



Review Paper

The Relationship Between Sensory Processing, Substance Abuse and Impulsivity With Suicide in Schizophrenia: A Narrative Review



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ABSTRACT

Background and Objectives: Schizophrenia is a debilitating and complex mental health disorder characterized by symptoms, such as delusions, hallucinations, and cognitive impairments. A high comorbidity rate is observed between substance abuse, schizophrenia and impulsivity. Given the higher rate of suicide among individuals with schizophrenia, this research aims to investigate the correlation between three factors, sensory processing, substance abuse and impulsivity, concerning suicide in individuals diagnosed with schizophrenia.

Methods: Research was conducted on PubMed, Google Scholar and Web of Science using the keywords “schizophrenia,” “substance use disorder (SUD),” “sensory processing,” “suicide” and “impulsivity.” Sixteen articles were selected as the most recent and relevant studies for reporting.

Results: The reviewed studies demonstrated a high prevalence of suicide in patients with schizophrenia, particularly during the early stages of the illness. Impulsivity plays a contributing role in the elevated rates of suicide and substance abuse, with substance abuse directly influencing the incidence of suicide. Moreover, sensory processing difficulties can lead to self-harm and suicide. Therefore, the presence of these three factors in patients can increase the risk of suicide.

Conclusion: Studies have addressed these risk factors to a considerable extent, less attention has been given to sensory processing, impulsivity, and substance abuse, which are significant factors in self-harm and suicide, as well as their predictive value for suicide. Further studies in this area are recommended.

Keywords: Schizophrenia, Suicide, Sensory processing, Impulsivity, Substance abuse



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↑ *What is “already known” in this topic:*

Suicide is a widespread phenomenon in schizophrenia, and sensory processing, impulsivity, and substance abuse can play a role in its occurrence, but the results of studies are contradictory.

→ *What this article adds:*

In this study, it was added that altered sensory processing, substance abuse, and impulsivity are related to each other and have an exacerbating effect on each other. These factors are very effective in the incidence of suicide in schizophrenia patients. By controlling these factors, the incidence of suicide in these patients can be greatly reduced.

Introduction

Schizophrenia is known as a debilitating mental disorder with the appearance of various symptoms, such as delusions, hallucinations, disturbed speech or behavior and cognitive impairment. Its early onset, along with its chronic symptoms, makes it a disabling disorder for many patients and their families [1]. Schizophrenia affects approximately 1% of the population worldwide and typically the onset of the disease occurs early in life (usually in late adolescence or early adulthood). Most patients have long-term side effects [2].

The main reasons for this disorder are not well understood and a combination of genetic and environmental factors play a role in the emergence of this disease [1, 3]. Environmental factors include birth complications, such as oxygen deprivation [4] and prematurity [5]. Advanced paternal age can also contribute to the development of schizophrenia [6]. Other non-genetic factors associated with the onset of schizophrenia include trauma, social isolation, migration, city life and substance abuse [7].

The primary reason for death among people with schizophrenia spectrum disorders (SSD) is suicide. The rate of suicide attempts among individuals with psychotic disorders ranges from 10% to 50%. Approximately 40% to 79% of individuals with schizophrenia report suicidal ideation at least once during their illness [8]. Even in the early stages of schizophrenia, the suicide rate is 2.4%, and in the first five years of the illness, the suicide rate is 0.48% per year [9].

Various risk factors for suicide among individuals with schizophrenia have been identified. Being male, being Caucasian, younger age, having concurrent depression, history of suicide attempts and lack of social support are

the most influential factors [10]. Additionally, the risk of suicide significantly increases in the presence of substance abuse or dependence [11].

Substance abuse is common among people with schizophrenia, particularly in men. Nearly 50% of individuals with schizophrenia have a comorbid substance use disorder (SUD) at some stage during their illness [2]. Substance abuse in schizophrenia is associated with worse outcomes, including severe psychotic symptoms and less treatment adherence [12].

Regarding substance abuse, most studies report an increased risk of suicide and aggression [9] and most individuals with schizophrenia suffer from comorbid conditions, including impulse control disorders [13]. Sensory processing is one of the basic brain functions that is impaired in individuals with schizophrenia and this impaired sensory processing is related to emotional regulation and symptoms, such as suicidal thoughts and hopelessness [14].

Sensory processing refers to the way the nervous system receives sensory signals and converts them into appropriate behavioral and motor responses [15]. The sensory processing pattern in patients with psychiatric disorders, including schizophrenia demonstrates lower levels of sensory registration, sensory avoidance and sensory sensitivity, as well as reduced sensory-seeking behavior [16].

According to the studies, substance abuse and impulsivity are related to each other and exacerbate each other [13, 17] and these two factors, along with altered sensory processing, have a vital effect on the incidence of suicide in patients with schizophrenia [14]. Most studies in the field of suicide in individuals with schizophrenia have investigated the relationship between demographic fac-

tors such as age, gender, etc. [9, 18]. Despite the high importance of the three components of substance abuse, impulsivity, and sensory processing in the incidence of suicide in schizophrenic patients, fewer studies have investigated the relationship between these components in the suicide of these patients and also the studies that have been conducted in this field provide contradictory information about the relationship between these factors and the suicide of individuals with schizophrenia.

On the other hand, due to the high rate of suicide in schizophrenic patients, more and more in-depth investigations in this field and further investigation of risk factors and their relationship to the occurrence of suicide can be effective in preventing suicide and helping to reduce its rate and increase the life expectancy of these patients.

Therefore, this study was conducted to review the relationship between three variables of sensory processing, substance abuse, and impulsivity with suicide in patients with schizophrenia.

Materials and Methods

The present study is a literature review conducted using a systematic search approach. The keywords listed in the Table 1 were searched in databases, such as PubMed, Web of Science, and Google Scholar from 2010 to 2024.

Results

Using the keywords listed in Table 1, first, 372 articles were found after that 16 articles were identified as the most recent and relevant articles. These include 5 articles on suicide in schizophrenia, 3 articles on sensory processing in schizophrenia, 5 articles on substance abuse in schizophrenia and 3 articles on impulsivity and schizophrenia, as reported in Table 2.

Discussion

This study includes the results of 16 articles published from 2010 to 2022. The main results of this review are as follows:

The suicide rate in schizophrenia is significantly higher than in the population. Various studies report different incidences of suicide in schizophrenia. In a comprehensive review conducted by Lu et al. [19] in 2020, the lifetime suicide rate was reported to be 26.8%. However, another study conducted by Aydin et al. [20] in 2019 reported a much higher suicide rate among these patients. In this study, it was mentioned that at least 40.8% of individuals with schizophrenia attempted and 39.6% of these individuals attempted suicide repeatedly. Different studies, using different populations and methodologies, provide different estimates of suicide rates in schizophrenia. The population size in the first study was much larger than in the second study, and the significant difference in the reported prevalence of suicide may be due to this reason. The first study appears to provide a more accurate statistical estimate due to a more extensive investigation.

In two other studies conducted in 2021, Berardelli et al. [21] also reported the suicide attempt rate among individuals with schizophrenia to be between 25% and 50%, while Bai et al. [22] 34.5% of these patients had suicidal thoughts and 44.3% of planned suicides, which is consistent with the above studies.

In 2019, the suicide rate in individuals with schizophrenia was reported to be 10% [18]. This rate significantly differs from the prevalence reported in other studies, indicating a potential increase in suicide rates among these patients over time.

Despite the varying prevalence rates mentioned, all of these studies indicate that suicide is the most significant factor in reducing hope for life and the main cause of mortality in individuals with schizophrenia, emphasizing the need for careful examination. Furthermore, individuals who attempt suicide tend to have more severe symptoms.

Table 1. Search keywords

Search Keywords	Categories of Articles
(Suicide OR self-harm) AND (schizophrenia OR schizophrenic patients OR schizophrenic people)	Suicide in schizophrenia
(Impulsivity OR impulsiveness) AND (suicide) AND (schizophrenia OR schizophrenic patients OR schizophrenic people)	Impulsivity in schizophrenia
(Sensory processing OR sensory processing impairment OR sensory) AND (schizophrenia OR schizophrenic patients OR schizophrenic people)	Sensory processing in schizophrenia
(Substance abuse OR substance misuse OR substance use disorder OR SUD) AND (schizophrenia OR schizophrenic patients OR schizophrenic people)	Substance abuse and schizophrenia

Table 2. Characteristics of the studies on the relationship between sensory processing, substance abuse, and Impulsivity with suicide in schizophrenia

Author (y)	Title	Type of Study	Sample Size	Outcome Measures	Results	Conclusion
Lu et al. 2020 [19]	Prevalence of suicide attempts in individuals with schizophrenia	Meta-analysis	16747	- Suicide risk - Demographical variables	The lifetime prevalence of suicide in individuals with schizophrenia was 26.8%, while the one-year prevalence, 1-month prevalence, and the prevalence of suicide attempts from illness onset were 3.0%, 2.7% and 45.9%, respectively.	
Aydin et al. 2019 [20]	Suicide attempts with related factors in schizophrenia patients	Cross-sectional	223 (18-65)	- Questionnaire on family/caregiver features - Questionnaire on socio-demographic and clinical features (demographic-clinical variables)	It has been found that 40.8% of individuals with schizophrenia have made at least one suicide attempt, and among those who have attempted suicide, 39.6% have made multiple suicide attempts.	
Suicide in Schizophrenia	Sher et al. 2019 [18]	Review	Literature review	- Demographical variables - Suicide risk	The lifetime suicide price among people with schizophrenia is about 10%. Suicide is the main motive of decreased life expectancy in people with schizophrenia. In the first decade of the disorder, schizophrenics are significantly more likely to commit suicide, even though they continue to be at improved chance all through their lifetime, experiencing durations of worsening or development in suicide chance.	Suicide is the leading cause of death among individuals with schizophrenia and has been previously described as one of the "most serious symptoms of schizophrenia." The lifetime incidence of suicide in schizophrenia is considered to be ten times, with 40% of patients having a history of a minimum one suicide attempt. Schizophrenia has a relatively higher attempt of suicide, particularly among younger age groups.
	Bai et al. 2021 [22]	Meta-analysis and systematic review	5079	- Prevalence of suicidal ideation and/or suicidal plan or relevant data that allowed for the calculations of the prevalence of suicidal ideation/suicidal plan	The lifetime prevalence of suicidal ideation was 34.5% and the point prevalence was 29.9%. The suicide planning was 44.3.	
Berardelli et al. 2021 [21]	The importance of suicide risk formulation in schizophrenia	Review	Literature review		Suicide is responsible for about 5% of untimely deaths amongst individuals with schizophrenia, and 25% to 50% of people with schizophrenia make suicide tries for the duration of their lifetime. Evidence indicates multiple personal, clinical, social, and psychological elements contributing to suicide in individuals with schizophrenia.	

Author (y)	Title	Type of Study	Sample Size	Outcome Measures	Results	Conclusion
Chaudhury et al. 2016 [27]	Effects of SUD on presentation of schizophrenia	Review	Literature review		Substance abuse and other factors such as untreated duration of psychosis, treatment duration and mortality are directly or indirectly related.	
Güney et al. 2020 [28]	Predicting factors for NSSI in patients with schizophrenia spectrum disorders and the role of substance use	Cross sectional	165	ISAS, NSSI, SUD	It has been found that SUD is associated with NSSI in people with SSD and is linked to approximately four-fold increased risk of non-suicidal self-injury. The lifetime incidence of SUD in the study sample and the non-suicidal self-injury (+) group turned into 38.2% and 55.6%, respectively. The prevalence of non-suicidal self-injury in the study sample was 43.6%.	
Lähteen-vuo et al. 2021 [29]	Morbidity and mortality in schizophrenia with comorbidity of SUDs	Cohort	45467 (<46)	- Substance abuse (prescription register) - Mortality (death register)	Any comorbid SUD, particularly polydrug use and alcohol consumption, was associated with a 50% to 100% increase in hospitalization and mortality rates compared to individuals without substance abuse. High risks of mortality, especially due to suicide and other external causes, were observed.	Men are at a more significant risk of developing substance abuse compared to women. Substance abuse contributes to an earlier onset of schizophrenia, prolonged illness duration, extended treatment periods, and increased mortality, particularly through suicide, in these patients. Furthermore, substance abuse exacerbates both positive and negative symptoms of schizophrenia compared to individuals who do not misuse substances.
Hunt et al. 2018 [25]	Prevalence of comorbid substance use in schizophrenia spectrum disorders in clinical and community settings	Systematic review and meta-analysis	165811 (123 articles)		Substance abuse was significantly more common in men, with a rate of 48%, compared to women with schizophrenia. People with substance abuse had an earlier onset of schizophrenia.	
Kelkar et al. 2020 [26]	Prevalence of substance abuse in patients with schizophrenia	Observational cross-sectional	100	- PANSS - AUDIT	48% of individuals with schizophrenia had substance abuse. It was found that smokeless tobacco had the highest occurrence of substance abuse (42%) among people with schizophrenia. Substance abuse was more common in men than women. Individuals with schizophrenia and substance abuse had higher positive PANSS ratings in comparison to those without substance abuse.	

Author (y)	Title	Type of Study	Sample Size	Outcome Measures	Results	Conclusion
van den Boogert et al. 2022 [16]	Sensory processing problems in psychiatric disorders	Meta-analysis	33 articles (n=2008)	Sensory processing (AASP)	In this group, sensory seeking was observed to a lower extent, while sensory sensitivity and sensory avoiding had higher scores in comparison to the reference group. Additionally, low registration was greatly higher in this group compared to the reference group.	In studies conducted on individuals with schizophrenia compared to control groups, sensory integration dysfunction was observed. As the level of sensory integration dysfunction increased in these patients relative to the control group, higher psychiatric symptoms were also observed. In individuals with schizophrenia, sensory avoiding, sensory sensitivity and low registration were observed to a greater extent, while sensory seeking was observed to a lesser extent. Sensory processing difficulties can lead individuals towards risk-taking behaviors such as suicide.
Halperin et al. 2020 [23]	Schizophrenia spectrum disorders, linking motor and process skills, psychiatric symptoms, and sensory patterns	Cross-sectional	18	- Sensory pattern (adolescent/adult sensory profile) - Motor and process skills (assessment of motor and process skills) - Brief psychiatric rating scale	Among the 18 participants, the vast majority demonstrated sensory differences and exhibited moderate to severe symptoms. There was a great relationship between sensory variations and psychiatric symptoms.	
Zhou et al. 2020 [24]	Self-reported sensory responsive patterns in typically-developing and early-onset schizophrenia adolescents: Its relationship with schizotypal and autistic traits	Cross-sectional	127	- AASP - SPQ - AQ	The results indicate that increased levels of hypersensitivity and hyposensitivity coexisted in individuals with schizophrenia and were associated with both negative and positive symptoms of schizophrenia. Unusual sensory experiences, other than sensory seeking, were positively correlated with higher schizotypal traits irrespective of diagnostic status.	
Ouzir et al. 2013 [17]	Impulsivity in schizophrenia	Review	Literature review	- Impulsivity - Substance use - Violence - Aggression - Suicidality	Impulsivity, the risk factor for aggression and violence, increases the likelihood of suicidal behavior	
Sehgal & Patil, 2021 [30]	Impulsivity, aggression and suicide risk in patients with Schizophrenia	Cross-sectional	65	- Sociodemographic data - PANSS - Impulsiveness (Barratt impulsiveness scale-11) - Buss Perry aggression questionnaire - Suicide (Becks SSI)	Impulsivity is considered a crucial trait of suicide and aggression in individuals with schizophrenia. Impulsive behavior can cause disruptive behaviors, including violence or self-harm. Therefore, anger, aggression, and impulsivity play a significant role in the adverse outcomes experienced by individuals with schizophrenia.	Pathological impulsivity is often considered one of the primary features of schizophrenia. Individuals with schizophrenia are more impulsive than healthy individuals. Impulsivity in schizophrenia has a direct impact on increased substance abuse, elevated suicidal ideation, and suicide attempts. Furthermore, impulsivity leads to poorer insight in individuals with schizophrenia.
Iancu et al. (2010) [31]	Impulsivity, aggression and suicide risk among male Schizophrenia patients	Cross-sectional	68	- Negative and PANSS - IS - SRS - Overt aggression scale	The excessive impulsivity group exhibited higher levels of current and past suicidal ideation and demonstrated an extra propensity for lifelong suicide attempts. Impulsivity scores were positively correlated with SRS ratings and a few PANSS scores	

Abbreviations: NSSI: Non-suicidal self-injury; ISAS: Inventory of statements about self-injury; PANSS: Negative and positive symptom scale; AUDIT: Alcohol use disorder identification test; AASP: Adolescent/adult sensory profile; PSQ: Schizotypal personality questionnaire; AQ: Autism spectrum quotient; SSI: Scale for suicide ideation; IS: Impulsivity control scale; SRS: Suicide risk scale.

Therefore, suicide in schizophrenia is a serious and highly prevalent issue, with its rates increasing over time. By addressing the risk factors and factors associated with suicide, it is possible to reduce its occurrence in these patients.

Sensory processing in schizophrenia

Sensory processing and its patterns in schizophrenia have been the subject of studies that have demonstrated significant sensory differences compared to healthy individuals. In studies conducted by van den Boogert et al. in 2022 [16], Halperin et al. [23] and Zhou et al. [24] in 2020, it was shown that sensory processing is compromised in individuals with schizophrenia, and sensory avoiding and sensory sensitivity patterns are observed to a greater extent than in healthy individuals. The low registration pattern is significantly more prevalent in these patients compared to the healthy group, while sensory seeking is less common.

Halperin et al. [23] also addressed in their study that sensory processing difficulties can have a significant impact on daily functioning, social performance and quality of life. These studies also indicated a significant relationship between sensory processing problems and psychiatric symptoms.

Therefore, the multiple sensory processing difficulties in these patients can have highly detrimental effects on their lives, including reduced quality of life, diminished functional capacity, and increased hopelessness. Consequently, due to the high prevalence of sensory processing problems in schizophrenia and their impact on the lives of these patients, studying these issues is of utmost importance.

Substance abuse in schizophrenia

The comorbidity of substance abuse is highly common. Hunt et al. [25] reported an occurrence rate of substance abuse in schizophrenia at 41.7%. Kelkar et al. [26] reported a prevalence rate of 48%. Both studies also noted that substance abuse is significantly more prevalent in men with schizophrenia than in women.

Chaudhury et al. [27] showed that substance abuse was recognized as a critical risk factor for schizophrenia. It was also stated that substance abuse precedes schizophrenia in over 60% of cases, and in most instances, both occurrences happen within a month, suggesting a potential causal connection between substance abuse and schizophrenia.

According to the results of studies, substance abuse can have detrimental effects on the course of schizophrenia. Hunt et al. [25] and Kelkar et al. [26] indicated that substance abuse can lead to an earlier onset of schizophrenia, exacerbate negative and positive symptoms, and prolong the duration of the illness.

Studies have also demonstrated that substance abuse can lead to increased self-harm and mortality rates in individuals with schizophrenia. Güney et al. [28] stated in their study that substance abuse can increase self-harm by four times in patients with schizophrenia, making it a significant predictor of self-harm in these individuals. Another study conducted by Lähteenvuori et al. [29] found that substance abuse leads to a 50% to 100% increase in hospitalizations and mortality in schizophrenia.

The prevalence of substance abuse in schizophrenia is increasing over time, likely due to easier access to drugs and the higher inclination of people with schizophrenia towards substance use. The comorbidity of substance abuse and schizophrenia worsens the prognosis for these patients and is considered a major risk factor for suicide in this population.

Impulsivity in Schizophrenia

The study results of Ouzir et al. [17], Sehgal and Patil [30] and Iancu et al. [31] have indicated that impulsivity in schizophrenia is associated with increased suicide and self-harm.

Ouzir et al. [17] also stated that impulsivity in individuals with schizophrenia can play a key role in maintaining addiction, which in turn can worsen the prognosis and exacerbate schizophrenia symptoms.

Impulsivity has an impact on increased substance abuse, and substance abuse directly affects the worsening of schizophrenia symptoms and suicide. Additionally, impulsivity itself can be a reason for suicide. Therefore, the comorbidity of these three factors can serve as predictors of suicide in individuals with schizophrenia.

Conclusion

Given the high suicide rate among individuals with schizophrenia, this issue has become a serious problem. Therefore, addressing suicide risk factors in these patients is of great importance for the management and prevention of suicide.

Numerous studies have focused solely on examining these suicide risk factors in individuals with schizophrenia, but to date, there has been limited research on predicting several of these factors for suicide.

The conducted studies indicate a high comorbidity between substance abuse and schizophrenia, and it has a significant impact on suicide in these patients. Additionally, sensory processing and impulsivity are crucial factors in self-harm and suicide attempts, although they have received less attention.

By examining the predictive impact of mentioned factors, it is possible to prevent suicide in schizophrenia by controlling and managing them.

Ethical Considerations

Compliance with ethical guidelines

This article is a review study with no human or animal sample.

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The paper was extracted from the master's thesis of Roya Shourvazi, approved by the Department of Occupational Therapy, School of Rehabilitation, [Shahid Beheshti University of Medical Sciences](#), Tehran, Iran.

Authors' contributions

Conceptualization and supervision: Marzieh Pashmdarfard, and Roya Shourvazi; Methodology: Marzieh Pashmdarfard and Navid Mirzakhany; Funding acquisition, and resources: Amir Rahmnanirasa. Writing the original draft: Roya shourvazi, and Maedeh Loabichian; Investigation, review and editing: All authors.

Conflict of interest

The authors declared no conflict of interest.

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مقاله مروری

بررسی ارتباط سه متغیر پردازش حسی، سوء مصرف مواد و تکانشگری با خودکشی در افراد مبتلا به اسکیزوفرنی: یک مطالعه مروری روایتی

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چکیده

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مقدمه: اسکیزوفرنی یک اختلال پیچیده و ناتوان کننده در سلامت روان می باشد که ۱ درصد جمعیت را درگیر می کند و با علائمی مانند هذیان، توهم و اختلال در توانایی شناختی همراه است. از دیگر علائم این بیماری تغییر در پردازش حسی می باشد که می تواند بر عاطفه این افراد تأثیر گذارد و باعث عواطفی مانند ناامیدی شود. همچنین هم ابتلایی بالایی بین سوء مصرف مواد، اسکیزوفرنی و تکانشگری دیده می شود. با توجه به اینکه نرخ بروز خودکشی در این بیماری نسبت به جمعیت عادی بسیار بالاتر می باشد و خودکشی اصلی ترین علت کاهش امید به زندگی در این بیماران محسوب می شود، هدف مطالعه حاضر بررسی ارتباط سه عامل پردازش حسی، سوء مصرف مواد و تکانشگری در بروز خودکشی در این بیماران می باشد.

مواد و روش ها: جست و جو در پایگاه های پابمد، وب آوساینس و موتور جست و جوی گوگل اسکالر با کلیدواژه های schizophrenia، sub-stance use disorder، sensory processing، impulsivity و stance use disorder انجام شد و ۱۶ مقاله از به روزترین و مرتبط ترین مطالعات برای گزارش انتخاب شدند.

یافته ها: مطالعات بررسی شده نشان دادند شیوع خودکشی در اسکیزوفرنی به ویژه در اوایل دوره بیماری بسیار بالا می باشد. تکانشگری می تواند باعث افزایش خودکشی و سوء مصرف مواد شود و سوء مصرف مواد نیز تأثیر مستقیم بر افزایش خودکشی دارد. همچنین مطالعات عنوان کردند مشکلات پردازش حسی می تواند باعث آسیب به خود و خودکشی شود. بنابراین حضور هر سه این موارد در بیماران می تواند خطر خودکشی را افزایش دهد.

نتیجه گیری: با توجه به افزایش روزافزون نرخ خودکشی در بیماران اسکیزوفرنی، بررسی ریسک فاکتورهای خودکشی در این بیماران اهمیت زیادی دارد. مطالعات انجام شده تا حد زیادی به این ریسک فاکتورها پرداخته اند، اما به پردازش حسی، تکانشگری و سوء مصرف مواد که عوامل مهمی در اقدام به آسیب به خود و خودکشی محسوب می شوند و نیز به میزان پیش بینی کنندگی آن ها برای بروز خودکشی کمتر پرداخته شده است که پیشنهاد می شود مطالعات بیشتری در این زمینه صورت گیرد.

کلیدواژه ها:

اسکیزوفرنی، خودکشی، پردازش حسی، تکانشگری، سوء مصرف مواد مخدر

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