Macrotextual, microtextual and writing analysis of texts written by people with schizophrenia differentiated by their symptoms

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Abstract: Schizophrenia is a severe mental disorder that primarily affects the semantic and pragmatic aspects of language. The aim of this study was to analyze pragmatics at macrotextual, microtextual and writing levels in persons with schizophrenia in order to ascertain the narrative characteristics and determine the nature of such pragmatics according to positive and negative symptomatology. Cross-sectional and quasi-experimental study was conducted on a sample of 41 individuals with schizophrenia. An analysis of textual pragmatics was performed using the participants' summary of "The Tale of Landolfo Rufolo". Macrotextual coherence was functional in that it presented key plot information and respected the timeline of the story. Microtextual cohesion was characterized by repetitions, low lexical variation, low syntactic complexity and maintained morphology. The participants' writing was consistent with a generalized dysorthographic profile. In addition, the present work revealed significant differences according to symptomatology. Individuals with positive symptomatology showed lower macrotextual coherence, while microtextual cohesion entailed a greater number of words and therefore greater lexical variation. In contrast, those with negative symptomatology presented a greater dysorthographic profile. This study provides a functional overview of written language in persons with schizophrenia, highlighting the need for a multidisciplinary speech and language therapy intervention to enhance such individuals' quality of life by favoring their social integration.

Keywords: Speech and language therapy, Schizophrenia, Textual Pragmatics, Cohesion, Coherence, Writing

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1. INTRODUCTION

Schizophrenia is a severe mental disorder that impacts thinking, language, emotion, and behavior. The Diagnostic and Statistical Manual of Mental Disorders (DSM-V) (American Psychiatric Association, 2013) differentiates between positive symptomatology, characterized by the presence of excessive abnormal behaviour, auditory or visual hallucinations, delusions, thought disorders, perceptual disturbances and speech disorganization, although it has a better prognosis and response to treatment (Bora et al., 2019). Meanwhile, negative symptoms are marked by emotional blunting, abulia, poor language (alogia) or speech content, poor self-care, lack of motivation, anhedonia and social withdrawal. Its prognosis is less favourable, seriously affecting an individual's quality of life and functionality (García-Portilla and Bobes, 2013; Martínez et al., 2018; 2019).

The language of the population with schizophrenia has long been a subject of research (DeLisi, 2001; Martínez et al., 2018; 2019), as it has a characteristic nature that may be considered a criterion for the diagnosis of the disorder (de Boer et al., 2020; Hartopo et al., 2022).

The most deeply affected areas of language are the semantic, and particularly the pragmatic (Bordas and Sanclemente, 2010; Martínez et al, 2018; Musiol & Rebuschi, 2007), with syntax and morphology being partially conserved (Martínez et al., 2019). Nonetheless, syntax in persons with negative symptomatology shows little variability and a certain syntactic poverty, meaning that speech is delivered incoherently, making effective communication difficult. In addition, the average length of the utterance emitted by people with schizophrenia is shorter than that of people without this pathology (Bordas and Sanclemente, 2010). At the morphosyntactic level, individuals present residual difficulties and a low prevalence of morphological alterations (Salavera & Puyuelo, 2010).

In contrast, in the lexical-semantic domain, persons with schizophrenia present more serious anomalies, such as alterations in lexical access, deficient semantic organization, dysfunctions in the use of nexus in sentences, difficulties in providing descriptions appropriate to the needs of the recipient, and activation of semantic representations irrelevant to the context of the words of the discourse (Ye et al., 2021), as well as atypical verbal processing (Martínez et al., 2019; Salavera & Puyuelo, 2010). As regards the use of words in this type of patient, analyses have revealed its singular nature, with a use of peculiar, low-frequency words (Baskak et al., 2008). Persons with schizophrenia thus present impairments in the storage, recovery and organization of semantic information (Bordas and Sanclemente, 2010).

Analysing the pragmatic domain, these patients show multiple signs, such as derailment; poor content of expression; being anomic, perseverative and presenting low circumstantial speech; the use of words is not adapted to the register; and there is a lack of coherence and cohesion in speech (Martínez et al., 2018; Willits et al., 2018). Deficits in metalinguistic capacity are observed, which prevents affected individuals from self-correcting errors during verbal utterances. They show an inability to follow verbal instructions (Verhaegen, 2007).

Thus, it seems that persons with schizophrenia use language correctly at the syntactic and morphological level. It is sometimes non-functional due to their semantic, and particularly, their pragmatic, deficits (Insúa et al., 2001; Tan et al., 2019). These characteristics make it difficult for the speaker to maintain interest and understand the communication exchange.

Writing is an aspect that has been the subject of little research. Figueroa-Barra & Martínez (2021) using writing tasks to analyse the lexical capacity of patients with schizophrenia showed that verbal stereotypies are continuously observed in both spontaneous communicative exchanges and in writing tasks that demand planning and reflection. These authors even reported that such deficits could be observed from the first episode of the disease. Furthermore, they concluded that these individuals have a lower lexical resource in terms of variety and volume. Other studies also show that the words such individuals use in writing have a low frequency and do not fit the semantic context, and that most of the words used are monosyllabic, such as prepositions, articles and conjunctions. This suggests that patients tend to mostly use function words rather than content words when carrying out writing tasks. This is reflected in inappropriate sentence structures, such as omissions, duplications, or incorrect use of complex sentences. For example, a person with schizophrenia said, *"I gave him a call last night,"* whereas a person without schizophrenia said, *"I gave him a call a message last night."* (Bordas and Sanclemente, 2010; Tak Jo et al., 2023). This can cause their language to be poor.

In terms of disease markers, the language of patients itself could be a valuable resource (de Boer et al., 2020) and especially the writing (Tak Jo et al., 2023).

Accordingly, the main aim of this study was thus to identify the narrative characteristics in individuals diagnosed with schizophrenia through a written summary made after reading "*The Tale of Landolfo Rufolo*" (Insúa et al., 2001). We expected to find a distinguishing pattern in textual pragmatics between people with schizophrenia who exhibited negative symptoms and those with positive symptoms. Positive symptoms are characterized by an excess or distortion of normal functions, such as hallucinations (most often verbal auditory hallucinations), delusions (fixed false beliefs that are inconsistent with cultural norms and persist despite evidence to the contrary) and thought disorder (disorganized language output). In contrast, negative symptoms involve the absence of characteristics typically seen in healthy individuals, including a lack of voluntary behaviour or motivation, apathy, flat or inappropriate affect, and 'negative thought disorder' (poverty of speech and language). The analysis focused on both macrotextual and microtextual aspects of the text, as well as specific features of the writing to see if they were different based on the symptoms.

2. METHODOLOGY

a. Participants

This was a cross-sectional quasi-experimental study using a sample of 41 participants with a mean age of 53.15 years (SD= 11.26). Ages ranged from 20 to 79 years. Of these 41 individuals, 58.5% (N= 24) presented positive symptomatology and 41.5% (N= 17) negative

symptomatology. Regarding gender, 63.4% were male (N= 26) and 36.69% (N= 15) were female. Regarding education status, 68.3% of participants had completed primary school (N = 28), 22% had completed high school (N = 9), and 9.8% had completed higher education (N = 4). All participants were Spanish and monolingual speakers.

The diagnostic criteria were as follows: a) diagnosis of schizophrenia according to the DSM-V (American Psychiatric Association, 2013); b) no associated diagnosis or subtype of schizophrenia, such as schizoaffective disorder; c) period of one and a half years since diagnosis, to avoid false positives, and d) positive/negative symptomatology at the time of recruitment. The psychiatrists collaborating in this study provided information on the participants' symptomatology.

To determine the possible effect of certain sociodemographic and clinical variables on the performance of the groups (positive and negative symptomatology) in the variables of writing and to ensure equivalence between them and buffer the possible effect of some of these variables, we performed an analysis of the variables in both groups finding: sex ($\chi 2(1) = 1.552$; p= .213), age (Z = -.871, p= .284), educational level ($\chi 2(2) = 1.241$; p= .538), age at first episode (Z = -1.168, p= .243) and the number of psychotic episodes (Z = .579, p= .563). No effect was revealed for any of the variables analyzed, indicating that the groups were homogeneous and there are no differences in terms of age, sex, or educational level.

The participants were recruited from a number of mental health associations in Spain, including AMAFE (Madrid Association of Families and Friends of Persons with Schizophrenia), the VIVIR association (Cuenca), the psychosocial rehabilitation center of Tomelloso (province of Ciudad Real), ATAFES (Talavera Association of Friends, Families and Persons with Mental Disease) in Talavera de Reina (province of Toledo), and the mental health unit of Virgen de la Luz Hospital in the city of Cuenca.

Once informed of the aims and procedure of the study, the participants signed an informed consent form, in which anonymity and data protection were guaranteed. The possibility of revoking consent at any time was also included.

b. Instruments

To assess textual pragmatics, we used "*The Tale of Landolfo Rufolo*" (Insúa et al., 2001; Van Dijk, 1980). The story was two pages long and a total of 530 words. The participants read and write a summary. We printed this tale in Spanish Times New Roman calibre12 (Daxer et al., 2022). Participants could read the tale twice and could also ask for a definition of any word if they did not understand. The instruction provided was the following: "*Try to read the following text as best as possible in a low voice. If you consider, you can read it twice. If you find any word that you do not understand, ask me, please. Pay attention, because you will write later a summary about of the tale you have read*". Before, the instruction for writing the summary was the following: "*Please try to prepare a summary of the story you have read, including all the details you remember. You have not time or space limit, so write everything you consider important*".

When they read the tale, later they wrote a summary by hand. They had no time limitation.

The narratives generated by individuals with schizophrenia after listening to the story were evaluated by the four authors of this study. An inter-rater average score was calculated for each of the macrotextual, the microtextual and writing aspects analyzed across 41 texts. The inter-rater agreement indices (Kappa) were consistently above *K*=0.70, with the highest reliability observed for joined words (*K*=0.91) and the lowest for paragraphs (*K*=0.73).

To evaluate this story and perform the corresponding analysis, several macrotextual, microtextual and writing criteria were considered.

The term macrotextual is derived from the concept of textual superstructure introduced by Van Dijk and Kintsch (1983). This term refers to the mental schemas that individuals construct to organize and develop a text.

Firstly, we assessed the textual macrostructure and overall cohesion following criteria established in previous studies (Fernández et al., 2015; Insúa et al., 2001; Tak Jo et al.,2023; Manschreck et al., 1984):

- The textual components considered in reconstructing the original text were categorized as follows. These were divided into main ideas and secondary ideas. To differentiate between main and secondary ideas, the story's plot was divided into distinct events occurring within specific time-space frames. Each event consisted of a triggering action (the complication) and the resulting change of state (the resolution). A series of events taking place within the same time-space frame or involving the same character was categorized as an episode. Consequently, the episodes represented the main ideas of the text, while the individual events within those episodes were considered secondary ideas. A new episode commenced each time a distinct time-space frame emerged in the text, comprising various events. The coding of ideas was structured as follows: Main idea 1 (Episode 1) → Secondary idea 1A (Event 1A) → Secondary idea 1AA (Event 1AA) → Secondary idea 1B (Event 1B) → Secondary idea 1BB (Event 1BB). Main idea 2 (Episode 2) → Secondary idea 2A (Event 2A), and this hierarchical structure continued similarly for subsequent main and secondary ideas throughout the discourse.
- Complete modules: basic information and part of the secondary information are included. An episode was deemed complete when all its constituent events were present.
- Incomplete modules: only the core element of the text is included. We considered it incomplete when it explained the episode, but without recounting the events that occurred in it.
- Modules containing distortions: irrelevant or erroneous information included in the summary. Distortions were identified when information was presented in a disorganized manner, where the triggering events are not directly connected to their resolutions, making it difficult for the reader to follow. This issue can also arise when events from different episodes are conflated, thereby violating fundamental coherence principles: non-contradiction, progression, the relationship of ideas and the repetition of ideas, proposed by Charolles (1978).

- Intra-constituent errors: those affecting the sequence of events.
- Inter-constituent errors: those affecting the location of the component in the overall sequence of the discourse.

Following Lopéz & Cavieres (2022), we anticipated that participants' delusions would manifest in their writing, therefore, we used Paolini et al., (2016) for the analysis.

- Persecutory delusions: belief that one is being watched, harmed or maltreated.
- Grandiose delusions: exaggerated self-confidence regarding power, fame, knowledge, ability, talent or strength.
- Erotomaniac delusions: the belief that someone, generally beyond the individual's reach, is in love with them.
- Dysmorphic delusion: an individual's belief that their body organs are malfunctioning or that they are ill.
- Referential or self-referential delusions: belief that something has a hidden meaning.
- Thought insertion or thought broadcasting delusions: an individual's belief that thoughts have been put into their minds or are that their thoughts are being transmitted to other people.
- Cosmic, religious or metaphysical delusions: delusions related to the destruction of the self and the end of the world. Characteristic examples are related to global catastrophes, machines that influence people, or artificial or virtual universes (Vlachos et al., 1997).

Secondly, we evaluated microtextual elements to assess cohesion, including lexical competence, morphology, word formation, syntax, and grammatical structure (Fernández Urquiza et al., 2015). We followed the proposals made in other studies assessing criteria of text cohesion (Gómez, 1976):

- Verb Adjective Ratio (VAR) (Fernández Urquiza et al., 2015; Frosting, 1940). If the ratio is low, it indicates a lack of qualifiers in the discourse indicators. If it is high, the conclusion would be the opposite.
- Type Token Ratio (TTR). This measure indicates the degree of heterogeneity, diversity and lexical flexibility of speech. It is calculated by dividing the total number of different words in a text by the total number of words. Values range from 0 to 1, with lower scores indicating greater perseverance. It should be noted that as the length of the discourse increases, the TTR tends to fall due to the repetition of function words (Manschreck et al., 1981; 1984).
- Total number of words: the total number of words was recorded.
- Repetitions: we considered content words, function words, clauses and ideas. This repetition does not refer to the repetition of ideas, but rather to the repetition of words. To count word repetitions, only those that were duplicated consecutively were considered, as all function words in the texts were expected to be repeated. For example, the word "*the*" was only counted if it appeared consecutively, such as in "*the the house*".
- Number of function words and content words: the total number of each type was recorded. Function words, like articles, conjunctions, pronouns and auxiliary verbs have minimal intrinsic meaning but serve to indicate relationships between words and have

more importance in the syntax. Content words, such as nouns, verbs, adjectives and adverbs carry specific meaning by describing entities, actions, or attributes and are the main subject of semantics. We used the classification of Fries, 1940; Schmauder et al., 2000; Truckenbrodt, 1999). Our objective was to determine whether semantic or syntactic elements were more prominently affected in the language disorder of individuals with schizophrenia (Takashima et al., 2001). Research indicates that during reading processes, functional words are more likely to be overlooked (Staub, 2023), although in writing, these processes have been less explored (Tiu & Carter, 2022), and even less so in individuals with schizophrenia. Some studies suggest that difficulties in this population may be more semantic than syntactic, and no differences were found in event-related potentials recorded for content and functional words (Takashima et al., 2001).

- Paragraphias, at phonological, semantic and unspecific level. Phonological paragraphias are when the person writes "*cat*" instead of "*car*" whereasa semantic paragraph would be when the person writes "*horse*" instead of "zebra" (Iribarren et al., 2001). Lastly, a distinct scenario arises when none of these processes can account for the phenomenon. This is an unspecific paragraphia, for example, the person writes "*dog*" instead of "*table*".
- Paranoid words: following the classification proposed by Nieto-Moreno et al. (2006), we counted the total number of paranoid words. For example: murdered, persecuted, kidnapped, etc.
- Verb tenses and their correct use: we considered the verb tenses and whether they were used appropriately. The concordance of gender and number was assessed to determine whether the verb agreement was grammatically correct. For example, verbal formulations such as "*we was eaten*" or "*Landolfo go*" were counted as errors. In Spanish, verb concordances are more complex than in English, so it is more common to make mistakes in the concordances of the tenses.
- Verb types: we differentiated between mental verbs, action verbs and reflexive verbs (Smirnova et al., 2017) and attributive verbs (Arrizabalaga, 2002).
- Clause structure: we considered the most common grammatical structures in the Spanish language, being subject+verb+predicate; verb+predicate and subject+verb; incoherent clause and impersonal clauses (Mendoza et al., 2005; Ziv et al., 2022).
- Type of clause: here, we classified the clauses into simple clause, juxtaposed clause, coordinate clause, subordinate clause and coordinate+subordinate clause (Carreiras et al., 2004; Mendoza et al., 2005).

Finally, related to aspects of writing primarily associated with spelling (Gawda, 2016):

- Punctuation marks: We evaluated whether punctuation was included in the text. Higher scores on this metric indicate stronger writing skills.
- Spelling mistakes: We checked for the presence of spelling errors in the text. Higher scores on this metric reflect poorer writing skills. We only count errors related to standard Spanish spelling, such as omitting the letter H or incorrectly substituting "*v*" with "*b*".
- Capital letter use: whether capitals were used in the text. Higher scores on this metric indicate positive writing skills.

- Self-corrections: we assessed whether the writer made self-corrections in their summary, such as crossing out and rewriting parts. Higher scores on this metric reflect poorer writing skills.
- Joined words: We evaluated whether participants combined words incorrectly, such as writing "*thehouse*" instead of "*the house*". Higher scores in this parameter indicate that participants had worse writing skills.
- Incomplete words: We examined whether participants finished words properly in their writing. Low scores in this parameter indicate weaker writing skills.
- Incomprehensible words: we counted how many words were illegible and could not be understood. Higher scores on this parameter reflecting negative indices in terms of writing skills.

c. Procedure

Our statistical analysis was conducted using IBM SPSS (Statistical Package for Social Science, SPSS Inc., Chicago, Illinois, USA), version 28.0. The dataset comprising the mean ratings from the four judges, along with all study variables, is publicly available at the following DOI: 10.17605/OSF.IO/TUDPE. Additionally, the source text by Landolfo, which forms the basis of this research, is also archived at the same link.

The results of the Shapiro-Wilk test showed that the sample did not follow a normal distribution, but that all the variables evaluated followed a probability of less than or equal to 0.05. Therefore, for data analysis, we ran the Mann-Whitney test, which is the non-parametric test parallel to the t-test for independent samples. The confidence level was set at .05 for all the statistical analyses. Additionally, frequency and descriptive distributions (mainly means and standard deviations) and Chi-square tests of independence were performed.

3. RESULTS

a. Macrotextual results

Table 1 presents the mean scores, standard deviations, and the minimum and maximum ranges from the inter-rater evaluation. This evaluation encompassed both primary and secondary ideas. Additionally, each researcher assessed the presence (yes) or absence (no) of the main and secondary ideas, as well as the module typology, in each of the 41 texts. The scores provided by the four evaluators were averaged, and the resulting mean is displayed in the table.

Table 1.

Descriptive statistics for macrotextual coherence

	Mean (SD)	Range
Total main ideas	1.12 (1.07)	0-3
Main ideas	(N, %)	
Escaping in a chest	Yes	4 (9.8)
	No	37 (90.2)
Being helped by a woman	Yes	19 (46.3)
	No	22 (53.7)
Chest containing jewels	Yes	13 (31.7)
	No	28 (68.3)
Becoming rich	Yes	6 (14.6)
	No	35 (85.4)
	Mean (SD)	Range
Total secondary ideas	12.73 (2.7)	0-13
Secondary ideas	(N, %)	
Italy	Yes	8 (19.5)
	No	33 (80.5)
Doubling wealth	Yes	5 (12.2)
	No	36 (87.8)
Cyprus	Yes	10 (24.4)
	No	31 (75.6)
Selling goods	Yes	13 (31.7)
	No	28 (68.3)
Being ruined	Yes	2 (4.9)
	No	36 (87.8)
Changing ships	Yes	2 (4.9)
	No	39 (95.1)
Becoming a pirate	Yes	18 (43.9)
	No	23 (56.1)
Sheltering on an island	Yes	3 (7.3)
	No	38 (92.7)
Becoming a prisoner	Yes	8 (19.5)
	No	33 (80.5)
Being saved	Yes	2 (4.9)
	No	39 (95.1)
Ship being destroyed	Yes	5 (12.2)
	No	36 (87.8)

Reaching the island	Yes	11 (26.8)
	No	30(73.2)
Woman cleaning	Yes	5 (12.2)
	No	36 (87.8)
Woman giving him the chest	Yes	2 (4.9)
	No	39 (95.1)
Selling jewels	Yes	4 (9.8)
	No	37 (90.2)
Becoming richer	Yes	6 (14.6)
	No	35 (85.4)
Giving money to woman	Yes	8 (19.5)
	No	33 (80.5)
Never trading	Yes	2 (4.9)
	No	39 (95.1)
Complete modules	Yes	1 (2.4)
	No	39 (95.1)
Incomplete modules	Yes	10 (24.4)
	No	31 (75.6)
Insufficient modules	Yes	26 (63.4)
	No	15 (36.6)
Distortions	Yes	34 (82.5)
	No	7 (17.1)
Intra-constituent errors	Yes	3 (7.3)
	No	38 (92.7)
Inter-constituent errors	Yes	4 (9.8)
	No	37 (90.2)
Types of delusions	None	29 (70.7)
	Persecutory	6 (14.6)
	Self-referential	1 (2.4)
	Cosmic	1 (2.4)
	Erotomanic	2 (4.9)
	Thought control	1 (2.4)
	Dysmorphic	1 (2.4)

Table 1 outlines the findings for the four primary ideas: escaping in a chest, receiving assistance from a woman, discovering a chest containing jewels, and acquiring wealth. The total average across the 41 texts analyzed by the four judges is 1.12 (SD = 1.12), meaning that, on average, only one main idea appears in the texts of individuals with schizophrenia.

Regarding the 18 secondary ideas in the text (Italy, double wealth, Cyprus, selling Goths, going bankrupt, changing ships, becoming a pirate, taking refuge on an island, becoming a prisoner, being saved, destroyed ship, reaching the island, woman cleaning, woman giving him

the chest, selling jewels, becoming richer, giving money to woman, never trading), the total average across the 41 texts analyzed by the four judges is 12.73 (*SD* = 2.7). This suggests that secondary ideas appear at a relatively high average. The data revealed that the most frequently mentioned primary idea was receiving assistance from a woman, while the most common secondary idea was becoming a pirate. The most common modules were insufficient ones and distortions. Notably, intra-constituent and inter-constituent errors were rare. Moreover, delusions were infrequent, with persecutory delusions being the most prevalent.

b. Microtextual results

We followed the same procedure as for the macrotextual results. Each inter-rater evaluation was assigned an average score for the values analyzed. Table 2 presents the average of the four inter-rater evaluations. For the remaining values, we recorded their presence (yes) or absence (no), as well as the typology assigned by each judge for the variable, and then calculated the average.

Table 2.

Descriptive statistics for microtextual cohesion

		Mean (S.D)	Range
VAR		0.24(0.31)	0-1
TTR		0.65(0.14)	0.38-1
Total words		71.17(45.33)	12-201
Total repeated words		29.05 (26.98)	0-123
Total FWs		14.85 (6.77)	1-36
Total CWs		27.32 (14.85)	4-58
Total verbs		12.46 (6.91)	1-28
		(N, %)	
Verb types	Mental	3 (7.3)	
	Action	13 (31.7)	
	Reflexive	1 (2.4)	
	Attributive	24 (58.5)	
Verb tenses	Imperfect	5 (12.2)	
	Past simple	29 (70.7)	
	Present	6 (14.6)	
	Present participle	1 (2.4)	
Correct verb use	Yes	39 (95.1)	
	No	2 (4.9)	
Type of repetition	CWs	3 (7.3)	
	FWs	34 (82.9)	
	Sentence	3 (7.3)	
	None	1 (2.4)	
Paranoid words	Yes	14 (34.1)	
	No	27 (65.9)	
Types of paragraphias	None	39 (95.1)	
	Phonological	2 (4.9)	
Clause type	Simple clause	3 (7.3)	
	Juxtaposed clause	7 (17.1)	
	Subordinate clause	1 (2.4)	
	Coordinate clause	22 (53.7)	
	Coordinate+subordinate	8 (19.5)	
Clause structure	S+V+P	3 (7.3)	
	V+P	29 (70.7)	
	Incoherent	4 (9.8)	
	Impersonal clauses	5 (12.2)	

NOTE: **VAR**=Verb Adjective Ratio **TTR**= Type Token Ratio **FWs**= Functions words such as: articles, conjunctions, pronouns and auxiliary verbs; **CWs**= Content words such as: nouns, verbs, adjectives and adverbs carry.

Overall, low mean scores were observed across all analyzed indicators. Regarding frequency data, participants demonstrated a diverse use of appropriate verb types, with a predominant use of the simple past tense and the verb+predicate morphological structure. Coordinated clauses were the most commonly employed. Paranoid words and paragraphias were scarcely present.

c. Writing results

We made the same interjudges evaluation that table 1 and 2.

Table 3 shows the results for the writing indicators. Notably, low mean scores were observed across all variables analyzed, alongside high rates of spelling errors, inconsistent use of capital letters, and punctuation marks. We scored such as "yes" when people with schizophrenia did well.

Table 3.

Descriptive statistics for writing

	Mean (S.D)	**Range**
Total illegible words	0.66 (1.81)	0-9
Total punctuation marks	3.39 (4.07)	0-15
Total spelling mistakes	4.22 (4.96)	0-26
Total capital letters	8.39 (20.41)	0-19
Total joined words	0.24 (0.66)	0-3
Total incomplete words	1.12 (1.79)	0-8
		(N, %)
Self-corrections	Yes	10 (24.4)
	No	31 (75.6)
Punctuation marks	Yes	30 (73.2)
	No	11 (26.8)
Spelling mistakes	Yes	32 (78)
	No	9 (22)
Capital letters	Yes	25 (61)
	No	16 (39)
Joined words	Yes	6 (14.6)
	No	35 (85.4)
Incomplete words	Yes	18 (43.9)
	No	23 (56.1)

d. Correlations between variables

Correlations were found only between TTR and some of the variables under study (see Table 4).

e. Significant relationships between variables

The Mann-Whitney U test was applied to analyze the means of all macrotextual, microtextual, and writing variables in texts produced by individuals with schizophrenia, based on symptom predominance, as the data did not follow a normal distribution according to the Shapiro-Wilk test. Comparisons were made between the average ratings of the four judges for each variable analyzed across the 41 texts. The sample was divided according to the predominance of positive or negative symptoms, and the average scores for each group were then compared.

Table 4.

Correlations between variables

		Total words	Total repetitions	Total verbs	Number FWs	Number CWs
TTR	Pearson's correlation	-.682**	-.759**	-.574**	-.390*	-.521**
	Sig. (Bilateral)	<.001	<.001	<.001	<.012	<.001

Statistically significant differences emerged between symptomatology type (positive versus negative) and various textual indicators across all three dimensions: macrotextual, microtextual, and writing-spelling (see Table 5). The "Z" value represents the result of the Mann-Whitney U Test, while the "P" value indicates the significance level, set at P=0.05. The results indicate a higher prevalence of primary and secondary ideas among patients with positive symptomatology, though these ideas are often poorly connected, incomplete, and insufficient.

Conversely, patients with negative symptomatology exhibit more concrete and core ideas, though fewer in number. Regarding microtextual cohesion, the VAR index is higher and the TTR lower in patients with positive symptomatology, as is the case for the rest of the lexical values. Additionally, patients with positive symptomatology demonstrate a higher use of punctuation marks, whereas those with negative symptomatology tend to produce a greater number of joined words.

Table 5.

Significant relationships between variables

	POSITIVE (n=24)	NEGATIVE (n=17)	Z	P
Macrotextual coherence				
Main ideas	24.88	15.53	-2.571	.010
Escaping on a chest	20.44	21.78	-0.695	.487
Being helped by a woman	17.69	25.68	-2.435	.015
Chest containing jewels	19.81	22.68	-0.935	.350
Becoming rich	19,31	23,38	-1.360	.174
Secondary ideas	26.96	12.56	-3.838	.010
Italy	19.02	23.38	-1.831	.067
Doubling wealth	20.08	22.29	-1.027	.304
Cyprus	18.31	24.79	-2.294	.022
Selling goods	18.96	23,88	-1.608	.108
Being ruined	20.94	21.09	-0.070	.944
Changing ships	20.29	22.00	-1.205	.228
Becoming pirate	18.90	23.97	-1.554	.120
Sheltering on an island	19.94	22.50	-1.496	.135
Being taken prisoner	18.17	25	-2.621	.009
Being saved	20.29	22.00	-1.205	.228
Ship being destroyed	20.94	21.09	-0.070	.944
Reaching the island	18.81	24.09	-1.810	.070
Woman cleaning	19.23	23.50	-1.984	.047
Woman giving him the chest	20.29	22.00	-1.205	.228
Selling jewels	19.81	22.68	-0.935	.350
Becoming richer	18.88	24	-2.204	.028
Giving money to woman	18.17	25	-2.621	.009
Never trading	20.29	22.00	-1.205	.228
Total, Complete Modules	21.35	20.50	-0.842	.400
Total, Incomplete module	24.54	16.00	-2.994	.003
Total, Insufficient module	26.73	12.91	-3.781	<.001
Total, Distortions module	22.27	19.21	-0.821	.412
Intra-constituent errors	21.25	20.65	-0.352	.725
Inter-constituent errors	20.67	21.47	-0.411	.681
Microtextual cohesion				
VAR	24.21	16.47	-2.043	.041
TTR	16.17	27.82	-3.074	.002

Total words	28.52	10.38	-4.778	<.001
Total repeated word	28.52	10.38	-4. 710	<.001
Number of function words	27.60	11.68	-4.207	<.001
Number of content words	27.96	11.18	-4.422	<.001
Total verbs	28.15	10.91	-4.547	<.001
Total paranoid words	25.15	15.15	-3.171	.002
Writing				
Total illegible words	22.04	19.53	-0.825	.410
Total punctuation marks	24.67	15.82	-2.361	.018
Total spelling mistake	20.85	21.21	-0.554	.580
Total capital letters	20.10	22.26	-0.407	.684
Total joined words	18.79	24.12	-2.282	.022
Total incomplete words	20.58	21.59	-0.293	.769

NOTE: Z**= Represents the result of the Mann-Whitney U Test.** P**= value indicates the significance level, set at p=0.05.**

4. DISCUSSION

Regarding textual macrostructure and coherence, main ideas appeared less frequently than secondary ideas, with "the woman helping" being the most mentioned main idea. Among the secondary ideas, the most prevalent were "becoming a pirate," "selling the goods," and "reaching the island." This may be because people with schizophrenia have difficulty processing semantic representations irrelevant to the context, leading them to focus more on secondary ideas despite their lesser importance (Ye et al., 2021).

In general, the modules are almost never completed, being, in contrast, mostly insufficient, and, above all, there is a great presence of modules containing distortions. This means that they include the core elements of the story, neglecting any secondary information. Additionally, the key plot information is seen to appear and the timeline of the story is maintained despite the distortions, and there thus seems to exist functionality despite the distortions and inconsistencies. This may be due to difficulty in inhibiting irrelevant information, as proposed in previous studies (Figueroa, 2015).

Consequently, the overall coherence of the text is maintained despite the derailment or thematic loosening. However, other authors (Allé et al., 2015) have proposed that this derailment or loosening of themes is incoherent. Nonetheless, in the analysis of the type of delusion, our results showed no statistically significant differences in any of the macrotextual, microtextual or writing variables. This finding, therefore, highlights the functionality of delusional thinking that is not transferred into written language. This should be studied in future research because if this were the case, it would show that delusion in writing is

coherent, functional, correct and does not interfere with the task proposed, while it seems to be inhibited and neither contaminates nor distorts the results of the writing.

Arguably, the task proposed in this research, being a guided task, might facilitate the reduction and inhibition of delusional thinking by providing participants with a guided, tangible and concrete reference to follow, one about which they can think, reflect and where they may even self-correct (Bryan & Gast, 2000).

Lastly, another aspect examined regarding macrotextual coherence was the classification of delusions, revealing that the majority of the sample (70.7%) did not exhibit any specific type of delusion. This finding is intriguing because it suggests that the nature of delusional thinking may not significantly influence the narrative organization, as previously suggested (Paolini et al., 2016). Our results, however, imply that the classification of delusions does not play a significant role in participants' summaries of the story, since delusions do not appear in the majority the summaries.

As regards the cohesion analyzed through microtextual elements, the VAR shows a lack of qualifiers in the text descriptors. This may be the result of a lower lexical flexibility evidenced using verbal fluency tests in other studies (Barattieri di San Pietro et al., 2023; Bordas & San Clemente, 2010; Martínez et al., 2018). In the TTR, we found perseverations in both long and short texts. In addition, TTR correlates negatively with the total number of words, of function words and of content words, which the participants tend to repeat. This would suggest that the longer the text, the greater is the repetition of all the words analyzed. Nonetheless, the presence of these deficiencies also in short texts would be evidence of impaired lexical flexibility in this population (Bordas & Sanclemente, 2010; Martínez et al., 2018).

With respect to the types of verbs, these are varied and action verbs are used. The verb tenses are correct and used functionally with a predominance of the past simple, we can infer that there is a degree of preservation in the morphological component (Walenski et al., 2010).

Finally, the participants make scant use of paranoid words and there are no paragraphias. However, in syntax and lexical construction, the patterns are less complex than in the population without schizophrenia, with many coordinate and juxtaposed clauses in the persons with schizophrenia. Other authors have shown that this morphosyntactic pattern resembles the sentence patterns typical in the writing of young children, because children in Spanish tend to use a greater number of coordinate and juxtaposed clauses (Moro et al., 2015).

Thus, a decrease in syntactic complexity is evidenced, arguably the result of the overall cognitive deficit present in this population (Willits et al., 2018), although it might also be due to the linguistic component, since persons with schizophrenia tend to reduce the use of function and content words, which simplifies the language (Bordas & Sanclemente, 2010; Insúa et al., 2001; Tak Jo et al., 2023) with the use of fewer words and repetitions of those used. Our findings indicate that the frequency of content and function words in the writings of individuals with schizophrenia not only differs from that of control groups (Takashima et al., 2001) but our results also help distinguish between the active and negative symptomatology because they had different scores.

As regards the case of the writing-spelling component, the writing was found to present a dysorthographic profile in the spelling mistakes made e.g. "*olbidaron*" for "*olvidaron*" or "*hola*" for "*ola*". However, capital letters and, punctuation marks are used and words are completed. We are unaware of the reason for these results, and so we encourage future research to continue in this line, although we might attribute them to the metalinguistic alterations that hinder the use of spelling in writing (Verhaegen, 2007) or to the cognitive impairment characteristic of schizophrenia (Rouy et al., 2021).

Despite the handwriting being difficult to read in some of the texts, there were few illegible or joined words. Other studies (Gawda, 2016; Uludag et al., 2021) have evidenced a motor deficit in spatial parameters that might justify this type of script. In addition, there are no self-corrections in the text, which could lead us to think once more about the presence of difficulties in metalinguistic skills. Most texts exhibited spelling mistakes, structural errors, information omissions, or lacked cohesion. These shortcomings necessitated self-corrections, yet participants failed to address them. This data would support the postulates of Verhaegen (2007), which claim that metacognition and metalinguistic skills are impaired. Symptoms of writing indicate a higher prevalence of linguistic deficits compared to cognitive deficits. However, considerable scientific debate persists on this matter, making further research in this area particularly interesting.

Regarding our analysis of the statistically significant differences in the variable of type of symptomatology (positive vs negative), we found, at macrotextual level, a greater number of main and secondary ideas in patients with positive symptomatology, while specific ideas were more common among those with negative symptomatology. Moreover, macrotextual coherence, as assessed by incomplete and inadequate modules, reveals that although participants with positive symptomatology score higher, those with negative symptomatology exhibit less incomplete and inadequate modules. Consequently, while participants with positive symptomatology may employ more ideas, these are expressed less coherently, indicating the construction of lengthy yet incoherent discourses (Liddle et al., 2002). Nevertheless, future analyses are needed to elucidate this result. Therefore, it is worth underlining those participants with negative symptomatology, despite generating a smaller number of main and secondary ideas, are more coherent than their counterparts with positive symptomatology.

The results in microtextual cohesion show that the patients with positive symptomatology present higher scores in all the variables analyzed, i.e., word rate, longer summaries, more repetitions, verbs and paranoid words. This would indicate that subjects with positive symptoms and therefore under the influence of their delusion, thought derailment or hallucination would be influenced by these in the microstructure of the text (Figueroa, 2015), although this might also be due to difficulties in semantic inhibition (Salavera & Puyuelo, 2010).

In contrast, the participants with negative symptomatology present less lexical variability, which can be seen in the lower number of function words, content words and lower VAR.

Once again, we see that presenting negative symptomatology may condition the scarcity of words generated, arguably because of abulia (Ayuso-Lanchares et al., 2023).

At the writing level, the persons with negative symptomatology use fewer punctuation marks, possibly due to the shorter length of the text and the greater number of joined words compared to their counterparts with positive symptomatology. It is difficult to know the reason for this, although Gawda (2016) posits a motor deficits pattern with a disturbance of spatial parameters, while Ayuso-Lanchares et al. (2023) proposes cognitive difficulty in executive functions or abulia, which complicates task completion.

As discussed, there were no statistically significant differences in the type of delusion and the macrotextual, microtextual and writing variables. This would evidence that functionality of the narrative is maintained with macrotextual coherence, microtextual cohesion and fully functional writing, despite the disease and, therefore, despite the different symptoms presented (positive or negative).

This may be due to the structuring and tangibility of the narrative task. However, our results challenge the proposal made by Witkowska-Łuć (2017) which posits a decrease in coherence according to the severity of the delusion in individuals with positive symptoms. Consequently, studies on the role of delusion in the development of pragmatics are recommended.

In conclusion, pragmatic characteristics of the text and/or narrative in persons with schizophrenia are typified by a macrotextual coherence marked by the presence of the necessary information about the plot of the story analyzed and its temporal sequencing, neglecting secondary information, such that there is a textual functionality in the macrostructural aspects. The microtextual cohesion presents repetitions and shows a deficit in lexical variability. However, the syntax component is preserved, although it its low complexity is notable, given the little variation in the types of sentences and their structure. The writing has a dysorthographic profile, with frequent spelling mistakes, although capital letters and punctuation marks are used. However, there are few illegible words or words joined together (Uludag et al., 2021). As for some of the statistically significant differences found, we can say that symptomatology (positive versus negative) is a variable that showed many differences, with participants with positive symptomatology using a greater number of ideas, which were, however, less concrete and concise compared to the ideas produced by their counterparts with negative symptoms. In microtextual cohesion, those with positive symptomatology presented a higher word rate, more repetitions, and lexical variability including paranoid words. In writing, in contrast, it is the negative symptomatology group that showed a greater frequency of joined words and less use of punctuation marks compared to the participants with positive symptomatology.

Finally, this study is not without limitations. First, it would have been interesting to know the cognitive profile of the participants. Secondly, despite using the evaluation criteria for textual analysis proposed in other studies, there remains some subjectivity, as there are no objective scales for pragmatics in the population with schizophrenia. Thirdly, problems arose in reproducing the items from Insúa et al. (2001) since some could not be replicated as they

were not developed in the methodology of said study and were not therefore included.The authors were contacted to gather all required information land to incorporate new study variables identified as significant in recent research. Although people with schizophrenia were asked if they smoked, with almost 80% indicating that they did, the amount smoked was not considered. Therefore, smoking status, which we did not consider as a parameter, is another confounding factor associated with schizophrenia (Uludag & Zhao, 2023). Fourthly, the written text used for this research, despite being the most widely used in literature, may not be the most appropriate, as some of the terms used resemble "paranoid" words such as the kidnapping suffered by the protagonist. Future studies should consider using a text with a more suitable theme for this population. Fifthly, the study did not include a healthy control group, which might have been of interest to compare results. This decision was taken because individuals without this disorder are generally assumed not to have written language problems . Finally, for future research, we suggest increasing the sample size and replicating the study with a control group, since the present study revealed significant differences in the narrative according to symptomatology. This symptomatologic differentiation might help professionals working with patients with schizophrenia to adjust treatments and interventions, in which the speech and language therapist, as the specialized professional, could work on these language deficits.

In the future, it would be useful for speech and language therapists to begin to work in this field of mental health in collaboration with other professionals to improve the quality of life of patients, and to provide a fresher and functional vision of the use of written language by individuals with schizophrenia, with the aim of bettering their integration into society.

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