# Impairments of Language and Communication in the Different Phases of Schizophrenia: A Narrative Review

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### Short title

Language Impairments across Phases of Schizophrenia

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## Abstract

**Introduction**: Language impairment is common in patients with schizophrenia. Objectives: To identify the different language impairments present at each stage of schizophrenia. **Methods**: A literature search was conducted using the PubMed database for papers published between 2013 and 2023. **Results**: Thirty-seven articles were included. The language domains most affected are pragmatics (the relationship between language and context, involving parameters such as coherence) and figurative language. The initial phases often demonstrate subtle language disorganisation, while the acute phases demonstrate heightened abnormal language use in various language domains, and the chronic phases demonstrate fragmented speech patterns. **Conclusions**: Progress in artificial intelligence and greater awareness among the general population and healthcare workers should be implemented further in clinical practice.

**Key words**: clinical high-risk, chronic, first episode, prodromal, psychosis.

## Introduction

### Overview of Schizophrenia

Schizophrenia is a severe mental health condition characterised by a variety of symptoms. It is a heterogeneous psychiatric disorder that significantly impacts an individual's biological, psychological, and social functioning (Castle & Li, 2023). Complications during fetal development, higher paternal age during child-rearing, lower social and economic status, migration, amphetamine and cannabis abuse, and childhood adversity such as abuse appear to increase the likelihood of developing schizophrenia. The typical age of onset is late adolescence or the early 20s for men, and the latter half of the 20s or early 30s for women. However, schizophrenia can also occur in childhood or later in life, albeit less commonly.

Symptoms of schizophrenia can be categorised as positive, negative or cognitive. Positive symptoms include hallucinations, delusions and disorganised thinking, while negative symptoms encompass deficits or reductions in normal functioning, lack of motivation, reduced emotional expression, social withdrawal and

anhedonia. Cognitive symptoms refer to difficulties relating to thinking processes and mental abilities.

Schizophrenia is a variable and heterogeneous process comprising overlapping phases: clinical high-risk psychosis, the prodromal phase, the acute phase, the chronic phase, the residual or remission phase, and the relapse phase. The initial phases of schizophrenia are characterised primarily by functional decline, marked by reduced motivation and non-specific symptoms such as anxiety, dysthymia or impaired concentration (Corcoran, 2016).

These vague symptoms can manifest as mood changes and academic difficulties, which characterise these phases as asymptomatic. During this period, individuals often become introverted and reluctant to share their inner world with others (Kahn et al., 2015). The onset and duration of the prodromal phase of schizophrenia have been the subject of conflicting studies. Most articles report that 80–90% of patients undergo a prodromal phase lasting approximately one year (Kahn et al., 2015; Cheng et al., 2019). In the remaining 10%, the onset is marked by a first episode without a recorded prodromal phase. Alternatively, some studies define the beginning of this phase as the first day of hospital admission (Kahn et al., 2015; Cheng et al., 2019).

Through qualitative analysis of interviews with patients with recent-onset schizophrenia, Cheng et al. (2019) have divided the course of the illness into four phases: 1. Something is wrong; 2. Boiling up; 3. Breaking point, and 4. Losing control.

In the first phase, subjects experience a subjective episode for the first time, during which they notice the onset of the illness (strange behaviour, difficulty concentrating, problems with writing, an inability to express themselves, and a depressed mood). They then experience unusual feelings and thoughts, and begin to doubt whether their experiences are real. During the boiling-up phase, these symptoms increase in severity and frequency. Internal experience is impaired; for example, patients feel overwhelmed by information and have a distorted perception of external stimuli, causing them to question reality. They also exhibit abnormal social interactions, specifically communication and speech problems, including a discrepancy between what they intend to communicate and

what the recipient perceives, as well as difficulties with expressive and receptive language functions. In the next phase, the Breaking Point, patients become immersed in long, repetitive activities and feel out of control, exhibiting distorted behaviours of which they are unaware. Suicidal thoughts may emerge during this phase. They start to experience vivid imagery related to past experiences. The final phase, 'Losing Control', is characterised by the individual experiencing a feeling of being possessed, a loss of control over their actions, and deep fear. This phase coincides with the acute phase of schizophrenia.

**Thought and Language Disturbances in Schizophrenia**

Language is a complex function, and linguists have described several levels, each with their own main units and content: phonics (sounds and phonemes); morphology (morphemes); syntax (words and analysis of structures); and lexicology and semantics (vocabulary and relations of meaning). Pragmatics may also be considered an additional level or dimension, focusing on the use of language (Lyons, 1993). Semantics and pragmatics are the levels most affected by psychiatric disorders. Semantics is defined as 'the branch of linguistics that deals with changes in the meaning of words' (Espinal, 2014). Furthermore, pragmatics is defined as 'a branch of linguistics that focuses on how context influences the interpretation of meaning. Context is understood as a situation and can include any extralinguistic aspect, such as the communicative situation, the knowledge shared by the speakers and the interpersonal relationships. In other words, it encompasses all the factors that influence the use of language and are not considered in a purely formal study' (Ahern, Amenós & Escandell, 2021).

Patients with schizophrenia may exhibit various pragmatic impairments, i.e. difficulties in using language appropriately in different contexts, in both expression and comprehension (Bambini et al., 2022; Bosco, Gabbatore, Gastaldo & Sacco, 2016; Rajabzadeh et al., 2024). Comprehension impairments include difficulties recognising prosody and facial expressions, and understanding metaphors, humour, and irony (Bambini et al., 2022; Bosco et al., 2016). Failures in language expression and comprehension may affect standard and non-standard communicative acts, politeness strategies and presuppositions (Rajabzadeh et al., 2024) that require an understanding of complex contexts. In a sample of 43 schizophrenia patients, these impairments primarily affected the

non-verbal domain, particularly eye contact, compared to paralinguistic and oral communication domains (e.g. loudness, speech speed and rhythm, and verbal expression of ideas or emotions) (Rajabzadeh et al., 2024). Although impairments in schizophrenia may appear at the semantic, syntactic, and pre-lexical levels, the level at which the disorder is most obvious is pragmatics (Jimeno, 2024).

Consequently, patients with schizophrenia tend to exhibit persistent abnormalities in thought, language, and communication. Disturbances in thought processing are associated with deficiencies at the pragmatic level, classifying schizophrenia as a cognitive communication disorder. Importantly, disorganised thought cannot be observed directly; however, disorganised language use can be objectively assessed and analysed.

The mechanisms contributing to these impairments are still unclear, particularly with regard to whether they are congenital, acquired, or a combination of both. Deficits in cognitive function, disturbances in Theory of Mind (ToM) and abnormalities in right-hemisphere activity have been suggested (Bambini et al., 2022; Bosco et al., 2016; Rajabzadeh et al., 2024). These deficits appear to manifest in the early stages. For instance, in a sample of individuals accessing an early detection service, disorganised communication was identified as a critical symptom in the progression to negative and overt psychotic symptoms (Jimeno et al., 2020).

However, cultural differences may also influence the expression of language in patients with schizophrenia. In the study by Mete et al. (1993), the content of the language used by Turkish patients with schizophrenia and the themes they spoke about most frequently were analysed using a computerised content analysis. These patients exhibited higher cognitive activity related to thinking compared to other psychiatric and non-psychiatric patients. They alluded to thought processes using words such as 'think', 'thought', 'believe' and 'suspect', and referred more to political or abstract topics than to self-references or their own feelings. Day-to-day topics or banal issues played a secondary role (Mete et al., 1993). However, this study was limited by potential differences in family support, which could affect the reliability of these results.

As well as potential cultural differences, the communication context may also play a role in pragmatic impairments. For example, stressful situations such as conflict-ridden conversations or contradictory conversations may increase disturbances in thought and language by causing abnormalities in emotional processing. Furthermore, the emotional and verbal content of speech appears to be disrupted by stress in schizophrenia (Dombrowski, McCleery, Gregory & Docherty, 2014).

Taking this into account, quantifying and qualitatively assessing the severity of, and changes to, thought disorder and language in schizophrenia may enhance the effectiveness of treatment (Metsanen, Wahlberg, Hakko, Saarento & Tienari, 2006). Additionally, language impairments can predict a later onset of psychosis in high-risk psychosis patients (Heim, Dehmer & Berger-Tunkel, 2019). Higher age and longer periods of institutionalisation have been associated with lower verbal productivity in elderly patients with chronic schizophrenia (Ayuso, Botillo, Gonzalez Pablos & Martin Lorenzo, 2023). Despite all these findings, little is known about the progression of language impairments and their potential modifications across the different stages of schizophrenia.

Schizophrenia presents challenges that extend beyond medical needs and require the involvement of professionals such as speech therapists, who work to improve communication and cognitive skills. The condition is also associated with significant healthcare costs, legal issues arising from actions contrary to societal norms, and psychosocial dysfunction, which can hinder employment and relationships. It is crucial to address these interconnected aspects for effective schizophrenia management and support.

## Objectives

The primary objective of this study was to conduct a narrative review of language and communication impairments throughout the various stages of schizophrenia. This contributes to advancing knowledge about language in schizophrenia and raising awareness among healthcare professionals and the general population.

The specific objectives were: 1. to recognise language patterns in the development from high-risk psychosis to overt psychotic symptoms; 2. to encourage early diagnosis and treatment of schizophrenia, focusing on language and thought patterns in patients; 3. to highlight deficits in the existing literature on this topic, indicating where further research is necessary.

## Methods

The inclusion criteria were as follows: (i) original articles addressing language, speech or communication across various phases of schizophrenia; (ii) listed in the PubMed database; (iii) languages of publication: English, German or Spanish; (iv) published between 1 January 2013 and 4 April 2023; (v) full-text access available. Both qualitative and quantitative studies were accepted.

In a first step, the following search strategy was used: (*Schizophrenia* OR Psychosis) AND (Language OR Speech OR Thought OR Communication OR Lingu*) AND (high-risk OR prodromal OR first-episode OR acute OR chronic OR residual OR relapse) AND (phase OR stage)*. A total number of 202 articles were initially selected.

In a second step, all the abstracts were read and papers that were not pertinent to the study objectives, that contained any proband under the age of 12 or that were clinical trials with fewer than 50 patients were excluded. Additionally, supplementary articles derived from this search that met inclusion criteria (i) to (v) were manually added.

The third step involved examining the full text and allocating it to one or more of the following phases of schizophrenia: Clinical High Risk for Psychosis (CHR-P), the prodromal phase, First-Episode Psychosis (FEP), other Acute Phases and Relapses, Chronic Schizophrenia (CSZ) and Remission. The analysis of the papers also included the following: sample size and groups; age and gender; scales or tools used for language assessment; treatment or intervention for language improvement; and main results.

## Results

Following the application of the inclusion criteria, 29 papers were initially selected. Eight articles that were considered relevant for the review were added manually. Thus, a total of 37 papers were analysed (see Table 1).

**Table 1:** Articles included in the narrative review

**Table 2.** Language impairments in every language level in schizophrenia

### Clinical High-Risk for Psychosis

According to Corcoran et al. (2016), perceptual disturbances and subtle impairments in speech and language — also known as subtle thought disorder — may be present in this phase. The key difference between subtle and psychotic disorder is that individuals experiencing the former do not perceive themselves as mentally ill (Corcoran, 2016).

The Latent Semantic Analysis (LSA) is a frequently employed tool for evaluating language during the early stages of schizophrenia. This technique involves analysing the connections between a set of documents and their respective terms. LSA reveals the latent relationships between words and the concepts they represent by observing that words used in similar contexts tend to have similar meanings. In essence, it measures semantic coherence. For example, the words 'white', 'liquid', and 'breakfast' collectively signify 'milk', demonstrating a high level of coherence. Conversely, a lower level of coherence would involve associating a word with a more distant meaning, such as 'water'. While de Boer, Brederoo, Voppel & Sommer (2020) considered it a useful tool for detecting formal thought disorder, Bedi et al. (2015) used it as an automated speech tool for determining the onset of psychosis in high-risk patients (Bedi et al., 2015; de Boer et al., 2020). Specific parameters were assessed, including the minimum semantic coherence between consecutive phrases, the frequency of determiners, and the maximum number of words per phrase. In the follow-up study, only approximately 5% of participants progressed to schizophrenia. Those who transitioned exhibited common characteristics, including a lower frequency of determiners, decreased minimum semantic coherence, and shorter maximum phrase lengths, compared

to individuals at clinical high risk (CHR) who did not develop psychosis (Bedi et al., 2015).

Pawelczyk, Kotlicka-Antczak, Łojek, & Pawełczyk (2019) conducted an analysis of higher-order language functions, such as understanding irony and metaphors, processing implied information, and comprehending context, even in unclear situations. All of these functions had been identified at the pragmatic language level (see Introduction). The study assessed indirect speech understanding, semantic processes and prosody (intonation and rhythm) in individuals at clinical high risk (CHR) of psychosis and in the first episode of psychosis (FEP), comparing them to a healthy control (HC) group. The results indicated that CHR individuals scored lower than HCs in interpersonal communication and the comprehension of implied information. However, their performance in these areas was better than that of individuals with FEP (Pawelczyk et al., 2019). Individuals at CHR showed decreased negative and positive emotional responses to pleasant and unpleasant stimuli, respectively (Gruber, Strauss, Dombrecht & Mittal, 2018).

Bianciardi et al. (2023) categorised CHR patients into CHR-positive (CHR-P) and CHR-negative (CHR-N) groups based on the CAARMS, which is used for the attenuated psychotic symptoms group, as well as the COPER/CODGIS and SPI-A scales. The study investigated prosody and temporal variables in language, including rhythm, intonation, stress, tone variation, intensity, vowel space, the frequency and number of pauses, speech duration and articulation rate. Compared to CHR-N and HCs, CHR-P individuals exhibited a higher speech rate and shorter mean sentence length. They also had fewer pauses. In contrast, CHR-N individuals displayed more frequent silent periods than CHR-P or HCs. Furthermore, Bianciardi et al. (2023) found that pitch/tone variation was directly correlated with higher CAARMS-P and SPI-A scores.

In an observational study by Salinger, O'Brien, Miklowitz, Marvin & Cannon (2018), family problem-solving interactions between parents and adolescents with clinical high risk (CHR) for psychosis and bipolar disorder were compared using a behavioural coding system. After controlling for adolescent gender, age, functioning and parental education, it was found that mothers, but not fathers, of

young people at clinical high risk (CHR) for psychosis displayed significantly more conflictual communication than mothers of young people at CHR for bipolar disorder. This suggests that families with adolescents at clinical high risk (CHR) for psychosis may benefit from more intensive communication training than those with adolescents at CHR for bipolar disorder.

Digital communication is likewise altered in schizophrenia. An innovative study by Grossman et al. (2020) involved administering a questionnaire to FEP and CHR patients and healthy controls (HC) about satisfaction, difficulties and frequency of face-to-face and digital communication. These clinical groups communicated less frequently at work or in their personal lives (Grossman et al., 2020). They also reported more barriers and expressed greater dissatisfaction. This dissatisfaction was directly related to fewer communication episodes. However, there were no significant differences in communication between the two groups of people with schizophrenia, whether face-to-face or digital.

**Prodromal phase**

Hartopo & Kalalo (2022) describe a cohesion disorder present in the prodromal phase of schizophrenia. Cohesion forms part of the pragmatic level of language. Pragmatics describes the relationship between language and context, an area in which patients with schizophrenia appear to be more impaired. Cohesion is represented by the correct use of words that bond sentences together, giving them a more solid structure. An increase in lexical cohesion (e.g. the use of pronouns, conjunctions and repetitions) is typical of the prodromal phase of schizophrenia (Hartopo & Kalalo, 2022). Chang et al. (2021) surveyed patients on social media, electronic social interactions, day-to-day situations, and youth concerns, collecting their responses. The 5-factor model, which focuses on negative symptoms, best fits both: CHR meeting prodromal criteria and CSZ. This model encompasses blunted affect (the inability to express emotions), alogia (poverty of speech), anhedonia, avolition, and asociality. It provides the most accurate conceptualisation of negative symptoms in all phases of schizophrenia (Chang et al., 2021).

During the early phases of psychosis, patients made decisions more hastily than controls. After being presented with different social situations, participants were

asked a variety of questions. Psychotic patients jumped to social conclusions and showed a higher rate of overconfidence in false responses on social cognition tasks. However, as further information about the situations was provided, both control participants and prodromal patients showed similar responses (Grossman & Bowie, 2020).

## First-episode psychosis

Man et al. (2018) used the 'Repeatable Battery for the Assessment of Neuropsychological Status' (RBANS) to evaluate cognitive abilities, including language abilities, in individuals experiencing their first episode of psychosis (FEP). The RBANS assesses cognitive function in five areas: language, immediate and delayed memory, and attention and visuo-spatial abilities. The language assessment included picture naming and semantic fluency tasks. Eighty drug-naïve patients with FEP and 80 healthy control patients took part in the study. They had all been diagnosed with an acute episode according to the DSM-IV by two independent psychiatrists. FEP patients showed significantly lower cognitive performance on the RBANS total score and on four of its five subscale scores, including the language subscale, compared with the HC group. The visuospatial domain remained unaltered (Man et al., 2018).

Barajas et al. (2019) carried out a clinical trial analysing participants with a recent onset of FEP (i.e. less than one year since the onset of the illness and two or more psychotic symptoms). Prodromal symptoms were included in the IRAOS scale. One of the dimensions tested was language (IRAOS-L). Around 33% of the study population showed poverty of speech, 9% used neologisms, 33% presented incoherence, 41% exhibited derailment and 31% displayed alterations in non-verbal communication. It was concluded that patients with language difficulties may experience more severe psychosis. Poverty of speech content was identified as the most specific symptom (Barajas et al., 2019). Other symptoms, such as thought blocking and weakness of focused thinking, played a less significant role (Barajas et al., 2019).

Spencer et al. (2021) analysed three groups: CHR, FEP and HC. Speech connectedness was assessed using directly transcribed patient quotes. Participants were shown eight photos and asked to comment on each one for

one minute. Two parameters were used for measurement: The Largest Connected Component (LCC), which is the total number of words in the largest connected paragraph, and the Largest Strongly Connected Component (LSC), which is the total number of words in the largest connected paragraph where every word must be related to the previous one. Values close to 1 for both parameters indicated random connections, a lack of focus, and the use of incorrect pronouns or a lack of referential explanations. Group differences in speech connectedness were observed. Speech connectedness was lower among FEP patients than among CHR and HC patients. The Thought and Language Index (TLI) is a measure of the severity of formal thought disorder and is also used to define the correlation between connectedness and formal thought disorder. Both the LCC and the LSC were linked to a negative TLI score, loss of goal, and poverty of speech (Spencer et al., 2021).

Figueroa-Barra et al. (2022) analysed HC, CSZ and FEP patients using the mimicking technique. This technique enables machine learning algorithms to be trained to recognise language patterns associated with schizophrenia. By mimicking the learning process of the human brain, these algorithms can identify linguistic features that distinguish individuals with schizophrenia from those without. FEP patients exhibited altered parameters such as verbal productivity, verbal fluency and semantic coherence, characterised by the appearance of non-functional pauses, dysfunctional use of pronouns and alterations to semantic coherence, primarily associated with patients experiencing negative symptoms (Figueroa-Barra et al., 2022).

Zanelli et al. (2022) conducted a 10-year follow-up study of FEP patients. Two sets of data were collected: one at the initial assessment and another after 10 years. They found differences in the following parameters: verbal learning; immediate and delayed verbal memory; vocabulary; comprehension; and verbal fluency (specifically semantic fluency). Additionally, FEP patients appeared to have a lower IQ that decreased over the course of the illness, a finding that was also observed in children who later developed schizophrenia (Zanelli et al., 2022).

Although figurative language is more closely associated with acute schizophrenia, it has also been studied in FEP. Perlini et al. (2018) conducted a clinical trial in which the FEP group's understanding of metaphors and idioms was

tested. These patients demonstrated an altered comprehension of metaphors and idioms in both the open and closed tasks. The open task involved providing a spontaneous answer, while the closed task involved answering a multiple-choice test. An example of an open metaphor would be as follows: ‘Your room is a jungle’ (punctuation 0: ‘Many animals live in your room’; 1: ‘You need help to tidy your room’; 2: ‘Your room is very untidy’). It was demonstrated that the Closed Task for Idioms was the most effective discriminating parameter between FEP and HC patients (Perlini et al., 2018). These higher-order language functions were also described by the gropu of Pawelczyk et al. (Pawelczyk et al., 2019; Pawełczyk, Łojek, Żurner, Gawłowska-Sawosz & Pawełczyk, 2018). FEP patients demonstrated poorer comprehension of implicit information, understanding of metaphors and discourse, and interpersonal communication skills than both CHR and HC patients.

Caletti et al. (2018) analysed the prosody of individuals experiencing first-episode psychosis (FEP). During the prosody comprehension assessment, participants were required to identify the intonation (positive, negative or interrogative) of a given sentence. In the emotional prosody comprehension subtest, they were asked to distinguish between expressions of anger, happiness and sadness and categorise them as positive or negative. The findings revealed that individuals with FEP scored lower in the interrogative domain of the prosody comprehension task than the HC group (Caletti et al., 2018). Furthermore, FEP patients exhibited lower mean scores in all three emotional prosody comprehension domains — anger, sadness and happiness — compared to HCs. Furthermore, both studies demonstrated a higher emotional deficit in non-affective patients when comparing first-episode non-affective and first-episode affective groups (Caletti et al., 2018; Villalta-Gil et al., 2013).

**Acute phase and relapses**

According to Curcic-Blake et al. (2017), individuals experiencing verbal hallucinations in this phase demonstrate tangentiality, which is characterised by drifting away from the main topic of conversation and shifting towards unrelated or loosely related topics. They also exhibit loosening of associations, a form of formal thought disorder that impairs their ability to maintain a logical flow of

thought. It is difficult to perform highly structured linguistic tests in this phase, so studies often rely on clinical reports and scales (Curcic-Blake et al., 2017).

Verbal hallucinations occur due to alterations in brain connectivity. They are linked to the language, memory, and auditory domains. These verbal hallucinations are associated with language, memory and auditory domains. They may stem from the activation of latent memories, particularly those related to childhood trauma, thereby confirming the link between verbal hallucinations and memory. Interestingly, talking can suppress the processing of auditory connections, providing relief for individuals experiencing auditory hallucinations. Patients with schizophrenia encounter auditory hallucinations during the acute phase of the condition, and such experiences manifest themselves in alterations observed in their language patterns (Curcic-Blake et al., 2017). According to Wyszomirska, Martyniak & Bak-Sosnowska (2020) review, during the acute phase of schizophrenia, individuals exhibit disruptions in their ability to comprehend and produce non-literal language. In particular, they struggle to understand metaphors. Research suggests a more direct association between impairment in understanding metaphors and negative symptoms, whereas dysfunctions in recognising irony, which are more prevalent in the chronic phase of schizophrenia, are correlated with positive symptoms (Wyszomirska et al., 2020).

Furthermore, Kahn et al. (2015) and Ayer et al. (2016) state that language impairments may improve or remit after the acute phase, often remaining stable until the next episode (Ayer et al., 2016; Kahn et al., 2015).

Finally, de Boer et al. (2020) suggest that an elevated use of pronouns, swear words and terms associated with anger and death, alongside a reduced use of words related to everyday life, work, friends and health, may indicate a potential relapse.

**Chronic schizophrenia**

Grimes, Foussias, Remington, Kalahani-Bargis & Zakzanis (2021) aimed to demonstrate whether semantic and phonemic verbal fluency remained stable in patients with chronic conditions over a 6-month and 1-year follow-up period. To this end, four categories were used: (1) semantic verbal fluency (i.e. the number

of words produced from a central category); (2) phonemic verbal fluency (i.e. the number of words produced from a letter); (3) cluster size category (i.e. the number of words produced within a subcategory); and (4) cluster switching category (i.e. the number of times the patient changes topic). The results showed a moderate decline in verbal fluency. Throughout the three time points of the study, both semantic and phonemic verbal fluency remained stable (Grimes et al., 2021).

Watson et al. (2017) conducted a review of studies analysing processing speed in patients with schizophrenia. Processing speed was defined as 'the speed with which an individual can perform any cognitive operation'. It was measured by the number of correct responses to a task within a given time. Tasks from the different studies were distributed according to difficulty level. It was concluded that, compared to non-clinical patients, patients with schizophrenia have quicker initial thinking but slower processing during task or problem resolution, with a higher number of errors, especially at the highest difficulty levels. Patients struggled with planning and tended to adopt a step-by-step approach (Watson et al., 2017). This was hypothesised to be due to impulsivity and impaired working memory. Similarly to previous findings concerning verbal productivity (Figueroa et al., 2022), patients with chronic schizophrenia also exhibited a pattern of statements with aberrant pauses, resulting in fragmented speech (Watson et al., 2017).

Impairment of figurative language also occurs in the chronic stage of the illness. Compared with controls, patients have difficulty understanding irony and misinterpret non-literal messages (Wyszomirska et al., 2020).

Langdon, Flynn, Connaughton & Brüne (2017) categorised this group as 'concrete thinkers' due to their misinterpretation of metaphorical speech. Theory of Mind (ToM), an important component of social cognition, is evaluated in chronic patients and healthy controls (HCs) to assess the capacity to comprehend the feelings and thoughts of others in order to predict human behaviour. ToM can be approached in two ways: implicitly, unconsciously or automatically, or explicitly, consciously and only once a child has acquired language and demonstrated higher-order mental skills. Patients with schizophrenia perform poorly in explicit processes and often generate false implicit hypotheses or delusions. Participants were tested in the explicit domain: they were asked to watch a video (H&S animation) and imagine the dynamic geometric shapes as people performing

actions. This was called the 'people instruction'. The total word count was gathered, including different types of mental state language (words referring to perception, emotions, desires, driven actions, intentions, etc.). Although the results revealed no difference in the number of words generated between CSZ and HC patients, the former showed fewer mental-state terms, including basic and more complex language related to emotions, indicating impairments in the explicit domain (Langdon et al., 2017).

CSZ is also characterised by emotional stress. Alexithymia, or the difficulty of identifying and expressing feelings, has been associated with poorer neurocognition and, consequently, lower language output. It is thought that the difficulty of describing feelings in CSZ patients is due to higher emotional stress or mental pressure (Fogley, Warman & Lysaker, 2014).

### Remission

According to the inclusion criteria, no relevant information about language impairments was found for this phase.

## Discussion

The present narrative review aimed to synthesize and evaluate critically the existing literature on language and communication impairments in each phase of schizophrenia. One of the key findings of this review is the consistent evidence supporting the existence of language impairments across various linguistic domains in individuals with schizophrenia, mainly pragmatics (Jimeno, 2024). However, since schizophrenia is a heterogenous syndrome, there is a large variability in the domains of language potentially affected during the different stages of the disease. Getting to know language impairments across the course of schizophrenia contributes to a better understanding of the relationship between language and the progression of the disorder.

Assessing language from various perspectives, such as linguistic levels and social cognition, offers valuable insights into understanding language impairments. Examining language at a linguistic level involves analysing phonology, syntax, semantics, and pragmatics to highlight specific deficits in

language processing and production. This approach helps identifying structural and grammatical abnormalities that may contribute to communication difficulties in individuals with language disorders. Moreover, considering language within the context of social cognition explores how individuals comprehend and use language in social interactions, including understanding non-verbal communication, interpreting intentions or understanding social norms.

**Early Detection**

Identifying early markers in the early phases of schizophrenia has gained increased attention due to its potential significance in early identification and intervention. Although linguistic deficits in the prodromal stage may not be as pronounced as in later phases, these findings emphasise the importance of incorporating language assessment into early detection strategies. Emergent psychosis is particularly considered as subtle language disorganisation (Corcoran, 2016). The prodrome phase is understood as either the phase before frank psychosis, or the pre-psychotic period before a relapse (Yung & McGorry, 1996). It is therefore an area of potential early intervention. Pre-psychotic states need to be organised to minimise the psychological, social, and legal disruption caused by schizophrenia.

**Transition to a first-episode or frank psychotic symptoms**

In recent years, research has increasingly focused on language parameters that characterise, or even predict, the development from a CHR or FEP to frank psychosis. Some of the predictors identified in these studies were reduced determiner use, lower semantic coherence, and shorter maximum phrase length (Bedi et al., 2015).

Consequently, this review contains a substantial amount of information regarding this transition. Different scales or parameters are used in each study to establish this transition, such as the Ultra-High Risk Mental State (UHR) scale, which includes attenuated psychotic symptoms, brief limited intermittent psychotic symptoms, genetic risk, and deterioration syndrome (Miret, Fatjó-Vilas, Peralta & Fañanás, 2016), the SPI-A (Schizophrenia Proneness Instrument, Adult version) (Jimeno et al., 2020), and a combination of the PANSS, language alterations and demographic factors (Figueroa-Barra et al., 2022), to name a few.

### Acute phase of the illness

Our review confirmed a significant worsening of language impairments during the acute phase of the illness. Language production becomes more disorganised and is closely related to the emergence of auditory hallucinations and positive symptoms that encourage abnormal language use (Curcic-Blake et al., 2017; Wyszomirska et al., 2020). Raising awareness of the acute phase highlights the importance of early intervention services (Jimeno et al., 2020; Yung & McGorry, 1996), particularly in reducing the duration of untreated psychosis and improving long-term outcomes for individuals with schizophrenia.

### Figurative language in schizophrenia

This review also focuses on figurative language, which appears to be compromised throughout the course of the illness and is therefore a crucial element. This impairment is closely linked to social integration, humour comprehension, and effective cognitive and affective functioning (Villalta-Gil et al., 2013; Wyszomirska et al., 2020). The review findings confirm deficits in the comprehension and production of figurative language among individuals with schizophrenia, particularly in first-episode psychosis and the acute and chronic phases. These deficits can lead to difficulties in discerning the intended meaning, which may result in barriers to social interactions. From a clinical perspective, speech and language therapists, in collaboration with mental health professionals, could develop therapeutic approaches to enhance the cognitive and communicative aspects of figurative language, thereby improving social functioning.

### Natural Language Processing and Artificial Intelligence

Techniques such as mimicking intelligence were included in this review (Figueroa-Barra et al., 2022). This technique is part of artificial intelligence (AI), which could be useful in the future for analysing natural speech and identifying different language parameters that could help to characterise schizophrenia. Natural language processing (NLP) is another field of AI that focuses on the interaction between computers and human language. NLP techniques are becoming increasingly important in linguistic analysis, but have yet to be introduced into day-to-day clinical practice. These techniques involve developing

algorithms and computational models that enable machines to understand, interpret and generate human-like language. NLP encompasses a variety of language-related tasks, such as text analysis, speech recognition, and language generation (Elvevag & Cohen, 2022). However, it remains to be seen whether language patterns identified using AI technology can be matched to the linguistic parameters available to clinicians in initial interviews.

**Limitations**

Despite progress in understanding language impairments in schizophrenia in recent years, several gaps and methodological limitations have been identified. The heterogeneity of study designs involves a large number of different scales and indexes that are used indiscriminately among the studies and use different parameters. This makes it difficult to interpret the results. Many studies were excluded due to small sample sizes (the minimum method criterion established was n = 50).

Secondly, language is often influenced by social and cultural factors that may have developed over successive generations. Studies conducted in different cultural contexts, with variations in family and social support, may reveal differences in the manifestation of language impairments. In general, non-Western cultures seem to exhibit a more benign outcome despite the similarity of the initial acute phase of the illness, as they tend to suppress negative expression, have greater family and societal support, and experience less stigmatisation of the illness (Mete et al., 1993).

Language has a subjective and literal aspect that can be interpreted differently by each patient. Studies that specifically used sentence interpretation may introduce response bias into this review (Grossman & Bowie, 2020; Grossman et al., 2020).

Furthermore, this review does not differentiate between probands who have or have not previously received antipsychotic treatment, which leads to differences in the results, especially in the acute phase of the illness.

Lastly, this review did not aim to relate various linguistic impairments in the phases of the disorder to other cognitive domains. Although we highlighted the

co-occurrence of cognitive and linguistic-communicative symptoms, not all studies investigated both domains in sufficient detail. This review can therefore be used as a starting point for systematically investigating language and communication disorders, as well as cognitive and thought disorders, in the different phases of the disease.

**Future Directions**

Future research should prioritise standardised methodologies and larger, more representative samples to normalise findings and enable cross-study comparisons. The impact of cultural differences on the findings, such as the differentiation between patients with and without psychotic medication, should also be considered.

From a clinical point of view, artificial intelligence shows promise for future clinical practice. Family and social support may also help to combat the stigmatisation of schizophrenia and facilitate constructive communication to improve language impairments associated with the condition.

No research was found regarding language impairments in the residual phase or remission of schizophrenia, and very little research was found relating to the relapse phase. This highlights the need for more investment in this field.

Tools for assessing and intervening in the rehabilitation of language impairments in patients with schizophrenia have been reviewed elsewhere (Jimeno, 2024).

Programmes such as the Cognitive Pragmatic Treatment programme (Bosco et al., 2016) may be considered by professionals to provide effective communicative treatment programmes for patients with schizophrenia. Consisting of 20 group sessions, it focuses on linguistic, extralinguistic and paralinguistic aspects, as well as theory of mind and other cognitive functions. Most of the sessions use video-recorded scenes based on different language tasks. The study aimed to help patients interpret intended meanings and consider non-literal meanings, corresponding to the pragmatic level. Participants experienced improvements in linguistic ability, including direct and indirect speech, irony, and deceit (Bosco et al., 2016).

Schizophrenia affects every aspect of a person's life and is associated with many other comorbidities. Long-term support for physical health, provided by primary care practitioners, specialists, and other healthcare professionals, such as speech therapists, could improve the quality of life for these patients (Castle, 2023). Speech therapists primarily engage in therapeutic interventions aimed at enhancing communication abilities and cognitive functions in individuals with schizophrenia. Furthermore, schizophrenia imposes substantial healthcare expenses on society, including costs associated with hospitalisations, medication and specialised treatments. Legal issues often arise from the behaviours exhibited by individuals with schizophrenia, as they may exhibit impaired judgement and engage in actions that contravene societal norms, necessitating legal interventions and support mechanisms. Additionally, schizophrenia can lead to social and occupational dysfunction, as individuals may struggle to maintain employment, form stable relationships, and integrate into mainstream society due to the debilitating symptoms and social stigma associated with the disorder. These interconnected aspects highlight the importance of taking a comprehensive approach to managing and supporting people with schizophrenia, addressing the clinical, financial, legal and socio-occupational dimensions.

## Conclusions

Based on the objectives outlined in this review, the following conclusions can be drawn. Firstly, various approaches were utilised to analyse the primary language impairments associated with schizophrenia, revealing consistent impoverishment and progressive impairment across language domains (see Table 2). This depletion aligns with the progressive deterioration of the illness from a psychopathological perspective. Secondly, encouraging early diagnosis may prevent an acute episode, particularly in the early stages, and guide patients towards a relapse or remission phase without experiencing overt psychosis.

Thirdly, the existing literature remains limited. Nevertheless, significant progress has been made in recent years, particularly with regard to specific phases of the disorder, such as CHR and FEP. However, studies examining language deficits in schizophrenia often employ diverse parameters and methodologies, making it challenging to draw consistent conclusions across different phases of the illness.

Variations in sample characteristics, assessment tools and diagnostic criteria make it difficult to interpret findings and hinder the identification of clear patterns of language impairment at different stages of schizophrenia. Moving forward, there is a need for more standardised research methodologies that consider the dynamic nature of language dysfunction in schizophrenia across its various phases. This would enable us to better understand how language issues evolve over time and develop treatments that facilitate communication and social interaction, particularly in the early stages of schizophrenia. Artificial intelligence could be used in future to analyse natural speech and identify different language parameters relevant to characterising schizophrenia. Together with the information gathered in this review about the core language impairments in each phase, individualised assessments could be used to modify existing intervention programmes and improve treatment, early intervention and understanding of patients.

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**Table 1:** Articles included in the narrative review

| ARTICLE | SAMPLE PROBANDS | TYPE OF PUBLICATION |
|---|---|---|
| ***Kahn et al, 2015*** | | Narrative review |
| ***Corcoran, 2016*** | | Narrative review |
| ***Figueroa-Barra et al, 2022*** | 49 HC (51% women), 38,6 mean age.<br>40 FEP (37% women), 18,1 mean age<br>44 CSZ (43% women) 35,5 mean age | Case-control study |
| ***Wyszomirska et al, 2019*** | | |
| ***Salinger et al, 2018*** | 58 CHR psychosis (40% women)<br>45 CHR bipolar (69% women)<br>13-17 years old | Observational study |
| ***Cannon et al, 2016*** | Baseline: 743 CHR (42,3% women)<br>Follow up: 596 CHR<br>12-35 years old | Cohort study with follow-up (2 years) |
| ***Chung et al, 2021*** | 164 CHR (59% women), 20,26 mean age<br>377 Ep (early psychosis- (57% women), 21 mean age | Case-control study |
| ***de Boer et al, 2020*** | | Review |
| ***Magnani et al, 2023*** | 90 CHARMS criteria +<br>90 HC<br>14-25 years old | Case-control study with follow-up |
| ***Carrion et al, 2016*** | Baseline: 210 CHR subjects<br>Follow up; 176<br>12-25 years old | Transversal study |
| ***Pawelczyk et al, 2019*** | 20 HC (45% women), 18,25 mean age<br>33 UHR (57,6% women), 19,6 mean age<br>20 FEP (45% women) 19,45 mean age | Case-control study |
| ***Gruber et al, 2018*** | 29 UHR (38% women), 19 mean age | Case-control study |

| | | |
|---|---|---|
| | 32 HC (60% women), 18,5 mean age<br>23 affective disorder/substance abuse<br>50 CHR-Positive | |
| ***Bianciardi et al, 2023*** | 23 CHR-Negative<br>17 HC<br>19 CHR | Case-control study |
| ***Grossman et al, 2020*** | 57 FEP<br>51 HC<br>12-22 years old | Case-control study |
| ***Hartopo et al, 2022*** | | Review |
| ***Grossman et al, 2020*** | 35 prodromal psychosis (18% women), 23,57 mean age<br>35 HC (29% women), 23,34 mean age<br>218 FEP (166 non-affective; 52 affective) | Case-control study |
| ***Delvecchio et al, 2018*** | 46% women, 30,5 mean age<br>106 HC (55% women), 31,8 mean age<br>79 FEP (55,7% women) 20,22 mean age | Case-control study |
| ***Barajas et al, 2019*** | Mean age first prodromal feature: 19,41<br>Mean age onset psychotic episode: 19,9 | Observational study |
| ***Spencer et al, 2021*** | | Review |
| ***Zanelli et al, 2022*** | Baseline: HC 230, SZ 98, Bipolar 39<br>(54% women)<br>Follow up: HC 103, SZ 64, Bipolar 19<br>(52% women)<br>16-65 years old | Case-control study |
| ***Perlini, et al, 2018*** | 228 FEP (60 FEP-Affective, 168 FEP-Non-affective) 44% women, 30,4 mean age<br>70 HC (58% women), 34 mean age | Case-control study |
| ***Pawelczyk et al, 2018*** | 34 FEP (47% women), 20,85 mean age | Case-control study |

| | | |
|---|---|---|
| | 32 HC (53% women) 20,21 mean age<br>34 healthy relatives (47% women), 49,44 mean age | |
| ***Villalta-Gil et al, 2013*** | 22 FEP (41% females) 23,34 mean age<br>31 HC, mean age: 25,57, 51% females | Case-control study |
| ***Caletti et al, 2018*** | 208 FEP (156 non-affective, 52 affective), 41% women, 30,3 mean age<br>77 HC (55% women), 30,81 mean age | Case-control study |
| ***Curcic-Blake et al, 2017*** | | Narrative review |
| ***Grimes et al, 2021*** | Baseline: 70 CSZ or schizoaffective disorder<br>Follow up: 53 CSZ (30% women)<br>Mean age: 39,2 years old. | Observational descriptive study (6 months) |
| ***Watson et al, 2017*** | | Narrative review |
| ***Langdon et al, 2017*** | 45 CSZ (42% women), 42,2 mean age<br>27 HC (48% women), 41,5 mean age | Case-control study |
| ***Fogley, et al, 2014*** | 65 CSZ | Observational descriptive study |

**Table 2.** Language impairments in every language level in schizophrenia

| LANGUAGE LEVELS | Clinical High-risk `phase | Prodromal phase | First-episode psychosis phase | Acute phase | Chronic phase |
|---|---|---|---|---|---|
| **Morphologic and Syntactic Levels** | -Less frequency of determiners<br>-Maximum phrase length shorter.<br>**-CHR-P:** higher speed rate and lower mean length of sentenced.<br>Smaller number of pauses.<br>**-CHR-N:** more frequent silent periods.<br>-Lower verbal learning and memory performance, slower speed or processing → conversion. | **-Cohesion disorder**: increase in lexical cohesion (pronouns, conjunctions, words '*like*'…)<br>→ more lexical connectors. | **-Poverty of speech content.**<br>-Less **verbal fluency** and vocabulary learning.<br>-Alterations in **syntactic comprehension-** locative, active negative and relative sentences.<br>-Less verbal and vocabulary learning. | | **-Aberrant pauses.**<br>**Fragmented speech.** |
| **Semantic and Pragmatic Levels** | -Reduced semantic **coherence** (LSA). | | -Lower cognitive performance: picture naming and semantic fluency tasks.<br>-Non-functional pauses, dysfunctional use of pronouns and semantic coherence alterations (+ negative symptoms).<br>-Less semantic fluency. **Less speech connectedness** → loss of goal, random junctions, no | | -Medium decline in **semantic verbal fluency**.<br>-Aberrant pauses<br>Fragmented speech. |

| | | | | | |
|---|---|---|---|---|---|
| | | | references, incorrect use of pronouns.<br><br>>Negative TLI Score->loss of goal and poverty of speech. | | . |
| **Higher order functions** | -Lower interpersonal communication.<br><br>-Less understanding of **implied information.**<br><br>-Less digital communication. | | -Lower comprehension of implicit information, metaphors, following discourse and interpersonal communication.<br><br>-Altered non-verbal communication.<br><br>-Altered **figurative language-** Altered *Closed Task for Idioms*<br><br>-Prosody: interrogation domain deficit and emotional prosody deficit. | -Difficulties in understanding **metaphors** → reversed hemispheric activation<br><br>related + to negative symptom | -Difficulties in understanding **irony** – *concrete thinkers.* |
| **Thought disorder** | **-Subtle thought disorder** → subtle speech disturbances.<br><br>-Unusual content and suspiciousness →conversion.<br><br>-Constructive social communication → less episodic positive symptoms<br><br>-Reality is retained. | **-Mild thought disorder:** sub psychotic positive symptoms: unusual thoughts, suspiciousness, grandiosity, perceptual disturbances, disorganised communication.<br><br>-5-factor model.<br><br>Rusher decision making, | -Thought blocking and weakness of focused thinking.<br><br>-Neologisms, derailment, alterations | **-Positive formal thought disorder.**<br><br>**Tangentiality and loosening of associations.** | -Quicker initial thinking, slower subsequent thinking in problem resolution.<br><br>More errors.<br><br>-Fewer mental-state |

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| | -Functional decline, anxiety, dysthymia, poor concentration, changes in mood, loss of motivation, enclosed in themselves.<br>-Asymptomatic.<br>-Bad response to stress. | overconfidence, social conclusions.<br>-Loss of drive, slowness, misinterpretations, delusions of reference.<br>-Unusual thought of content and suspiciousness → conversion. | in non-verbal communication.<br>-Lower IQ | -Verbal hallucinations related to alterations in speech (relief when talking). | terms related to emotions.<br>-Difficulty understanding and describing feelings; emotional stress. |

**Table 1:** Articles included in the narrative review

**Table 2.** Language impairments in every language level in schizophrenia

### Conflicts of interest

The authors declare no conflicts of interest.