

Relation of formal thought disorder to symptomatic remission and social functioning in schizophrenia

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Abstract

Objective: The aim of this cross-sectional study is to examine the relation of formal thought disorder (FTD) with symptomatic remission (SR) and social functioning in patients with schizophrenia.

Method: The study was carried out with a sample consisting of 117 patients diagnosed with schizophrenia according to DSM-IV. The patients were assessed with the Positive and Negative Syndrome Scale (PANSS), the Thought and Language Index (TLI), and the Personal and Social Performance Scale (PSP). We used logistic regression in order to determine the relation between FTD and SR and linear regression to identify the strength of association between FTD and social functioning.

Results: Logistic regression analysis revealed that poverty of speech (odds ratio: 1.47, $p < 0.01$) and peculiar logic (odds ratio: 1.66, $p = 0.01$) differentiated the remitted patients from the non-remitted ones. Linear regression analysis showed that the PSP total score was associated with poverty of speech and peculiar logic items of the TLI ($B = -0.23$, $p < 0.01$, $B = -0.24$, $p = 0.01$, respectively).

Conclusion: Our findings suggest that poverty of speech and peculiar logic are the specific domains of FTD which are related to both SR status and social functioning in patients with schizophrenia.

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1. Introduction

Thought disorders are one of the fundamental symptom clusters of schizophrenia. Disorders of *thought form* that are characterized by deficiency in organizing thought in a definite logical sequence for a certain goal, and disorders of *thought content* such as delusions and obsessions are considered within thought disorders. In chronic stage, impairments in thought form are more frequent rather than impairments in thought content [1].

Formal thought disorder (FTD) has been identified in two subcategories in the literature: Positive and negative FTD. Positive FTD, determined by features such as derailment, perseveration, circumstantiality, tangentiality, blocking and incoherence, is known to be one of the key features of

psychotic episodes, and usually diminishes or disappears as acute episodes alleviate [2,3]. Negative FTD, on the other hand, identified by poverty of speech and poverty in content of speech, persists after alleviation of acute episodes [4]. Antipsychotic medication often helps to diminish FTD, and progression can be enabled in speech performance [5]. Particularly positive thought pathology is reduced with antipsychotic treatment [6]. Negative FTD is not considerably affected by medication and “residual thought pathology” continues even after remission has been achieved [6].

Ongoing existence of FTD refers to unfavorable prognosis and is accepted as a strong predictor of relapse [7]. In particular, negative FTD is associated with poor response to treatment [8], and it is less likely to achieve remission in patients with schizophrenia having negative FTD [2]. Further, presence of FTD at onset of schizophrenia increases relapse rate [9].

In severe mental disorders such as schizophrenia, social functioning is an important dimension as well as symptoms in phases of diagnosis and assessment. Even in the condition when remission of symptoms has been attained, social functioning of patients with schizophrenia may not improve

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entirely [10]. The European Group on Functional Outcomes and Remission in Schizophrenia (EGOFORS) stated that the functional deficits mostly experienced by patients with schizophrenia were in social relationships (40%), work (29%), and daily life activities (17%) [11].

FTD may disrupt individuals' interpersonal skills during interactions [12] through affecting one's perception [13], reasoning and communication skills [14]. Patients with schizophrenia have difficulty in following the common rules of dialogue, such as relevance to the topic, kindness and empathizing [15]. Additionally, they are not able to adjust their speech to the traditional norms of talking and correspondingly fail in language skills which hinders information sharing among themselves and the ones they are in communication with [13]. In these ways, FTD leads to worse social functioning and it's important to emphasize that worse social functioning is associated with clinical deterioration. Longitudinal studies denote that employment is related to better clinical outcomes [16,17]. Patients with severe mental illness who do not work tend to have clinical deterioration, particularly in negative symptoms [16]. Moreover, the longer duration of employment they receive, the better social networks they have [16]. As for schizophrenia-spectrum disorders, being employed alters the course of the disorder in terms of symptom severity, psychiatric hospitalization, life satisfaction, and global well-being [17]. EGOFORs reported that the patients involved in full-time work/study had better functioning and fewer symptoms compared to the patients involved in part-time work/study [18].

In vast amount of research on FTD, association of positive and negative FTD with acute and chronic phases of schizophrenia has been reported [2–4,19–23]. Besides, the relationship between FTD and social functioning has been evaluated in various studies [12–14]. In this current state of knowledge, we sought to identify the specific FTD domains having association with both symptomatic remission (SR) status and social functioning. Moreover, as far as we know this is the first study using the remission criteria suggested by the Remission in Schizophrenia Working Group (Andreasen et., 2005) by which the objective criteria of remission would be applied in order to determine the relationship between domains of FTD and SR in schizophrenia.

The aim of this cross-sectional study is to examine the relation between FTD and SR in patients with schizophrenia. The other aim of this study is to identify the relation between FTD and social functioning.

2. Methods

2.1. Participants

The study was carried out with a sample consisting of 117 patients (40 female, 77 male) aged between 18 and 65 and diagnosed with schizophrenia according to the DSM-IV criteria [24]. Patients having electroconvulsive treatment

were excluded from the study. All the patients were Turkish native-speaking. They were recruited from the Schizophrenia Outpatient Unit of Psychiatry Department of Dokuz Eylül University, School of Medicine.

Using the remission criteria developed by the Remission in Schizophrenia Working Group [25], 45 patients were assessed as “remitted” and 72 patients as “non-remitted”. In defining the remitted patients, we used only the symptom criterion of the Andreasen group, we did not include the time criterion (duration of 6 months). The remitted patients scored 3 or less on the following items of The Positive and Negative Syndrome Scale (PANSS): P1-Delusions, P2-Conceptual disorganization, P3-Hallucinatory behavior, N1-Blunted affect, N4-Passive/apathetic social withdrawal, N6-Lack of spontaneity and flow of conversation, G5-Mannerism/Posturing, and G9-Unusual thought content.

The study was approved by the Ethics Committee of Dokuz Eylül University School of Medicine.

2.2. Procedures

After providing written informed consent to participate in the study, the patients were assessed using PANSS in order to be assigned to the remitted or the non-remitted group. The evaluation of FTD and social functioning were made subsequent to the assessment of psychiatric symptoms, all at one point in time by a trained psychologist.

2.3. Measures

2.3.1. Psychiatric symptom assessment

2.3.1.1. The Positive and Negative Syndrome Scale. PANSS was used to assess the symptom severity of the patients. PANSS includes Positive Symptoms Subscale, Negative Symptoms Subscale and General Psychopathology Subscale [26,27].

2.3.2. Formal thought disorder

2.3.2.1. The Thought and Language Index. The Thought and Language Index (TLI) was developed for assessing FTD under standardized conditions [20]. Participant is required to produce eight one-minute speech samples in response to the eight standard pictures taken from the Thematic Apperception Test (TAT) [28]. The two-factor structure of the Turkish version of TLI has a Cronbach alpha value of 0.75 with a high interrater and test–retest reliability [29]. It comprises impoverishment of thought and disorganization of thought subscales. Impoverishment of thought subscale consists of three items: Poverty of speech, weakening of goal and perseveration. Disorganization of thought subscale includes five items: Looseness, peculiar word use, peculiar sentence construction, peculiar logic and distractibility. The entire interview is recorded on audiotape and then transcribed. These transcribed speech samples are assessed according to the TLI manual. As to the TLI manual, a score of 0.25, 0.50,

Table 1
Demographic and clinical features of the patients.

Variable (mean ± SD)	Remitted group (n = 45)	Non-remitted group (n = 72)	Test statistic	p
Age (years)	36.62 ± 9.57	35.65 ± 9.03	U = 1528.5	0.61
Gender (M/F), n	27/18	50/22	$\chi^2 = 1.10$	0.30
Education (years)	13.07 ± 4.85	11.14 ± 4.49	U = 1259.5	0.04
Illness duration (years)	12.78 ± 8.87	11.47 ± 7.21	U = 1524	0.59
Working in the last 6 months	16 (35.56%)	10 (13.89%)	$\chi^2 = 7.52$	0.01
PANSS score	51.73 ± 9.90	83.74 ± 15.13	U = 109	<0.01
Positive symptoms scale	11.62 ± 3.21	20.28 ± 5.77	U = 304.5	<0.01
Negative symptoms scale	14.44 ± 3.82	25.08 ± 5.34	U = 123	<0.01
General psychopathology scale	25.62 ± 5.32	38.47 ± 8.03	U = 310	<0.01
PSP score	66.29 ± 11.33	38.25 ± 12.11	U = 133	<0.01

SD = standard deviation; PANSS = Positive and Negative Syndrome Scale.

0.75 or 1.0 is given to each TAT picture depending on the severity of FTD.

2.3.3. Social functioning

2.3.3.1. The Personal and Social Performance Scale. The Personal and Social Performance Scale (PSP) examines the four dimensions of social functioning: Socially useful activities including work and study, personal and social relationships, self-care, disturbing and aggressive behaviors [30].

2.4. Statistical analyses

The Statistical Package for the Social Sciences (SPSS) version 15.0 for Windows was used for all the analyses. Due to the condition that our data were not normally distributed, the Mann–Whitney U nonparametric test was used to

determine the significance of inter-group differences for continuous variables and Spearman correlation coefficient was used to calculate the correlations between variables. Chi-square tests were used to analyze any differences between the groups for categorical variables.

In order to determine the relation between FTD and remission of symptoms, binary logistic regression was conducted. Being in SR or not was the dependent variable and the scores of the related TLI items were the independent variables. The related TLI items were selected by comparing the remitted and the non-remitted patient groups according to the TLI item scores and the items showing significant differences between the two groups entered into the logistic regression analysis.

In specifying the strength of association between FTD and social functioning of the patients, we conducted multiple

Table 2
Comparison of the remitted and the non-remitted patient groups according to the TLI item and subcategory scores.

	Remitted group mean ± SD)	Non-remitted group (mean ± SD)	Comparison of the groups
Poverty of speech	1.96 ± 1.84	3.84 ± 2.29	U = 866.5 p < 0.01
Weakening of goal	1.42 ± 0.90	2.24 ± 1.24	U = 972 p < 0.01
Perseveration	1.33 ± 0.69	1.41 ± 0.98	U = 1615 p = 0.98
Looseness	0.24 ± 0.58	0.51 ± 1.16	U = 1415 p = 0.17
Peculiar word use	0.45 ± 0.36	0.49 ± 0.45	U = 1609 p = 0.95
Peculiar sentence construction	1.01 ± 0.84	1.25 ± 1.42	U = 1576.5 p = 0.81
Peculiar logic	1.09 ± 1.05	1.94 ± 1.47	U = 1056 p < 0.01
Distractibility	0	0	U = 1620 p = 1
Impoverishment of thought subcategory	4.70 ± 2.32	7.50 ± 2.86	U = 727.50 p < 0.01
Disorganization of thought subcategory	2.80 ± 1.74	4.19 ± 3.15	U = 1183.50 p = 0.01
TLI total	7.50 ± 3.40	11.68 ± 4.45	U = 701.50 p < 0.01

SD = standard deviation.

Table 3
Significant correlations between TLI and PSP scores.

	Socially useful activities	Personal/ social relationships	Self-care	Disturbing/ aggressive behaviors	PSP total
Poverty of speech	0.36**	0.41**	0.29**	0.22*	-0.45**
Weakening of goal	0.39**	0.31**	0.13	0.26**	-0.39**
Perseveration	0.01	-0.04	0.10	-0.11	0.01
Looseness	-0.04	-0.02	-0.03	-0.07	0.04
Peculiar word use	0.07	-0.08	0.05	0.10	-0.01
Peculiar sentence construction	0.12	0.01	-0.17	0.08	-0.02
Peculiar logic	0.31**	0.26**	0.15	0.14	-0.31**
Distractibility	-	-	-	-	-
Impoverishment of thought subcategory	0.45**	0.46**	0.30**	0.27**	-0.52**
Disorganization of thought subcategory	0.29**	0.15	0.05	0.18	-0.23*
TLI total	0.48**	0.44**	0.25**	0.28**	-0.51**

* $p < 0.05$,

** $p < 0.01$.

linear regression analysis with the PSP total score as the dependent variable and the scores of the related TLI items as the independent variables. The related TLI items were selected by calculating the correlations between the TLI item scores and the PSP total score. The items of TLI showing significant correlations with PSP entered into the linear regression analysis.

3. Results

3.1. Demographic and clinical features

Demographic and clinical features of the patients are shown in Table 1. There were no significant group differences between the groups in age, gender or illness duration. The remitted patients had significantly more years of education and more remitted patients had been working in the last 6 months compared to the non-remitted patients. The scores on positive, negative and general psychopathology scales of PANSS were significantly lower in the remitted group compared to that of the non-remitted group.

3.2. Comparison of TLI scores between remitted and non-remitted groups

Comparison of the remitted and the non-remitted patient groups according to the TLI item and subcategory scores are given in Table 2. Poverty of speech, weakening of goal and peculiar logic were the TLI items showing significant differences between the two groups.

3.3. Association between TLI and PSP scores

Significant correlations that were found between the scores of TLI and PSP are given in Table 3.

3.4. Logistic regression analysis

We used logistic regression to determine the relation between FTD and SR. The three items of TLI (poverty of speech, weakening of goal and peculiar logic), which were shown to have significant group differences (Table 2), were submitted to binary logistic regression analysis. As shown in Table 4, poverty of speech and peculiar logic were found to differentiate the remitted patients from the non-remitted ones. When all these variables are taken into analysis, they explain the 34% variance in the dependent variable (Nagelkerke $R^2 = 0.34$).

3.5. Linear regression analysis

Multiple linear regression analysis was conducted with the PSP total score as the dependent variable and the related TLI items as the independent variables in order to specify the strength of association between FTD and social functioning. In order to test whether statistical assumptions of linear regression were met, we first examined the relationship between the independent and dependent variables. Accordingly, we chose the three TLI items that were found to correlate with the PSP total score (Table 3) as the independent variables. Secondly, we checked out the normality of our data with Kolmogorov-Smirnov test. As the data were not normally distributed, we corrected the data

Table 4
Binary logistic regression analysis of the variables related to SR.

	B	SE	Wald	df	p-value	Odds ratio	95% CI for OR
Poverty of speech	0.38	0.11	11.79	1	<0.01	1.47	1.18 - 1.83
Weakening of goal	0.28	0.24	1.29	1	0.27	1.32	0.82 - 2.12
Peculiar logic	0.50	0.20	6.18	1	0.01	1.66	1.11 - 2.46

SE, standard error; OR, odds ratio; CI, confidence interval.

Table 5
Multiple linear regression analysis with PSP score as dependent variable.

	B	SE	P
Poverty of speech	−0.23	0.05	<0.01
Weakening of goal	−0.13	0.11	0.22
Peculiar logic	−0.24	0.09	0.01

$R^2 = 0.30$.

with data transformation. Thirdly, we examined the correlation matrix of these three TLI items in order to explicate the relationship between them. There wasn't any correlation between poverty of speech and peculiar logic ($r = 0.04$). There was a significant correlation between poverty of speech and weakening of goal ($r = 0.40$), and between peculiar logic and weakening of goal ($r = 0.37$), so we decided to include these three TLI items in the linear regression. We ran forced entry multiple linear regression. Results of the regression analysis is given in Table 5. Poverty of speech and peculiar logic items of the TLI showed significant association with the PSP total score ($B = -0.23$, $p < 0.01$, $B = -0.24$, $p = 0.01$, respectively).

4. Discussion

The aim of this cross-sectional study was to examine the relation of FTD with SR and social functioning in patients with schizophrenia. We found that poverty of speech and peculiar logic were the specific domains of FTD which were associated with both SR status and social functioning.

It's noteworthy that both SR status and social functioning were found to be particularly related to the same two TLI items, which are poverty of speech and peculiar logic. This finding suggests that both positive and negative FTD are important extents of remission and functioning, as poverty of speech refers to negative FTD and peculiar logic represents positive FTD.

Previous studies on FTD note the significant association of positive and negative FTD with acute and chronic phases of schizophrenia. Thought disorders that exacerbate in acute episodes proceed in a vague form throughout the illness [19–22], persisting in remitted patients as well [23]. In our study, we found that the patients in SR particularly had less poverty of speech, weakening of goal and peculiar logic compared to the non-remitted patients. Additionally, in logistic regression analysis we found that poverty of speech and peculiar logic were the significant FTD domains differentiating the remitted and the non-remitted patients with schizophrenia.

Thought is an important factor in verbal and non-verbal communication. As thought disorders impair person's reasoning abilities, it is more likely that they would also affect interpersonal communication skills of patients with schizophrenia [12], which in turn would impair their social functioning. We

found that socially useful activities and personal/social relationships were related to poverty of speech, weakening of goal and peculiar logic. Additionally, we found that self-care was associated with poverty of speech and disturbing/aggressive behaviors with poverty of speech and weakening of goal.

Disorganization symptoms are predictive of social functioning in general [31]. Disorganized speech, seen in patients with schizophrenia, is a factor impairing communication with others, and in that sense, restricting social functioning [32]. Patients with disorganized thought are insufficient in representing others' state of mind correctly and in integrating contextual information [33]. They might not recognize how much information the person that they are communicating with needs or might think that the person already knows the information they have in mind [32,34]. Disconnected speech was associated with socially impolite behavior [35]. In our study, we found that disorganization of thought was particularly related to socially useful activities.

Verbal fluency was found to be an important predictor with regard to everyday problem solving abilities [19], and verbal underproductivity was associated with social disengagement and impaired friendships [35]. We found that impoverishment of thought was as important as disorganization of thought in social functioning of patients with schizophrenia, as it was correlated with all the dimensions of social functioning, including socially useful activities, personal and social relationships, self-care, disturbing and aggressive behaviors. Moreover, poverty of speech was the only TLI item that was associated with all of the four dimensions of social functioning.

As far as we know, the only study examining the effect of thought disorders upon social functioning was an eight-year follow-up study, in which the association between psychosocial functioning and bizarre-idiosyncratic thought was studied [12]. In that follow-up study, positive FTD was found to be related to occupational functioning, and it even predicted subsequent occupational functioning of the patients years later. We examined the relation of both negative and positive FTD to social functioning, but our study design does not allow for us to make any predictions. In our cross-sectional study, linear regression analysis revealed that poverty of speech and peculiar logic were the FTD domains significantly related to social functioning.

In schizophrenia, social cognition and metacognition might serve as connective factors between FTD and social functioning. It is crucial to be able to form assumptions regarding what runs through the person's mind that we are communicating with during interpersonal relations, and in patients with schizophrenia impairments in this ability are common. These social cognitive impairments are also found to be related to thought disorders [36]. Theory of mind, a subcategory of social cognition, is a prerequisite for efficient verbal communication [36], and impairments in this domain determine some problems that patients with schizophrenia face in communication [37]. Depending upon the condition of not taking one's perspective, patients do not understand

the complete information that is necessary for a goal directed, clear communication [22] which in turn, might result in inconvenient and inconsistent speech [38]. Impairments in metaphor and irony comprehension and emotion perception might also lead to communication problems and misunderstandings in social interactions [12]. Additionally, as metacognition refers to recognition of knowledge about one's own thought processes, it might be another moderator between FTD and social functioning. Deficits in metacognitive capacity are related to persistence of social dysfunction in schizophrenia [39]. Patients with schizophrenia having higher level of metacognition, especially in self-reflectivity were found to have higher ratings of work performance over time [40]. Metacognitive awareness was associated with frequency of social contacts and with flexibility in abstract thought as well [41]. In this regard, a more comprehensive research might be carried out by combining assessments of social cognition and metacognition in our study design in future.

The cross-sectional design of the study is the main limitation of our research. As this study was not longitudinal in nature, determinations regarding the effect of FTD on the course of remission and social functioning cannot be drawn. In future, follow-up study of the same sample might serve to establish inferences on causal effects of FTD on SR and social functioning. Additionally, as the Remission in Schizophrenia Working Group defined for SR, maintenance of predetermined symptom severity over a 6 month period is required (Andreasen et., 2005). In our study, we recruited our remitted patients considering the symptom criterion. In future research, incorporation of both symptom severity and time components of SR would be more relevant to be able to assess the long-term course of schizophrenia.

5. Conclusion

Overall, our findings indicate that (a) poverty of speech and peculiar logic are the specific FTD domains differentiating remitted patients with schizophrenia from non-remitted; (b) social functioning of patients with schizophrenia is strongly associated with poverty of speech and peculiar logic. Longitudinal studies will further clarify the nature of these relationships.

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