DOI: 10.14744/DAJPNS.2025.00000
Dusunen Adam J Psychiatr Neurol Sci
2025;38:000-000

RESEARCH ARTICLE

The effect of impoverishment of thought in early psychosis: Influence on suicide risk via depression and aggression

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ABSTRACT

Objective: Suicide is a leading cause of premature mortality among individuals with psychosis, particularly during its early stages. This study aimed to examine the direct and indirect effects of formal thought disorders (FTDs) on suicidal ideation and behavior in early psychosis, while also evaluating the roles of depressive symptoms and social functionality as both independent contributors to suicide risk and potential mediators of the relationship between FTDs and suicidality.

Method: The study included 64 patients diagnosed with early psychosis (≤12 months since initial treatment), 30 of whom had recently attempted suicide. Participants were assessed using the Columbia Suicide Severity Rating Scale (C-SSRS), Thought and Language Index (TLI), Personal and Social Performance Scale (PSP), Calgary Depression Scale for Schizophrenia (CDSS), and the Positive and Negative Syndrome Scale (PANSS).

Results: Patients with a history of suicide attempts scored significantly lower on the TLI-Impoverishment of Thought Subscale (TLI-ITS) ($p=0.001$), and significantly higher on the TLI-Disorganization Subscale ($p=0.036$), the CDSS ($p<0.001$), and the PANSS Positive Subscale ($p=0.003$). They also had significantly lower total PSP scores ($p<0.001$). Mediation analysis revealed that the effect of TLI-ITS on suicide attempts was negative and significantly mediated through both CDSS and the Personal and Social Performance Scale – Dysfunction subscale (PSP-D). Lower TLI-ITS scores were associated with higher CDSS scores and lower PSP-D scores, each of which contributed to an increased risk of suicide attempts ($p<0.001$ and $p=0.026$, respectively).

Conclusion: The prominence of impoverishment of thought may be associated with lower levels of depressive symptoms and increased disruptive and aggressive behaviors, which, in turn, could be linked to a reduced risk of suicidal thoughts and attempts. These findings could serve as an important point of consideration for clinicians when assessing suicidal ideation and behavior in early psychosis.

Keywords: Aggression, depressive symptoms, early psychosis, formal thought disorders, social functionality, suicide

How to cite this article: Celikkiran Erdem P, Gica S, Cinar B, Karamustafalioglu N. The effect of impoverishment of thought in early psychosis: Influence on suicide risk via depression and aggression. Dusunen Adam J Psychiatr Neurol Sci 2025;38:00-00.

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Received: January 20, 2025; **Revised:** July 01, 2025; **Accepted:** July 27, 2025

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INTRODUCTION

Suicide is a leading cause of premature mortality among individuals with schizophrenia spectrum disorders (1, 2). The incidence of suicide in this population is reported to be up to 20 times higher than in the general population (3), with as many as 5.6% of patients dying by suicide (4). The risk of suicide varies throughout the course of the illness (5), peaking in the early stages, particularly around the initial psychotic episode (6). Notably, patients experiencing their first episode of psychosis are at the greatest risk of dying by suicide within the first 12 months following diagnosis (5). Identified risk factors for suicide attempts include young age, male gender, alcohol and substance use, early stage of illness, depression, psychotic symptoms, previous suicide attempts, and a family history of psychiatric disorders (5,7–10). Additionally, biological factors such as inflammation and alterations in amygdala and hippocampal volumes are considered potential suicide risk factors (11, 12).

Formal thought disorders (FTDs) are considered one of the core features of schizophrenia, present in approximately 80-90% of patients during acute episodes (13). Although most commonly associated with schizophrenia, FTDs are recognized as a multidimensional phenomenon not specific to any single psychiatric diagnosis. They can also be observed in other schizophrenia spectrum disorders, as well as in mania, depression, and various other psychiatric conditions (14–17). FTDs involve disturbances in the logical organization and sequencing of thoughts, which manifest as abnormalities in the content and form of speech, such as disorganized speech, peculiar thought content, and illogical expressions (18). Longitudinal studies suggest that persistent FTDs following a first psychotic episode are associated with poor prognosis, higher relapse rates, treatment resistance, and eventual conversion to schizophrenia (19–21). Moreover, their presence in individuals at ultra-high risk for psychosis has been shown to predict transition to overt psychotic disorders. (22). Andreasen's classification divides FTDs into positive (e.g., incoherence, peculiar word use, distractibility) and negative (e.g., reduced speech volume and content) subtypes (23,24). While positive FTDs may improve with antipsychotic treatment, negative FTDs tend to persist and are more strongly associated with long-term functional impairment (25–27). Furthermore, chronic FTDs have been linked to persistent positive symptoms and reduced social functionality (28, 29). Considering all this evidence, impoverished or disorganized thought processes may hinder problem-solving abilities and emotional regulation, thereby exacerbating feelings of hopelessness and contributing to suicidal ideation and behavior. For this reason, FTDs hold clinical importance not only in the diagnostic and prognostic assessment of schizophrenia but also in clarifying their potential role in increasing suicide risk, particularly in the early stages of the illness.

Psychosis significantly affects an individual's social, psychological, and occupational functioning, even when psychotic symptoms are managed with psychopharmacological treatment (30). Impaired social functionality is a prominent and chronic symptom of schizophrenia and often presents greater challenges than positive symptoms for many patients (31). Studies suggest that fewer than 50% of individuals with psychosis achieve social recovery (32, 33). A meta-analysis by Marggraf et al. (34) demonstrated an inverse relationship between FTDs and social functioning. Moreover, Robinson et al. (35) reported that poor functioning at the onset of treatment in patients with first-episode psychosis is associated with an increased risk of suicide attempts.

Current data indicate that comorbid depression is common during the prodromal, acute, and post-psychotic phases in patients with schizophrenia. Approximately 80% of individuals with psychosis experience depression at least once over the course of the illness (6). Depression has been reported in 70% of patients with first-episode psychosis during the acute phase and in 36% during the post-psychotic phase (36). Patients with first-episode psychosis who exhibit depressive symptoms are at increased risk of suicide during the follow-up period (37).

While suicide attempts remain a serious and ongoing risk among patients with psychosis, detecting this risk within mental health services is often challenging, and treatment approaches are frequently inadequate. Therefore, identifying suicide risk factors in this population is crucial for guiding the development and implementation of effective interventions. Although suicidality has been studied in the broader context of psychotic disorders, few studies have specifically focused on early psychosis, a clinically distinct period marked by heightened suicide risk. Moreover, the role of FTD subtypes in suicide attempts has rarely been explored in this population. The present study aimed to investigate both the direct and indirect effects of FTDs on suicidal

ideation and behavior in early psychosis, while also evaluating the roles of depressive symptoms, social functioning, and disease severity as both independent contributors to suicide risk and potential mediators of the relationship between FTDs and suicidality. By examining the potential mediating roles of depressive symptoms and social functioning, this study aims to address gaps in the literature and provide insight into the mechanisms linking FTDs to suicidality in early psychosis. We hypothesized that, in patients with early psychosis: (I) FTDs would be more prominent, (II) depressive symptoms would be more severe, (III) social functioning would be lower, and (IV) disease severity would be higher among those with a history of suicide attempts compared to those without.

METHODS

Participants

Patients who were admitted to the psychiatric outpatient clinic or hospitalized at Bakırköy Prof. Dr. Mazhar Osman Mental Health and Neurological Diseases Training and Research Hospital, and diagnosed with Brief Psychotic Disorder, Schizophreniform Disorder, Schizophrenia, Other Specified Schizophrenia Spectrum and Other Psychotic Disorder, or Unspecified Schizophrenia Spectrum and Other Psychotic Disorder according to DSM-5 (Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition) criteria, were included in the study. Patients were considered to be in the early phase of psychotic disorder if they were within 12 months of receiving their first treatment for psychotic symptoms. While no universally accepted threshold exists for early psychosis, our definition aligns with prior research indicating that the risk of suicide is extremely high during this period (3, 5, 38). Therefore, the 12-month cut-off reflects a clinically meaningful timeframe that captures the critical window for suicide prevention in individuals newly diagnosed with a psychotic disorder. Exclusion criteria included patients younger than 18 or older than 65 years of age; those with comorbid psychiatric diagnoses, defined as any current or past DSM-5 Axis I disorder other than the diagnoses specified in the inclusion criteria; those with any current physical or neurological disease that could interfere with psychiatric assessment; and individuals with a current or lifetime substance or alcohol use disorder (excluding nicotine), based on clinical interviews and medical records. Patients who had received electroconvulsive therapy (ECT) within the past six months, those who had received antipsychotic treatment for more than 12 months, or those with clinically significant cognitive impairment (e.g., intellectual disability or observable deficits in attention or memory that could affect participation), as determined by a prior diagnosis or clinician's judgment, were also excluded. The sample size for this study was determined a priori using G*Power version 3.1.9.2, with an assumed effect size of 0.8, α=0.05, and power=0.85.

The final cohort comprised 64 patients with early psychosis, including 34 who had not attempted suicide and 30 who had attempted suicide within the past three months. The inclusion of patients who had attempted suicide within this timeframe aligns with the Columbia Suicide Severity Rating Scale's reference period for assessing suicidal behavior.

Procedures

Informed verbal and written consent was obtained from all patients. Sociodemographic and clinical data were collected using a structured form developed by the researchers, and additional clinical data were gathered using the assessment tools described below. Ethical approval was granted by the Ethics Committee of the hospital where the study was conducted (Protocol No. 364, dated 01.10.2019).

Data Collection Tools

Assessment of Suicidal Thoughts and Behaviors

The Columbia Suicide Severity Rating Scale (C-SSRS) is a semi-structured, interview-based assessment tool designed to evaluate suicidal ideation, the intensity of suicidal ideation, and suicidal behavior. Unlike conventional approaches that treat suicidal ideation and behavior as a one-dimensional phenomenon, this scale conceptualizes them as part of a broader spectrum, encompassing passive thoughts, active intent, and behavior. The "Suicidal Ideation" (SI) section consists of five items that assess suicidal ideation as a continuum, ranging from a wish to be dead to a specific suicide plan or intent. The "Intensity of Ideation" (IoI) section explores factors such as frequency, duration, control, deterrents, and underlying reasons for ideation. The "Suicidal Behavior" (SB) section is structured nominally and assesses actual, interrupted, and aborted suicide attempts, predisposing factors, and non-suicidal self-injurious behaviors. Additionally, the scale includes items evaluating the actual or potential lethality of suicide attempts. The C-SSRS assesses both lifetime and current suicidality, with reference periods of the past month for ideation and

the past three months for behavior, depending on clinical conditions or study requirements. The original version demonstrated acceptable internal consistency (Cronbach's alpha=0.73) (39). The validity and reliability of the Turkish version for adolescents were reported with ordinal alpha coefficients of 0.89 and 0.91 for recent and lifetime scores, respectively (40).

Assessment of Formal Thought Disorders

The Thought and Language Index (TLI) is a semi-structured clinical interview scale developed to assess FTDs under standardized conditions. The Impoverishment of Thought (TLI-ITS) subscale includes the following items: poverty of speech, weakening of goal, and perseveration. The Disorganization of Thought (TLI-DTS) subscale includes looseness, peculiar word use, peculiar sentence structure, peculiar logic, and distractibility. In the original study, interrater reliability (intraclass correlation coefficient, ICC) was reported as 0.88 for the impoverished thought/language subscale and 0.82 for the disorganized thought/language subscale (21). The validity and reliability of the Turkish version were established by Ulas et al. (41) Interrater reliability was reported as r=0.97 for the impoverishment of thought subscale and r=0.72 for the disorganization of thought subscale. Test-retest reliability was reported as r=0.78 for the impoverishment of thought subscale and r=0.44 for the disorganization of thought subscale. The TLI also demonstrated strong discriminative validity, successfully distinguishing patients from healthy controls ($p<0.001$).

Assessment of Social Functionality

The Personal and Social Performance Scale (PSP) is a six-point Likert-type assessment tool that evaluates four functional domains: socially useful activities, personal and social relationships, self-care, and disturbing and aggressive behaviors. The total score ranges from 1 to 100, with higher scores indicating better functioning. Test-retest reliability for the PSP was reported as 0.79 (30). Validity and reliability for the Turkish population were confirmed by Aydemir et al. (42) The Cronbach's alpha coefficient was calculated as 0.83, and inter-rater reliability was found to be 0.973.

Assessment of Depressive Symptoms

The Calgary Depression Scale for Schizophrenia (CDSS) is a semi-structured instrument developed to assess depressive symptoms in individuals with schizophrenia, independent of positive, negative, or extrapyramidal symptoms. A total score of 7 or above is predictive of moderate to severe depressive episodes, with a specificity of 82% and a sensitivity of 85%. The original version demonstrated good inter-rater reliability (ICC=0.895) and internal consistency (Cronbach's alpha=0.79) (43). The validity and reliability of the Turkish version were confirmed by Oksay et al. (44), who reported high internal consistency (Cronbach's alpha=0.90), inter-rater reliability (kappa=0.87-1.00), and test-retest reliability (r=0.95-1.00).

Assessment of Symptom Severity

Symptom severity was assessed using the Positive and Negative Syndrome Scale (PANSS), developed by Kay et al. (45) Among the 30 items on the scale, seven assess positive symptoms, seven assess negative symptoms, and 16 assess general psychopathology. In the original study, the alpha coefficients were reported as 0.73 for the positive scale, 0.83 for the negative scale, and 0.79 for the general psychopathology scale. Validity and reliability for the Turkish population were established by Kostakoğlu et al. (46), who reported Cronbach's alpha values of 0.75, 0.77, and 0.71 for the positive, negative, and general psychopathology subscales, respectively.

Statistical Analyses

Data were analyzed using IBM SPSS version 22.0. The conformity of the variables to a normal distribution was assessed using both analytical methods (skewness, kurtosis values, coefficient of variation, Kolmogorov-Smirnov/Shapiro-Wilk tests) and visual methods (histograms and Q-Q plots). Kurtosis and skewness values within the range of ±1.5 were considered indicative of conformity to the normal distribution hypothesis. The Independent Samples t-test was used when the normal distribution hypothesis was met, and the Mann-Whitney U test was used when it was not. Pearson correlation analysis was applied to normally distributed data, while Spearman correlation analysis was used for non-normally distributed data to explore relationships among PANSS, CDSS, TLI, C-SSRS, and PSP scores. Linear (simple) regression and multivariate regression analyses were conducted to assess whether patients' suicidal tendencies (as measured by the C-SSRS) could be predicted by other psychometric features. The mediating roles of depressive symptoms and the dysfunction subscale of the Personal and Social Performance Scale (PSP-D) in the relationship between FTD-ITS and suicide attempts were analyzed using the general linear model (GLM) procedure. The significance level for all statistical analyses in the study was set at $p<0.05$.

Table 1: Comparison of sociodemographic and clinical characteristics of patients with early psychosis with and without suicide attempt

	PEP with suicide attempt (n=30)		PEP without suicide attempt (n=34)		p
	Mean±SD	Min–Max/(%)	Mean±SD	Min–Max/(%)	
Age	32.67±11.07	18.00–56.00	30.65±9.22	18.00–53.00	0.429*
Gender					0.638†
Female (n)	15	50.0%	15	44.1%	
Male (n)	15	50.0%	19	55.9%	
Marital status					0.290‡
Single (n)	18	60.0%	24	70.6%	
Married (n)	8	26.7%	9	26.5%	
Separated/divorced (n)	4	13.3%	1	2.9%	
Years of education	8.90±3.92	0–16.00	9.56±4.59	0–17.00	0.542*
Employment status					0.247‡
Unemployed (n)	20	66.7%	27	79.4%	
Irregular employment (n)	10	33.3%	6	17.6%	
Employed (n)	0	0.0%	1	2.9%	
Current tobacco use					
Yes (n)	20	66.7%	16	47.1%	0.115‡
Alcohol use					
Yes (n)	2	6.7%	3	8.8%	0.748‡
Comorbid medical conditions					0.917‡
Present (n)	5	16.7%	6	17.6%	
Absent (n)	25	83.3%	28	82.4%	
Family history of psychiatric illness					**0.011**‡
Present (n)	13	43.3%	5	14.7%	
Absent (n)	17	56.7%	29	85.3%	
Age at illness onset	31.70±11.43	13.00–56.00	29.44±10.22	15.00–52.00	0.407‡
Duration of untreated illness (weeks)	60.43±83.20	1.00–312.00	104.79±101.97	1.00–416.00	**0.011**§
Duration of untreated psychosis (weeks)	12.07±15.17	1.00–52.00	31.15±60.20	1.00–310.00	0.131§
Number of psychotic episodes	1.07±0.25	1.00–2.00	1.06±0.24	1.00–2.00	0.898§
Number of hospitalizations	0.97±0.18	0.00–1.00	0.85±0.44	0.00–2.00	0.170§
Use of regular medication					0.423‡
Yes (n)	7	23.3%	11	32.4%	
No (n)	23	76.7%	23	67.6%	

p<0.05. PEP: Patients with Early Psychosis; M: Mean; SD: Standard deviation; *Student t-Test was used; †: Chi-Square Test was used; ‡: Fisher's Exact Chi-square test was used; §: Mann-Whitney U Test was used.

RESULTS

There were no statistically significant differences in age (p=0.429), gender (p=0.638), marital status (p=0.290), total years of education (p=0.542), or employment status (p=0.247) between early psychosis patients with and without a history of suicide attempts. Similarly, no significant group differences were found in smoking (p=0.115), alcohol use (p=0.748), presence of comorbid medical conditions (p=0.917), age at disease onset (p=0.407), number of psychotic episodes (p=0.898), number of hospitalizations (p=0.170), or regular use of medication (p=0.423). However, patients with suicide attempts were significantly more likely to have a family history of psychiatric illness (p=0.011). Additionally, patients without suicide attempts had a significantly longer duration of illness (p=0.012) and longer duration of untreated illness (p=0.011)

Table 2: Comparison of TLI mean scores in patients with early psychosis with and without suicide attempts

	PEP with suicide attempt (n=30)		PEP without suicide attempt (n=34)		Z	p
	Mean±SD	Median	Mean±SD	Median		
Poverty of speech	0.54±1.39	0.00	1.54±1.96	0.75	-2.44	**0.015**
Weakening of goal	0.29±0.86	0.00	0.82±0.98	0.38	-3.10	**0.002**
Perseveration	0.16±0.34	0.00	0.47±0.58	0.25	-2.77	**0.006**
Impoverishment of thought subscale total	0.99±2.18	0.25	2.84±2.95	2.25	-3.46	**0.001**
Looseness	1.52±1.53	1.00	0.97±1.45	0.63	-2.30	**0.021**
Peculiar words	0.66±1.13	0.25	0.50±0.69	0.25	-0.24	0.814
Peculiar sentences	0.39±1.30	0.00	0.28±0.59	0.00	-0.26	0.792
Peculiar logic	1.39±0.98	1.25	0.88±1.43	0.50	-3.01	**0.003**
Distractibility	0.20±0.55	0.00	0.29±1.38	0.00	-0.57	0.568
Disorganization of thought subscale total	4.12±4.68	2.50	2.93±4.68	1.75	-2.10	**0.036**
Thought and Language Index total score 134	5.11±4.58	4.00	5.76±4.72	4.13	-0.95	0.342

p<0.05. TLI: Thought and Language Index; M: Mean; SD: Standard deviation; PEP: Patients with early psychosis. Mann-Whitney U test was used.

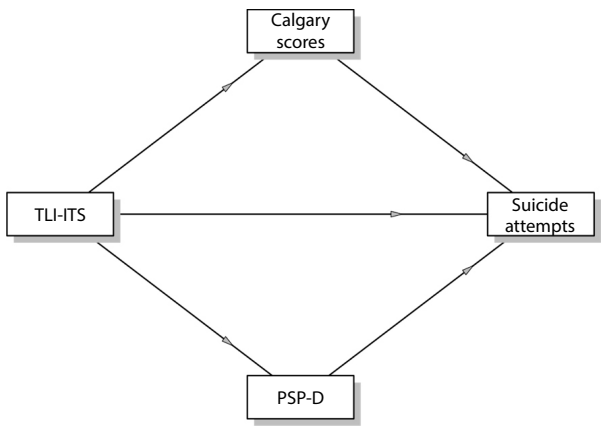

Figure 1. Indirect and total effects of the Impoverishment of Thought subscale of the Thought and Language Index on suicide attempts, mediated by scores on the Calgary Depression Scale for Schizophrenia and the Disturbing and Aggressive Behaviors subscale of the Personal and Social Performance Scale.

TLI-ITS: Impoverishment of Thought Subscale of the Thought and Language Index; Calgary: Calgary Depression Scale for Schizophrenia; PSP-D: Disturbing and Aggressive Behaviors Subscale of the Personal and Social Performance Scale.

compared to those who had attempted suicide. No significant difference was found between the groups in terms of duration of untreated psychosis (p=0.131). A comparison of sociodemographic and clinical variables is presented in Table 1.

Among patients who had attempted suicide, mean scores on the Impoverishment of Thought subscale (Z=-3.46, p=0.001), as well as on the Poverty of Speech (Z=-2.44, p=0.015), Weakening of Goal (Z=-3.10, p=0.002), and Perseveration (Z=-2.77, p=0.006) items of the Thought and Language Index, were statistically significantly lower than those of patients who had not attempted suicide. In contrast, mean scores on the Disorganization of Thought subscale (Z=-2.10, p=0.036), and its items Looseness (Z=-2.30, p=0.021) and Peculiar Logic (Z=-3.01, p=0.003), were significantly higher in patients who had attempted suicide. A comparison of TLI scores between patients with and without suicide attempts is presented in Table 2.

The PSP-A (t=-3.09, p=0.003), PSP-B (t=-2.35, p=0.022), PSP-C (t=-4,70, p<0.001), PSP-D (t=-9.20, p<0.001), and PSP total scores (t=-9.20, p<0.001) were statistically significantly higher in patients without suicide attempts compared to those who had attempted suicide. Among patients who had attempted suicide, CDSS total (Z=-6.50, p<0.001), PANSS-P (t=3.13, p=0.003), and PANSS total (Z=-2.37, p=0.018) scores were statistically significantly higher than those in patients without suicide attempts. A comparison of the psychometric test results between the two groups is presented in Table 3.

Among early psychosis patients (n=64), no statistically significant relationship (p>0.05) was found between total TLI scores and the total or subscale scores of the C-SSRS. However, a statistically significant negative relationship (p<0.05) was observed between TLI-ITS and both the C-SSRS total score and its subscale scores. Additionally, a statistically significant positive relationship (p<0.05) was found between the TLI-DTS total scores and the C-SSRS total and subscale scores, with correlation coefficients ranging from r=0.254 to r=0.416. The C-SSRS total and subscale

Table 3: Comparison of psychometric test scores between patients with early psychosis with and without suicide attempts

	PEP with suicide attempt (n=30)		PEP without suicide attempt (n=34)		Z/t	p
	Mean±SD	Median	Mean±SD	Median		
C-SSRS						
SI (last 1 month)	3.83±1.51	4.00	0.47±1.02	0.00	-6.30	**<0.001***
IoI (last 1 month)	19.33±7.46	20.00	2.47±4.74	0.00	-6.46	**<0.001***
SB (last 3 months)	3.37±1.63	3.50	0.03±0.17	0.00	-7.42	**<0.001***
C-SSRS lifetime	28.33±6.46	29.50	5.12±6.28	0.00	-6.83	**<0.001†**
C-SSRS recent times	26.53±9.71	29.50	3.00±5.73	0.00	-6.56	**<0.001***
PANSS						
PANSS-P	24.67±5.06	25.50	20.15±6.33	20.00	3.13	**0.003***
PANSS-N	19.00±5.09	18.50	18.97±6.02	19.00	0.02	0.983*
PANSS-G	38.23±9.83	38.50	35.50±9.22	36.00	-1.67	0.095†
PANSS total	83.10±13.25	81.00	71.79±20.62	75.50	-2.37	**0.018†**
CDSS						
CDSS total	11.20±3.18	11.00	3.18±2.38	2.50	-6.50	**<0.001†**
PSP						
PSP-A	8.00±4.28	7.50	11.91±5.64	10.00	-3.09	**0.003***
PSP-B	7.83±4.29	5.00	10.88±5.84	10.00	-2.35	**0.022***
PSP-C	12.83±4.29	15.00	18.09±4.61	20.00	-4.70	**<0.001***
PSP-D	3.33±3.30	5.00	15.88±6.80	15.00	-9.20	**<0.001***
PSP total	32.00±12.15	30.00	56.76±18.13	55.00	-6.33	**<0.001***

p<0.05. PEP: Patients with early psychosis; M: Mean; SD: Standard deviation; SI: Suicidal Ideation; IoI: Intensity of Ideation; SB: Suicidal behavior; C-SSRS: Columbia Suicide Severity Rating Scale; PANSS: Positive and Negative Syndrome Scale; CDSS: Calgary Depression Scale for Schizophrenia; PSP-A: Personal and Social Performance Scale – Socially Useful Activities Subscale; PSP-B: Personal and Social Performance Scale – Personal and Social Relationships Subscale; PSP-C: Personal and Social Performance Scale – Self-Care Subscale; PSP-D: Personal and Social Performance Scale – Disturbing and Aggressive Behaviors Subscale; *: Student's t-Test was used; †: Mann-Whitney U Test was used.

scores also showed a statistically significant negative correlation with PSP total and subscale scores, with correlation coefficients ranging from r=-0.287 to r=-0.731. Furthermore, a statistically significant positive correlation (p<0.001) was found between CDSS scores and the C-SSRS total and subscale scores, with correlation coefficients ranging from r=0.778 to r=0.845. Data on the correlations between the C-SSRS and other scales for the entire cohort are presented in Table 4.

When the results of the mediation analysis were examined (Fig. 1, Table 5), the direct effect of TLI-ITS on suicide attempts was not significant. However, a significant indirect effect on suicide attempts was observed through TLI-ITS's influence on CDSS and PSP-D scores. There was a negative relationship between TLI-ITS scores and CDSS scores (p<0.001), and it was found that lower CDSS scores were associated with a reduced risk of suicide attempts (p<0.001). Additionally, TLI-ITS scores were found to be associated with an increase in PSP-D scores (p<0.026), and higher PSP-D scores, in turn, were associated with a decrease in suicide attempts (p<0.001).

DISCUSSION

In this study, we conducted both comparative and mediation analyses to examine thought and language pathologies, social functionality, depressive symptoms, and disease severity in early psychosis patients with and without a history of suicide attempts. Our aim was to investigate both the direct and indirect effects of FTDs on suicidal ideation and behavior, while also evaluating the roles of depressive symptoms, social functioning, and disease severity as both independent contributors to suicide risk and potential mediators of the relationship between FTDs and suicidality.

According to the results of the present study, patients who had attempted suicide exhibited lower levels of impoverishment of thought and higher levels of disorganization of thought. This finding partially aligns with the work of Nordentoft et al. (47), who reported a negative relationship between thought disorders and suicidal behavior, suggesting that patients with thought disorders experienced a

Table 4: Correlations between C-SSRS scores and other psychometric test results

	TLI-ITS	TLI-DTS	TLI-total	PANSS-P	PANSS-N	PANSS-G	PANSS total	CDSS	PSP-A	PSP-B	PSP-C	PSP-D	PSP total
SI (last 1 month)	-0.50*†	0.37*†	-0.07†	0.35*†	0.14†	0.37*†	0.40*†	0.81*†	-0.37*†	-0.34*†	-0.56*†	-0.67*†	-0.63*†
IoI (last 1 month)	-0.51*†	0.42*†	-0.03†	0.41*‡	0.1‡	0.24‡	0.35*‡	0.83*‡	-0.46*‡	-0.34*‡	-0.58*‡	-0.70*‡	-0.66*‡
SB (last 3 months)	-0.49*†	0.31*†	-0.13†	0.34*‡	0.09‡	0.19‡	0.34*‡	0.78*‡	-0.34*‡	-0.30*‡	-0.47*‡	-0.69*‡	-0.58*‡
C-SSRS lifetime	-0.47*†	0.36*†	-0.06†	0.40*‡	0.07‡	0.25*‡	0.34*‡	0.85*‡	-0.45*‡	-0.32*‡	-0.59*‡	-0.72*‡	-0.66*‡
C-SSRS recent times	**-0.51*†**	**0.41*†**	**-0.05†**	**0.43*†**	**0.1†**	**0.34*†**	**0.40*†**	**0.82*†**	**-0.45*†**	**-0.32*†**	**-0.58*†**	**-0.73*†**	**-0.68*†**

*: p<0.05. SI: Suicidal Ideation; IoI: Intensity of Ideation; SB: Suicidal Behavior; C-SSRS: Columbia Suicide Severity Rating Scale; PANSS: Positive and Negative Syndrome Scale; TLI: Thought and Language Index; TLI-ITS: Impoverishment of Thought Subscale of the Thought and Language Index; TLI-DTS: Disorganization of Thought Subscale of the Thought and Language Index; CDSS: Calgary Depression Scale for Schizophrenia; PSP-A: Socially Useful Activities Subscale of the Personal and Social Performance Scale; PSP-B: Personal and Social Relationships Subscale of the Personal and Social Performance Scale; PSP-C: Self-Care Subscale of the Personal and Social Performance Scale; PSP-D: Disturbing and Aggressive Behaviors Subscale of the Personal and Social Performance Scale. †: Spearman correlation analysis was used; ‡: Pearson correlation analysis was used.

prolonged duration of untreated psychosis, which may have allowed them to survive the high-risk period. However, in that study, negative and positive FTDs were assessed together. In contrast, the TLI-ITS in our study assesses negative FTDs, characterized by poverty of speech, weakening of goal, and perseveration. These symptoms reflect a reduction in fluency, complexity, and goal-directedness of thought, indicating a structural disorganization of thought processes, rather than deficits in emotional expression or motivation. In contrast to negative symptoms such as anhedonia or avolition, which pertain to diminished emotional experience or volition, the TLI-ITS targets impairments in the form of thought and language. This distinction highlights its clinical relevance as a unique predictor of functional impairment and suicide risk in early psychosis. It has been shown that negative FTDs tend to become more prominent in the chronic stages of the illness, while positive FTDs typically emerge during acute episodes (25). Therefore, the association between positive FTDs and suicide attempts observed in our study may be expected, particularly since these symptoms are more likely to occur during the acute phase of the disease, which is marked by an elevated risk of suicide (3, 5, 38). Conversely, a higher prevalence of negative FTDs was expected to be associated with a reduced risk of suicide attempts, as these symptoms are more common in the chronic stages of the disease, when the acute, high-risk period may have already passed. However, further research is needed to confirm this interpretation.

Interestingly, our mediation analysis suggested that impoverishment of thought may be indirectly associated with a reduced risk of suicide attempts, potentially through its influence on increased aggression in early psychosis. The relationship between FTDs and aggression may be explained by the possibility that impoverishment of thought leads to a reduced ability to express oneself verbally, prompting a shift toward behavioral forms of expression. Alternatively, this finding may reflect the community's perception of disorganized behaviors, arising from disorganized thoughts, as aggressive. While some literature suggests an association between thought disorders and aggressive behavior (48), it is important to note that our study did not directly assess aggression. The PSP-D subscale, which reflects aggressive behavior, was used as an indirect indicator and may not accurately capture aggressive tendencies. In fact, our mediation analysis indicated that higher PSP-D scores were associated with reduced

Table 5: Direct, indirect, and total effects of the TLI-ITS on suicide attempts, mediated by Calgary Depression Scale for Schizophrenia and Disturbing and Aggressive Behaviors subscale of the Personal and Social Performance Scale

				95% CI (a)				
Type	**Effect**	**Estimate**	**SE**	**Lower**	**Upper**	**β**	**z**	**p**
Indirect	TLI-ITS ⇒ CALGARY SCORES ⇒ SUICIDE ATTEMPTS	-0.0429	0.01364	-0.0697	-0.0162	-0.23546	-3.1476	0.002
	TLI-ITS ⇒ PSP-D ⇒ SUICIDE ATTEMPTS	-0.0181	0.00912	-0.0360	-2.37e−4	-0.09933	-1.9859	0.047
Component	TLI-ITS ⇒ CALGARY SCORES	-0.7276	0.20207	-1.1236	-0.3315	-0.41042	-3.6006	<0.001
	CALGARY SCORES ⇒ SUICIDE ATTEMPTS	0.0590	0.00910	0.0412	0.0769	0.57369	6.4824	<0.001
	TLI-ITS ⇒ PSP-D	0.8061	0.36291	0.0948	1.5174	0.26754	2.2213	0.026
	PSP-D ⇒ SUICIDE ATTEMPTS	-0.0225	0.00507	-0.0324	-0.0125	-0.37125	-4.4325	<0.001
Direct	TLI-ITS ⇒ SUICIDE ATTEMPTS	-3.6404	0.01234	-0.0246	0.0238	-0.00200	-0.0295	0.976
Total	TLI-ITS ⇒ SUICIDE ATTEMPTS	-0.0614	0.02164	-0.1038	-0.0190	-0.33678	-2.8389	0.005

CI: Confidence interval; SE: Standard error; TLI-ITS: Impoverishment of Thought Subscale of the Thought and Language Index; Calgary: Calgary Depression Scale for Schizophrenia; PSP-D: Disturbing and Aggressive Behaviors Subscale of the Personal and Social Performance Scale.

suicide attempts, which may appear contradictory if PSP-D is assumed to reflects aggression. This finding contrasts with the broader literature, in which increased aggression is typically linked to a higher risk of suicide attempts in schizophrenia (49). It is possible that methodological factors, such as sample characteristics or the use of PSP-D to assess aggressive behavior, contributed to this discrepancy. Further research is needed to clarify the nature of the relationship between FTDs, aggression, and suicide risk in the context of early psychosis.

In our study, a relationship was found between FTDs and depressive symptoms, and the mediation analysis suggested that impoverishment of thought may be indirectly associated with a reduced risk of suicide attempts through its influence on decreased depressive symptoms in patients with early psychosis. In contrast, a study by Ulas et al. (41) reported no such association between depressive symptoms and FTDs, suggesting that thought disorders in schizophrenia may occur independently of comorbid depressive symptoms. The association observed in our study between depressive symptoms and FTDs may be explained by the possibility that thought disorders trigger social withdrawal and impair interpersonal communication and social participation, thereby facilitating the emergence or intensification of depressive symptoms (50, 51). Additionally, depressive symptoms were associated with suicidal ideation even in patients who had not attempted suicide, suggesting that the presence of a depressive mood may increase suicidal thoughts regardless of actual suicide attempts. Existing literature supports the high prevalence of depression among patients with early psychosis and identifies it as a significant predictor of suicide (35, 37, 52, 53). Nordentoft et al. (47) reported that the presence of psychotic symptoms and depression were the two most important risk factors for suicide attempts in patients with schizophrenia. The negative impact of depressive symptoms, when combined with the challenges posed by schizophrenia, may contribute to the increased risk of suicide attempts. Furthermore, difficulties in comprehending psychotic symptoms during the initial phase of the illness, combined with the fear of mental disintegration, which is known to be associated with suicide risk (7), are also likely to contribute to heightened suicide risk.

The present study also identified a correlation between suicidal ideation/behavior and social functioning in patients with early psychosis. Notably, patients who did not attempt suicide exhibited better

social functioning, engaged in socially beneficial activities, maintained healthier personal and social relationships, and demonstrated better self-care. These findings align with those of Robinson et al. (35), who reported that poor functioning at the onset of treatment in patients with first-episode psychosis was associated with subsequent suicide attempts. However, a study by Westermeyer et al. (54) demonstrated an association between high premorbid functioning and suicide attempts.

Additionally, we observed that patients who had attempted suicide were more likely to have a family history of mental illness. This finding is consistent with previous studies suggesting that a family history of depression and suicide (7), as well as having a first-degree relative diagnosed with schizophrenia, bipolar disorder, or a substance use disorder (55), may increase the risk of suicide.

In the current study, patients who had attempted suicide were found to have a shorter duration of illness and a shorter duration of untreated illness compared to those who had not attempted suicide. However, no significant difference was observed in the duration of untreated psychosis. Our findings regarding the duration of untreated psychosis diverge from most of the results reported in the existing literature. A recent meta-analysis by Catalan et al. (56) reported that a longer duration of untreated psychosis was associated with suicide attempts. The relatively small sample size may have limited our ability to detect subtle but meaningful associations between duration of untreated psychosis and suicide attempts. In contrast to the broader literature, Preti et al. (8) reported that a shorter duration of untreated psychosis was associated with suicide attempts; however, no such relationship was found for the duration of untreated illness. Consistent with our findings, some other studies have also reported no significant relationship between the duration of untreated psychosis and suicide attempts (47, 52). In a study investigating the frequency of suicide attempts in patients with first-episode psychosis, approximately 26% of patients had attempted suicide before treatment (10). Considering the heightened risk during the pre-treatment period and the short duration of untreated illness in patients who attempted suicide in the current study, these findings underscore the importance of implementing preventive measures against suicide during this vulnerable period.

This study has several limitations. The cross-sectional design fundamentally limits the ability to draw causal inferences, so the findings should be interpreted with caution. The clinician who administered the Thought and Language Index was not blinded to participants' diagnoses, which may have introduced bias. Moreover, the relatively small sample size may have reduced the statistical power of the findings. Due to this limitation, some potential variables could not be included in the mediation model, which may further limit the generalizability of the results. Additionally, the study was conducted at a single center, which restricts the applicability of the findings to the broader population of individuals with early psychosis. Given the difficulty of recruiting patients with early psychosis and the resulting small sample size, strict exclusion criteria were employed to ensure sample homogeneity. However, this methodological choice may have further constrained generalizability. Another limitation is that the PSP-D subscale, used as an indicator of aggressive behavior, may not fully capture the multifaceted nature of aggression. Despite these limitations, a notable strength of the study is the inclusion of individuals in the early stages of psychosis, a population that is typically difficult to access in clinical research.

CONCLUSION

In conclusion, our findings indicate that impoverishment of thought reduces depressive symptoms and increases disruptive and aggressive behavior, thereby lowering the risk of suicide attempts in patients with early psychosis. Furthermore, the results suggest that patients at higher risk for suicide attempts in early psychosis tend to exhibit fewer negative FTDs, more positive FTDs, poorer social functioning, greater depressive symptoms, and more severe positive symptoms. A family history of psychiatric illness, shorter total illness duration, and shorter duration of untreated illness also appear to contribute to the elevated risk in this group.

Ethical Approval: The Prof. Mazhar Osman Training and Research Hospital for Psychiatry, Neurology, and Neurosurgery Clinical Research Ethics Committee granted approval for this study (date: 01.10.2019, number: 364).

Informed Consent: Informed consent was obtained from all participants.

Conflict of Interest: The authors declare that they have no conflict of interest.

Financial Disclosure: The authors declare that they have no financial support.

Use of AI for Writing Assistance: Not declared.

Contribution Categories		Author Initials
Category 1	Concept/Design	P.C.E., N.K.
	Data acquisition	P.C.E.
	Data analysis/Interpretation	P.C.E., B.C., N.K.
Category 2	Drafting manuscript	P.C.E.
	Critical revision of manuscript	P.C.E., S.G., B.C., N.K.
Category 3	Final approval and accountability	P.C.E., S.G., B.C., N.K.
	Supervision	N.K.

Peer-review: Externally peer-reviewed.

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