	43 (9.7%)	
Catatonic	2 (0.5%)	
Undifferentiated	86 (19.4%)	
Residual	65 (14.7%)	
Currently treated by antipsychotics	433 (98.0%)	
Duration of remission		
[6–12 months]	91 (20.5%)	
[1–2 years]	106 (23.9%)	
[2–3 years]	91 (20.5%)	
[3–5 years]	71 (16.0%)	
≥ 5 years	84 (19.0%)	
Average length of remission (years)		3.2 (3.7)

SD: standard deviation.

We then performed multiple regression analyses to study the relationship between the variable to explain "duration of remission" (after rank transformation) and each of the 19 items of the FROGS (explicative variables). Two different regression methods were used: the stepwise method that adds or removes explicative variables based solely on the *t*-statistics of their estimated coefficients (significance levels for adding and removing effects fixed at 0.05). The second method was the R^2 selection method, which allows identifying the best explicative variables group to predict the "duration of remission".

Student's *t*-test and Mann-Whitney U were used to compare results between groups (depending on the distribution of the data). Pairwise comparisons of mean changes over time were analyzed by a non-parametric Wilcoxon test for matched samples.

Pearson or spearman correlation coefficients (depending on the distribution of the data) were also used to measure the relationships between the different scales.

Two-tailed tests with a significance level of 0.05 were performed and normality was tested by Shapiro-Wilk test.

Statistical analyses were performed using SAS 9.2 software.

3. Results

3.1. Design of the mini-FROGS (Study 1)

3.1.1. Patient characteristics

Table 1 presents patients' characteristics. 443 patients in clinical remission were included. Average duration of remission was 3.2 years ± 3.7.

3.1.2. Study population

Among the 531 evaluated patients in the validation of FROGS scale [19], 443 patients presented available data for the identification of items that were most related to the length of present remission. Twenty-two patients did not fulfil the clinical remission criteria (Remission for less than 6 months, according to Andreasen et al. [22]) and were therefore used to "qualitatively" distinguish patients with versus without the former criteria (Fig. 1).

FROGS data were available for 163 patients for the second wave of the assessment (from the initial sample of 443) [25], with 140 still having the criteria for clinical remission and 23 who relapsed between the two assessments (Fig. 1).

3.1.3. Mini-FROGS scale: selection of items

Measures of the correlations between each item of the FROGS and the duration of remission are presented in Table 2.

In a stepwise multiple regression, four items emerged from the analysis to explain the duration of remission: "Management of illness and treatment", "Housekeeping", "Travel and communication", and "Self-esteem and sense of independence". The multiple regressions by R^2 method also identified this subset of four items as the best selection to explain the duration of remission (R^2 = 0.07)

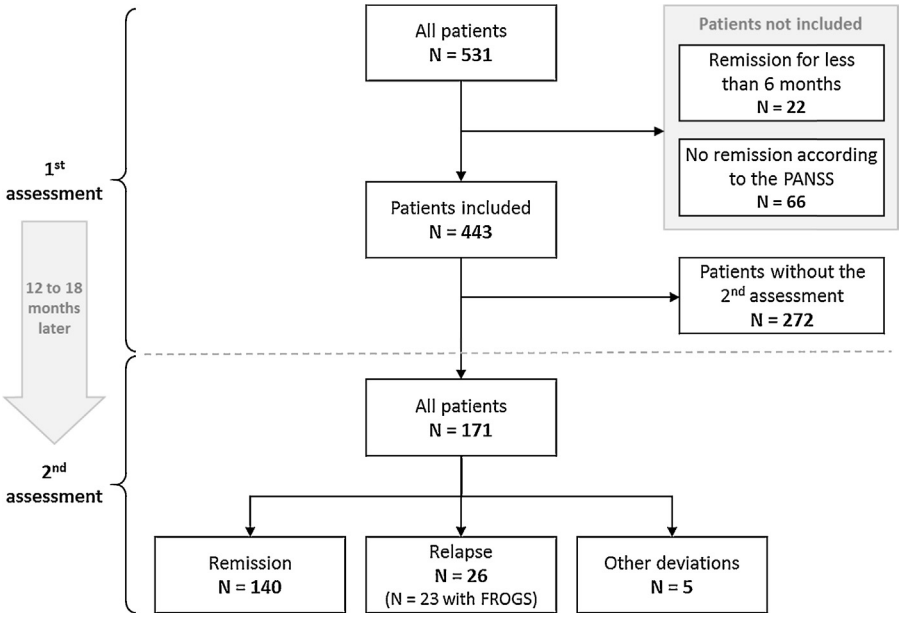

Fig. 1. Study 1 – Distribution of patients.

https://doi.org/10.1016/j.eurpsy.2017.09.001 Published online by Cambridge University Press

(Model 1 Table 3). However, because of the selection of "Housekeeping", the relationship between the gender and the 4 items score was studied and found to be significant ($P = 0.04$) (Table 4). To overcome this difficulty, we selected the second best selection of 4 items identified in the multiple R^2 regression ($R^2 = 0.07$). The item "Respect for biological rhythms" was selected instead of "Housekeeping" (Model 2 Table 3). The R^2 being relatively small, these regression models indicate that the mini-FROGS items explain only a small degree of variability of length of clinical remission.

3.1.4. Mini-FROGS scale: psychometric properties

Among the initial sample of 443 patients in remission, the correlation of the mini-FROGS score with total FROGS score was very high (rho = 0.88, $P < 0.001$), as expected.

The mean score of the Mini-FROGS for the 22 patients excluded from the first assessment due to a too short time of remission was also significantly lower 13.7 ± 3 than for the 443 included patients 15.3 ± 3 ($P = 0.005$).

Among the 140 patients in remission at both assessments, the mean of the Mini-FROGS total score was 15.9 ± 2.5 at the first evaluation and 16.7 ± 2.4 at the second, showing a significant improvement (+0.81, $P < 0.001$) between the two evaluations.

In addition, the 23 patients showing a relapse between the first and second assessments showed a decrease of their mini-FROGS score of -0.96 ± 2.5 (versus an increase of $+0.81 \pm 1.4$ for the 140 patients still in remission [$P < 0.001$]).

3.2. Informativity of the mini-FROGS in comparison to different functioning scales in different European treatment centers (Study 2)

3.2.1. Study population and patient characteristics

Overall, 295 patients were consecutively included in European and Turkish centres. Table 5 presents patients' characteristics: 44.7% were female, with a mean age of 42.7 years old ($\pm$16.2 years old). All patients were currently treated with antipsychotics (100% adherence). Among the patients, 33% were considered in clinical remission according to the Andreassen criteria and 10% in clinical remission for less than 6 months.

3.2.2. Study of the relationships between the mini-FROGS and other scales

As in study 1, the mini-FROGS score was highly correlated with the total FROGS score (rho = 0.93). Table 6 shows that the other scales also have good positive correlations with the mini-FROGS score: the QLS total score (rho = 0.78), the GAF (rho = 0.78), the UPSA-B (rho = 0.45), the PSP (rho = 0.44) and the SWN (rho = 0.31). As the PSRS assesses functional impairment, its total score showed a negative correlation with the mini-FROGS (rho = −0.75).

4. Discussion

The mini-FROGS was designed to measure functional remission in schizophrenia, with only four items, assessing important domains of psychosocial functioning, namely (1) management of illness and treatment, (2) biological rhythms, (3) travel and communication and (4) self-esteem and sense of independence. This abridged 4-item FROGS scale reflects presence and length of clinical remission, and showed satisfying cultural and gender consistency. Consequently, it can be used in different countries, with different types of patients and treatment settings, and constitutes a tool able to quickly capture the benefit of long-term clinical remission. Doing so, such tool could be used by clinicians as an indirect way to reinforce the benefit of good compliance, as potentially increasing the awareness of patients on the associated functional improvement.

Table 2
Study 1 – Spearman correlation coefficient between each item of the FROGS scale and duration of remission (non parametric).

Items	rho[a]	*P* value
Factor 1 (social functioning)		
Administrative and financial management	0.15	0.002
Travel and communication	−0.01	0.81
Personal activities	0.04	0.36
Social activities	0.03	0.56
Studying or work	0	0.97
Adaptation to stress and unforeseen circumstances	0.14	0.002
Self-esteem and sense of independence	0.13	0.006
Family, friends	0.08	0.11
Love and sexual life	0.04	0.42
Social network	0.12	0.009
Empathy and help for others	0.09	0.046
Factor 2 (daily life)		
Personal care and appearance	0.07	0.12
Diet	0.11	0.019
Housekeeping	0.16	< 0.001
Respect for biological rhythms	0.14	0.004
Factor 3 (treatment)		
Management of his illness and treatment	0.20	< 0.001
Absence of antisocial or violent behavior	0.08	0.075
Taking charge of personal health	0.14	0.003
Functional impact of the secondary effects of treatment	0.13	0.005

[a] Non-parametric test.

Table 4
Study 1 – Effect of gender over the mini-FROGS scores.

	Male ($n = 286$)	Female ($n = 156$)	*P* value
	Average (SD)	Average (SD)	
Mini-FROGS score – Model 1	14.5 (2.9)	15.1 (2.8)	0.039
Mini-FROGS score – Model 2	15.2 (2.7)	15.4 (2.6)	0.447

SD: standard deviation. *P* values were obtained by parametric tests.

Table 3
Study 1 – Summary of stepwise multiple regressions.

Label	Step	Partial r^2	Model r^2	C (p)	F Value	Pr > F
Model 1						
Management of illness and treatment	1	0.036	0.036	10.88	16.30	< 0.0001
Housekeeping	2	0.009	0.046	8.60	4.22	0.041
Travel and communication	3	0.012	0.058	5.17	5.42	0.020
Self-esteem and sense of independence	4	0.011	0.068	2.24	4.95	0.027
Model 2[a]						
Management of illness and treatment	1	0.036	0.036	9.30	16.30	< 0.0001
Travel and communication	2	0.008	0.044	7.68	3.59	0.059
Self-esteem and sense of independence	3	0.014	0.059	3.10	6.59	0.011
Respect of biological rhythms	4	0.009	0.068	1.03	4.11	0.043

[a] Model 2 was obtained by deleting the item "Housekeeping" from the model 1 and by changing the significance level at 6%.

https://doi.org/10.1016/j.eurpsy.2017.09.001 Published online by Cambridge University Press

Table 5
Study 2 – Characteristics of 295 European schizophrenia patients (EGOFORS study).

Clinical and demographic characteristics	*n* (%)	Average (SD)
Gender female	132 (44.7 %)	
Age (years)		42.7 (16.2)
Accommodation		
Living alone	89 (30.3 %)	
In a supported institution	37 (12.5 %)	
With parents	142 (48.1 %)	
Financially responsible	27 (9.2 %)	
Presently working (or student status)	87 (29.6 %)	
Duration of illness (years), average (SD)		18.8 (14.5)
Schizophrenia subtypes		
Paranoid	182 (61.7 %)	
Disorganized	24 (8.1 %)	
Catatonic	0 (0.0 %)	
Undifferentiated	33 (11.2 %)	
Residual	10 (3.4 %)	
Affective	26 (8.8 %)	
Schizophreniform	20 (6.8 %)	
Currently treated by antipsychotics	295 (100.0 %)	
Length of remission		
No remission	168 (57.1 %)	
Clinical		
[1–5 months]	29 (9.9 %)	
Clinical remission, including		
time criterion[a]		
[6–12 months]	27 (9.2 %)	
[1–3 years]	44 (15.0 %)	
≥3 years	26 (8.8 %)	
Length of remission (months)		9.8 (24.5)
If clinical remission, including		29.0 (35.7)
time criterion (n = 97)[a]		

SD: standard deviation.
[a] According to the Andreassen's criteria

Table 6
Study 2–Spearman correlation coefficient between the mini-FROGS score and other scales.

Scale	Number of subjects	rho	*P* value
Total FROGS	199	0.93	< 0.001
Total QLS	94	0.78	< 0.001
Total PSRS	178	−0.75	< 0.001
GAF	199	0.60	< 0.001
UPSA-B	24	0.45	0.027
PSP	127	0.44	< 0.001
Total SWN	73	0.31	0.008

The FROGS proposed five relevant domains to define functional remission in schizophrenia: daily life activity, relationship, quality of rehabilitation, health and treatment. But the factor analysis of the 19 items of the FROGS finally distinguished 3 factors of clinical relevance: "Social functioning", "Daily life" and "Treatment". These factors are interestingly also present in the mini-FROGS, with 2 items for factor 1 ("travel and communication", "self-esteem and sense of independence"), 1 item for factor 2 ("Respect for biological rhythms") and 1 item for factor 3 ("Management of illness and treatment").

The homogeneity of the tested samples in terms of symptomatology, presence of clinical remission including the duration criterion [22], is a specific feature of our study, in comparison with various studies designed for the validation of scales with nearby purposes [26,33–35]. Particularly, few brief versions are developed and able to capture functional remission as clinically defined. The UPSA-B is not specific to schizophrenia and evaluates functional capacity (a person's potential to perform) whereas the mini-FROGS evaluates real-world functioning according to the clinician (how the patient actually performs) [36–38]. Lastly, the PSRS measures psychosocial remission in schizophrenia, which is only a part of functional remission [13] and includes items overlapping symptomatology (such as "energy" and "interest"). Thus the mini-FROGS is to our knowledge the first brief questionnaire specifically devoted to assess functional remission in schizophrenia.

More importantly, the mini-FROGS captures the benefit on functional activities to continue treatment when clinical remission is obtained, being sensitive to the length of clinical remission. Studies reported that achieving symptomatic remission was associated with better functioning [39–43] and that this latter outcome was correlated with length of remission [40,43,44]. In routine care, the use of the mini-FROGS may help patients to understand the impact of adherence in everyday life.

This study has several limits. First, the Mini-FROGS is a clinician-rated scale and its inter-reliability has yet not been tested. Second, the evaluations were made by experienced psychiatrists. However, the mini-FROGS is easy to use as the rating instructions are simple, and has already been efficiently used by nurses to demonstrate the functional benefit of psychosocial skill training [45]. Third, the impact of the severity of clinical symptoms on the mini-FROGS remains to be explored. The sample size of patients with clinical relapse is too small (n = 23) to draw any definite conclusions. Fourth, the length of illness duration in these two studies could be a possible bias for the results (respectively 14.5 years ± 9.8 for the first sample and 18.8 years ± 14.5 for the EGOFORS Study). One can speculate that young persons in their first psychosis period might value their social network and contacts with friends more important than being able to travel and communicate. Further studies should explore the mini-FROGS properties in young adults with recent schizophrenia onset. Lastly, further studies should determine the correlations between the mini-FROGS and cognitive functions. The links between cognition, functional remission and functional capacity is indeed considered as important but irresolute. The relationships with other broader aspects of remission, such as quality of life, should also be elucidated. Finally, by looking at functionality items that best predict symptom remission, we considered that symptoms improvement and functional outcome are strongly related. While this may be so in most cases [39–44], some patients may have good functionality without achieving symptomatic remission. Thus, there may be components of functionality that are clinically relevant but less closely related to symptom improvement and that have not been included in this short-listed version of the FROGS.

5. Conclusion

The mini-FROGS is a short version of the FROGS with good psychometric properties, highly linked to other scales assessing the psychosocial functioning. It gives a new and easy assessment of social functioning, qualitatively distinguishing patients with relapse and quantitatively reflecting the length of remission. A shortened time of administration increases its applicability across studies, especially when functional remission is not the primary outcome.

Role of funding source

This study was financially supported by an educational grant by Janssen-Cilag France.

Contributors

Philip Gorwood and Jasmina Mallet wrote the draft of the final manuscript and did the Medline review. Sylvie Lancrenon was responsible for the statistical analyses. Christophe Lançon and Franck-Jean Bayle contributed as clinical investigators.

https://doi.org/10.1016/j.eurpsy.2017.09.001 Published online by Cambridge University Press

Pierre-Michel Llorca contributed as a clinical investigator and coordinated the analyses. Philip Gorwood contributed as a clinical investigator, participated in the analyses, wrote the first draft and organized the submission of the final manuscript.

Disclosure of interest

Consultancies, honoraria, paid expertise and grants were obtained by authors according to the list below, with no stock ownership or shares, nor patent application neither registration.

Jasmina Mallet, Sylvie Lancrenon and Christophe Lançon declare no conflicts of interest.

Pierre-Michel Llorca has received consulting fees from AstraZeneca, Bristol-Myers Squibb, Eli Lilly, Euthérapie, Lundbeck, and Sanofi.

Franck Baylé has received consulting fees within the last 4 years from Servier, Lundbeck, Eli Lilly, Bristol-Myers Squibb, and Janssen.

Philip Gorwood received research grants from Eli Lilly and Servier; honoraria for presentations in congresses from AstraZeneca, Bristol-Myers Squibb, Janssen, Lundbeck, and Servier; participated on advisory board of AstraZeneca, Janssen, Roche, and Servier.

Acknowledgments

The EGOFORS initiative is relying on the work performed by Yoram Barak (Israel), Roberto Cavallaro (Italy), Silvana Galderisi (Italy), Philip Gorwood (France), Lars Helldin (Sweden), Robert Hunter (England), Pierre Michel Llorca (France), Dieter Naber (Germany), Joseph Peuskens (Belgium), Luis San (Spain) and Alp Uçok (Turkey).

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https://doi.org/10.1016/j.eurpsy.2017.09.001 Published online by Cambridge University Press