



Stress-related cognitive–perceptual tendencies and their associations with psychological quality of life in informal Romanian schizophrenia caregivers: an exploratory ESI-based analysis

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Abstract

Background and aim. Family caregivers of individuals with schizophrenia frequently experience substantial emotional and functional strain, yet little is known about the subtle stress-related cognitive–perceptual tendencies that may emerge during long-term caregiving. Such tendencies, measurable with the Eppendorf Schizophrenia Inventory (ESI), have only recently begun to be examined in Romania, and their potential associations with caregiver well-being remain insufficiently explored.

The objectives of this study: to compare cognitive–perceptual tendencies between schizophrenia caregivers and matched hybrid controls; to examine associations between ESI subscales and quality of life (QoL), depressive symptoms, and cognitive performance among caregivers; and to interpret these findings within a stress–adaptation and response-shift framework.

Methods. In this cross-sectional study, 52 non-professional family caregivers of individuals with schizophrenia were compared with 52 matched hybrid controls comprising individuals with chronic somatic illnesses and their caregiving relatives. Participants completed the Romanian-adapted ESI, WHOQOL-BREF, Beck Depression Inventory (BDI), and Montreal Cognitive Assessment (MoCA). Group comparisons, Pearson correlations, and stratified exploratory comparisons based on Ideas of Reference were conducted.

Results. Caregivers showed moderately elevated ESI subscale scores, particularly Ideas of Reference, relative to controls. Higher Ideas of Reference scores were modestly associated with lower psychological QoL and higher depressive symptoms, whereas associations with cognitive performance were minimal. Correlation patterns indicated small-to-moderate associations across cognitive–perceptual tendencies and caregiver well-being domains.

Conclusions. In this exploratory, cross-sectional analysis, stress-related cognitive–perceptual tendencies were more pronounced in schizophrenia caregivers than in matched controls and showed modest associations with psychological QoL and depressive symptoms. These findings underscore the relevance of considering cognitive–perceptual stress responses in caregiver research while highlighting the need for longitudinal designs and formal psychometric validation of the Romanian ESI.

Keywords: schizophrenia, caregivers, quality of life, Eppendorf Schizophrenia Inventory, psychometrics, mental status and dementia tests, Romania

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Introduction

Schizophrenia remains one of the most disabling psychiatric disorders worldwide, profoundly affecting both individuals living with the illness and the family members who provide daily care [1–3]. In many European countries, and particularly in Romania where mental health resources are unevenly distributed, families constitute the main providers of community-based support [4,5]. Caregivers frequently assume responsibilities such as medication supervision, crisis management, emotional support, and navigation of the mental healthcare system [6,7]. Although these tasks are essential for patient stability, they expose caregivers to chronic stress, emotional strain, and diminished quality of life (QoL) [8–10]. Despite extensive documentation of emotional and social burden, comparatively little is known about stress-linked cognitive–perceptual tendencies that may emerge during sustained caregiving demands [11,12].

A substantial body of research has documented elevated depression, anxiety, sleep disturbance, financial strain, stigma, and social isolation among caregivers of individuals with schizophrenia. In Romania, caregiving demands are often intensified by limited access to community mental health services, resulting in sustained caregiving roles and reduced access to psychosocial support. However, how chronic caregiving stress influences cognitive or perceptual processes remains insufficiently understood, despite its potential relevance for explaining individual differences in caregiver resilience or vulnerability.

One particularly relevant domain involves subtle cognitive and perceptual tendencies, including heightened vigilance, increased sensitivity to social cues, and biased interpretations of ambiguous situations. These experiences, often conceptualized as non-pathological or subclinical “schizotypal-like” traits, may reflect stress-linked cognitive styles rather than underlying psychopathology. The Eppendorf Schizophrenia Inventory (ESI), a self-report instrument assessing domains such as ideas of reference, auditory uncertainty, perceptual distortion, and attentional difficulties, provides a structured approach to assessing these experiences. Although widely used internationally, the ESI has only recently been implemented in Romania, and its applicability to family caregivers has not yet been systematically examined. Examining cognitive–perceptual tendencies in caregivers using the ESI therefore represents a focused methodological extension of existing caregiver research.

Chronic caregiving frequently requires continuous monitoring of symptoms, anticipation of crises, and adaptation to unpredictable behavioral or emotional changes. This persistent state of alertness may shape how caregivers perceive and interpret environmental stimuli, potentially heightening sensitivity to ambiguous cues. While such cognitive–perceptual shifts may serve adaptive functions in managing daily demands, they may also contribute to emotional exhaustion or reduced QoL. Understanding

these processes is therefore important for clarifying how caregiving-related stress influences caregiver well-being.

A complementary framework for understanding caregiver adjustment is response shift, defined as changes in internal standards, priorities, or conceptualizations of quality of life in response to chronic stress or illness. Response shift may obscure declines in well-being when caregivers report stable QoL despite substantial objective strain. Cognitive–perceptual tendencies assessed with the ESI may interact with response-shift processes by influencing how caregivers evaluate stress, functioning, and daily demands.

Together, these considerations suggest that stress-related cognitive and perceptual adaptations may play an important role in caregiver functioning and may help explain why some caregivers experience reduced QoL despite maintaining outwardly stable daily performance. Given the scarcity of research addressing cognitive–perceptual correlates of caregiving, particularly in Eastern European contexts, the present study addresses a significant gap. Building on recent Romanian work that introduced the ESI for use in clinical and caregiving samples, we examine schizotypal-like cognitive and perceptual experiences among family caregivers of individuals with schizophrenia. Using a hybrid control group composed of individuals with chronic somatic illnesses and their family caregivers, all without psychiatric history, we compare ESI profiles across groups and examine how these experiences relate to QoL, depressive symptoms, and cognitive performance.

Therefore, the objectives of this study were:

1. To compare ESI scores of schizophrenia caregivers with those of hybrid controls, examining whether caregivers demonstrate elevated cognitive–perceptual tendencies relative to typical caregiving or chronic illness contexts.
2. To explore associations between ESI subscales and key psychosocial outcomes (quality of life, depressive symptoms, and functioning) among schizophrenia caregivers.
3. To interpret these findings within a stress–adaptation framework, considering the potential role of response shift in shaping subjective QoL assessments.

This analysis also extends our previously published QoL-focused report based on the same dataset. Whereas the earlier study examined group differences in quality of life between schizophrenia caregivers and matched controls, the present work addresses a distinct research question by focusing on stress-related cognitive–perceptual tendencies assessed with the ESI. By examining these schizotypal-like and stress-linked experiences, which were not included in the prior publication, the current study offers novel insights into cognitive–perceptual processing in Romanian caregivers. By integrating these domains, this exploratory study contributes to understanding how chronic caregiving may influence cognitive–perceptual processing and overall well-being and may inform future caregiver-focused research and support strategies.

In the present study, ESI scores are conceptualized

as context-sensitive, stress-related cognitive–perceptual experiences rather than as stable trait markers or indicators of latent psychopathology. Although the ESI was originally developed within schizotypy research, its subclinical scales capture subjective perceptual and interpretive experiences that may vary with environmental demands, emotional load, and situational stressors. Accordingly, ESI elevations in this caregiving sample are interpreted as reflecting stress-associated cognitive–perceptual tendencies rather than schizotypal traits or psychosis risk.

Methods

Study design

This cross-sectional study was conducted between October 2020 and January 2021 in the Department of Psychiatry at the Cluj County Emergency Clinical Hospital, Romania. The study examined stress-related cognitive–perceptual experiences and quality of life (QoL) among non-professional family caregivers of individuals with schizophrenia, compared with a hybrid control group consisting of individuals with chronic somatic illnesses and their caregiving relatives. All assessments were administered in validated Romanian versions. As in our previous report, all primary assessments were conducted by a single trained interviewer; in addition, in the present analysis we report the 20% double-rating quality control procedure that was also used in the original data collection.

The cross-sectional design was selected to allow an initial exploratory examination of cognitive–perceptual tendencies and their associations with psychosocial outcomes under real-world caregiving conditions, without implying temporal or causal relationships.

The Eppendorf Schizophrenia Inventory (ESI) was administered in its recently translated Romanian version, following an authorized translation and adaptation procedure conducted in accordance with Hogrefe Publishing guidelines. The translation was carried out using a forward–backward method with expert input and was preliminarily piloted on a small group to verify clarity and cultural appropriateness. A full psychometric validation of the Romanian ESI was not undertaken, as this was beyond the scope of the present study; instead, our aim was to apply the instrument in an exploratory manner to assess subtle subclinical cognitive–perceptual experiences associated with sustained caregiving and illness-related stress exposure.

Given that the Romanian version of the Eppendorf Schizophrenia Inventory (ESI) has not yet undergone formal psychometric validation, all ESI-derived findings in the present study are interpreted as descriptive indicators of self-reported cognitive–perceptual experiences, rather than as validated measures of latent psychological constructs. Subscale-level analyses are therefore intended to explore patterns of subjective experience within this sample, rather than to make definitive claims about specific cognitive–perceptual dimensions.

Internal consistency indices (Cronbach's α) were estimated for each ESI subscale in the present sample to support descriptive interpretation of the scores; these estimates are reported for transparency and do not constitute formal psychometric validation of the Romanian ESI.

The use of the ESI in this context is supported by its established theoretical structure, prior international applications in non-clinical samples, and its alignment with the assessment of subjective cognitive–perceptual experiences rather than diagnostic psychopathology.

The Frankness subscale, which primarily indexes response style, was not included in the present correlation and subgroup analyses, as our focus was on content-related cognitive–perceptual tendencies (IR, AU, DP, AS). As noted in our earlier QoL-focused report, the Romanian ESI was newly adapted in this sample, and here we explicitly emphasize its exploratory status and the need for formal validation. In our earlier QoL-focused analysis, we used the ESI as a broad proxy for psychopathology-related experiences in caregivers and controls. In the present secondary analysis, we focus more narrowly on the subclinical and stress-related aspects of these experiences, specifically cognitive–perceptual tendencies that are phenomenologically similar to those described in schizotypy research but can coexist with otherwise nonclinical functioning. Consistent with this conceptualization, ESI scores in the present study are treated as state-sensitive indicators of stress-related cognitive–perceptual experiences rather than as trait-level measures of schizotypy or psychosis liability.

Because the Romanian version of the ESI is newly adapted, several essential psychometric validation steps remain necessary for future research. These include formal assessment of internal consistency across subscales, examination of the factor structure through exploratory and confirmatory factor analyses, evaluation of test–retest reliability, and investigation of convergent and discriminant validity with related constructs such as schizotypal traits, perceived stress, or subclinical psychotic-like experiences. Establishing these metrics will be important for confirming the scale's reliability and construct validity in Romanian clinical and non-clinical populations and for supporting its use in future applied and clinical research.

Participants

Caregiver group

A total of 52 family caregivers of individuals with schizophrenia were recruited from the Department of Clinical Psychiatry. Caregivers participated together with their relatives diagnosed with schizophrenia; however, patient data were used solely to confirm diagnostic status and clinical stability, and patients were not included in any analyses for this study. Eligible patients were clinically stable adults meeting ICD-10 criteria for schizophrenia (F20.0–F20.9).

Caregivers were required to be the primary non-professional support persons, responsible for tasks such as

medication monitoring, symptom observation, daily living assistance, and emotional support. Caregiving involvement was required to be ongoing for a minimum of six months to ensure sufficient exposure to sustained caregiving demands.

Hybrid control group

The control group consisted of 52 participants recruited from the Occupational Health Clinic of the same hospital. This recruitment setting provided reliable access to individuals with chronic somatic conditions and their caregiving relatives, which was particularly important given the restrictions imposed during the COVID-19 pandemic.

The hybrid control group included two categories:

- Adults with chronic somatic illnesses (e.g., musculoskeletal, pulmonary, ophthalmologic, or cardiac conditions), and
- Their household relatives who provided informal, non-psychiatric caregiving support.

As in our previous QoL-focused analysis, individuals with any documented familial psychiatric conditions were excluded; in the present manuscript, we explicitly highlight first-degree relatives with severe psychiatric disorders as a key focus of this exclusion to ensure conceptual clarity and continuity with the earlier report.

To ensure comparability with the caregiver group while avoiding overlap with psychiatric caregiving, control participants with any personal psychiatric history were excluded, consistent with our earlier QoL-focused report using the same dataset. In the present analysis, we additionally specify that individuals with first-degree relatives diagnosed with severe psychiatric disorders were also excluded, in order to minimize potential familial psychiatric loading and to maintain a clear contrast with mental-health-related caregiving.

Although heterogeneous, this control group reflects a population exposed to chronic illness-related stress and caregiving demands, thereby enhancing ecological validity

while remaining distinct from mental health caregiving. Importantly, this heterogeneity is intentional and conceptually aligned with the study’s aim of comparing schizophrenia-related caregiving with other naturally occurring chronic care contexts. Including both somatic patients and their informal caregivers captures a broader spectrum of real-world stress exposure, functional demands, and role-related responsibilities. This design choice therefore prioritizes ecological validity over strict sample homogeneity, while preserving a clear conceptual boundary from psychiatric caregiving.

Matching procedure

In line with the original QoL-focused report, controls were initially selected to approximate caregivers on age, gender, and socioeconomic status; in the present secondary analysis, we additionally examined equivalence on education, employment status, and somatic health burden.

Each control participant was selected to approximate a caregiver of an individual with schizophrenia at the group level, based on age, gender, and socioeconomic status; in the present secondary analysis, comparability on education, employment status, and somatic health burden was additionally examined.

Rather than strict one-to-one individual matching, a frequency-based matching approach was applied, with the aim of minimizing large demographic imbalances between groups while preserving feasibility under COVID-19 recruitment constraints. As a result, residual differences between groups were anticipated and are reported descriptively, consistent with the exploratory aims of the study.

Inclusion and exclusion criteria

Inclusion and exclusion criteria were predefined to ensure consistency across the study cohorts. The detailed inclusion and exclusion criteria for family caregivers of individuals with schizophrenia and control subjects are summarized in tables I-II.

Table I. Inclusion and exclusion criteria for schizophrenia caregivers.

Inclusion criteria	Exclusion criteria
Adults ≥ 18 and ≤ 70 years of age	Presence of any form of “Intellectual Disability” (ICD-10: F70-F73, F79)
Primary non-professional caregiver for the patient for at least 6 months	Current or past severe alcohol or substance dependence (ICD-10: F10.0-2, F10.9), including abuse or habitual consumption of illicit drugs (Law no. 143/2000)
No personal diagnostic history of a severe psychiatric condition	Severe psychiatric conditions, such as schizophrenia, major depressive disorder, or bipolar disorder
Able to provide informed consent	Severe physical health conditions that significantly impair caregiving capacity
	Significant cognitive impairments, defined by scores below the threshold on a cognitive screening tool (e.g., MoCA)
	Refusal of informed consent or withdrawal from the study

Note: Caregivers with mild depression or anxiety were not excluded, as these conditions are common among caregivers and might provide valuable insight into caregiving stress.

Table II. Inclusion and exclusion criteria for the control group.

Inclusion criteria	Exclusion criteria
Adults ≥ 18 years of age	Presence of any form of “Intellectual Disability” (ICD-10: F70-F73, F79)
Individuals with severe chronic health conditions (e.g., musculoskeletal, pulmonary, ophthalmologic, cardiac) that either require long-term medical care or prevent them from working, along with close relatives living in the same household who may take on caregiving responsibilities.	Current or past severe alcohol or substance dependence (ICD-10: F10.0-2, F10.9), including abuse or habitual consumption of illicit drugs (Law no. 143/2000)
No diagnostic history of “psychiatric conditions,” neither personal nor familial	Chronic dependence on alcohol or other substances (ICD-10: F10.2)
Level of education comparable to study subjects	Caregiver role for any individual with a mental health disorder, including schizophrenia
Able to provide informed consent	Refusal of informed consent or withdrawal from the study

Note: The control group included individuals with severe chronic health conditions (e.g., musculoskeletal, pulmonary, ophthalmologic, or cardiac conditions) that typically exclude them from working. Many of these individuals required varying levels of care and support from a family relative, similar to the caregiving responsibilities seen in the schizophrenia patient cohort. However, none of the individuals in the control group or their relatives were diagnosed with schizophrenia or any other severe mental health disorder.

Data collection

Assessment tools

A targeted set of psychometric instruments was used to evaluate quality of life, cognitive functioning, depressive symptoms, and stress-related cognitive-perceptual experiences across caregivers and control participants. The selection of instruments reflected the specific aims of the study and the characteristics of the Romanian clinical and socio-cultural context.

The Eppendorf Schizophrenia Inventory (ESI) served as the primary assessment tool for this study. The ESI assesses subtle, non-clinical cognitive-perceptual and schizotypal-like experiences, making it particularly suitable for examining stress-linked tendencies in caregivers and non-psychiatric control participants. The present study applied the recently translated Romanian version of the ESI within an exploratory caregiver-control framework. The instrument was translated and adapted in accordance with Hogrefe Publishing procedures, using a forward-backward translation method with expert input and small-scale pilot testing to ensure clarity and cultural appropriateness. The ESI provided the core outcome variables used to compare caregivers and controls.

Quality of life was assessed using the WHOQOL-BREF, administered to caregivers and control participants to evaluate physical, psychological, social, and environmental domains. This instrument was selected for its suitability in both clinical and non-clinical populations and its relevance for capturing the broad impact of chronic stress and caregiving demands.

Depressive symptoms were evaluated using the Beck Depression Inventory (BDI), which was administered to both caregivers and control participants to assess the presence and severity of depressive symptomatology in non-psychiatric populations.

Cognitive functioning was assessed using the Montreal Cognitive Assessment (MoCA), administered to both caregivers and control participants. The standard cutoff score of less than 26 was applied to indicate mild cognitive impairment.

This integrated selection of instruments enabled a comprehensive assessment of psychological functioning across the two study groups, while ensuring that the primary focus on stress-related cognitive-perceptual tendencies measured by the ESI remained central to the analytical framework.

Table III summarizes the assessment tools and measures used to evaluate quality of life, depressive symptoms, cognitive function, and psychopathology across schizophrenia family caregivers, and control subjects. The primary purpose and specific assessment domain of each tool are also detailed.

Data collection procedure

Data collection took place over a four-month period (October 2020–January 2021) and followed a structured, two-stage process involving clinical interviews and standardized psychometric assessments. To ensure procedural consistency and minimize interviewer-related variability, all primary assessments were administered by a single trained interviewer. To further support scoring accuracy, approximately 20% of interviews were independently rated by a second assessor who was blinded to participant group and study objectives. These parallel ratings were used to verify scoring fidelity across instruments. Any discrepancies were resolved through consensus discussion, during which item-level differences were reviewed and clarified in accordance with standardized scoring guidelines. This approach ensured strong internal consistency in scoring practices without necessitating the calculation of formal interrater reliability coefficients.

Table III. Assessment tools and measures for schizophrenia family caregivers and control subjects.

Subjects	Assessment Area	Assessment Tools	Details
Schizophrenia Family Caregivers and Control Subjects	Quality of Life (QOL)	WHOQOL-BREF	Evaluates quality of life in caregivers and control subjects.
	Depressive Symptoms	BDI	Evaluates depression levels in caregivers and controls.
	Neurocognitive Function	MoCA	Evaluates neurocognitive functioning.
	Subtle schizotypal-like experiences	ESI (Romanian version)	Evaluates subtle schizotypal-like cognitive-perceptual tendencies (e.g., ideas of reference, perceptual sensitivity, attentional disruptions).

Note: Abbreviations used: BDI: Beck Depression Inventory; ESI: Eppendorf Schizophrenia Inventory; MoCA: Montreal Cognitive Assessment; WHOQOL-BREF: World Health Organization Quality of Life - Brief Version.

Data analysis

Statistical techniques

Data analysis was performed using IBM SPSS Statistics® (Version 31). Correlation analyses were conducted to examine relationships between quality of life (QoL) and relevant cognitive-perceptual, affective, and cognitive performance variables. Spearman rank-order correlations were additionally inspected as a robustness check and yielded the same overall pattern of associations; therefore, Pearson coefficients are reported for consistency and ease of interpretation. Group comparisons were performed using independent samples t-tests and, where applicable, one-way ANOVA, as appropriate, to evaluate differences in key outcomes such as QoL and MoCA scores across caregiver and control groups. In addition, independent samples t-tests were used to compare ESI total and subscale scores between family caregivers of individuals with schizophrenia and control subjects; where distributional assumptions were not met, non-parametric Mann-Whitney U tests were applied. All statistical tests were two-tailed, and significance was set at $p < .05$.

Prior to inferential analyses, distributional assumptions were evaluated using visual inspection of histograms and Q-Q plots, complemented by Shapiro-Wilk tests. Normality was evaluated both for the full sample and within IR-defined subgroups; based on these assessments, parametric tests were retained for primary analyses, with non-parametric Mann-Whitney U tests used as robustness checks for variables showing evidence of skew at the sample level. Median-split stratification of Ideas of Reference scores was used solely for descriptive and illustrative purposes, to facilitate visualization of patterns observed in continuous analyses, and was not intended as a confirmatory analytic approach.

Effect sizes were calculated to facilitate interpretation of findings in this exploratory study, using Cohen's d for parametric group comparisons and

Pearson's r for correlation analyses. For non-parametric Mann-Whitney U tests, effect sizes were expressed as r values derived from standardized z statistics ($r = z/\sqrt{N}$). Given the exploratory nature of the study and the limited sample size, no formal correction for multiple comparisons was applied; results are therefore interpreted cautiously, with emphasis placed on effect size patterns rather than isolated p values.

Given the exploratory aims of the study and the modest sample size, no multivariable or covariate-adjusted models were applied. Although group differences were observed on several sociodemographic variables, inclusion of multiple covariates would have substantially reduced statistical power and increased the risk of model overfitting. Accordingly, analyses focused on unadjusted group comparisons and within-group associations, with effect sizes interpreted descriptively. This approach is consistent with the study's exploratory design and the primary objective of characterizing stress-related cognitive-perceptual tendencies rather than estimating adjusted effect parameters.

Ethical considerations

The study was conducted in full compliance with the ethical standards outlined in the Declaration of Helsinki [13]. Ethical approval was obtained from the ethics committee of the Iuliu Hațieganu University of Medicine and Pharmacy prior to the initiation of the study. All participants provided written informed consent, and confidentiality was rigorously maintained, with GDPR compliance ensured according to GDPR EU 2016/679. Participants were informed of their right to withdraw from the study at any time without any consequences. Measures were also taken to minimize any psychological distress that could arise from participation, including regular monitoring of participants' mental states throughout the study and providing immediate access to psychiatric support services if any signs of exacerbated psychopathology were observed.

Results

Sociodemographic characteristics

Table IV summarizes the sociodemographic and caregiving characteristics of the schizophrenia caregiver group and the hybrid control group. Compared with controls, caregivers were older on average and included a higher proportion of female participants. Employment status and kinship roles differed between groups, with caregivers more frequently identified as parents of the care recipient and controls more frequently identified as spouses or adult children. Caregiving duration and co-residence with the care recipient were higher in the schizophrenia caregiver group. The hybrid control group included both individuals with chronic somatic illnesses and their caregiving relatives.

No inferential statistical comparisons were conducted for these descriptive variables; group comparability was addressed through the a priori frequency-based matching strategy described in the

Methods section, with remaining differences reported descriptively.

Internal consistency of the Eppendorf Schizophrenia Inventory

Internal consistency of the Romanian-adapted Eppendorf Schizophrenia Inventory (ESI) subscales was examined in the schizophrenia caregiver group using Cronbach's α . Internal consistency was acceptable for exploratory research purposes across all content-related subscales. Cronbach's α values were as follows: Ideas of Reference ($\alpha = 0.73$), Auditory Uncertainty ($\alpha = 0.76$), Deviant Perception ($\alpha = 0.83$), and Attention/Speech Impairment ($\alpha = 0.87$). The Frankness subscale, which indexes response style rather than content-related experiences and was not included in primary analyses, showed lower internal consistency ($\alpha = 0.59$).

These estimates support the internal coherence of ESI subscale scores for descriptive and exploratory analyses but do not replace the need for full psychometric validation.

Table IV. Sociodemographic and clinical characteristics of schizophrenia caregivers and hybrid controls.

This table presents the main sociodemographic and caregiving characteristics of schizophrenia caregivers and hybrid controls, outlining contextual differences between the two groups.

Variable	SZ Caregivers (n = 52)	Hybrid controls (somatic patients + caregivers, n = 52)	Note
Age	50 \pm 11.3	46 \pm 10.1	Age reported in years; values represent mean \pm SD.
Sex			Gender coded as male/female; values represent percentages within each group.
• Female	32 (61.5%)	28 (53.8%)	
• Male	20 (38.5%)	24 (46.2%)	
Education	11.5 \pm 2.4	12.2 \pm 2.6	Educational attainment reported as years of completed education.
Employment			Employment status categorized as employed, unemployed, or homemaker.
• Employed	28 (54.7%)	41 (79.6%)	
• Unemployed /homemaker	18 (34.5%)	10 (19.8%)	
• Retired	6 (10.8%)	1 (1.9%)	
Relationship to care recipient			Primary caregiving relationship defined as the main relative receiving or providing care.
• Parent	29 (55.8%)	10 (19.2%)	
• Spouse / partner	14 (26.9%)	24 (46.1%)	
• Son / daughter	5 (9.6%)	10 (19.2%)	
• Other relative (sibling, in-law etc.)	4 (7.7%)	8 (15.4%)	
Living with care recipient (yes)	44 (84.6%)	34 (65.4%)	Cohabitation defined as living in the same household as the care recipient.
Duration of caregiving, years	10.2 \pm 6.1	5.1 \pm 4.3	Caregiving duration reported in years.

Note: Abbreviation used: SZ: Schizophrenia.

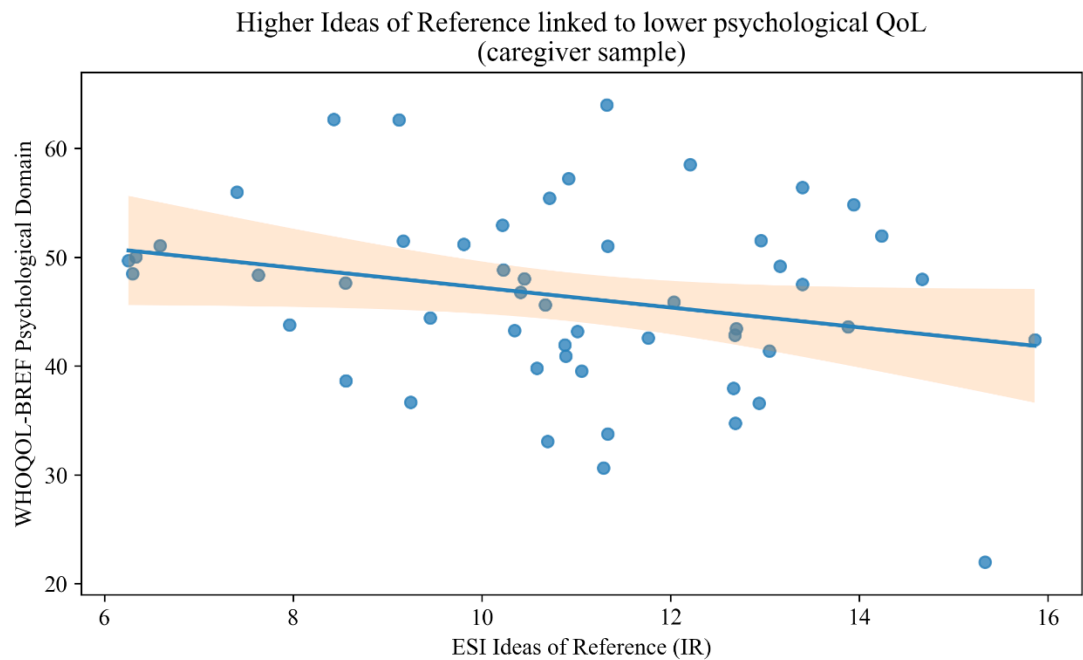


Figure 1. Scatterplot of Ideas of Reference and Psychological Quality of Life in Family Caregivers. Scatterplot depicting ESI Ideas of Reference scores and psychological QoL scores among non-professional family caregivers of individuals with schizophrenia. Each point represents an individual caregiver, and the fitted regression line is shown for descriptive purposes.

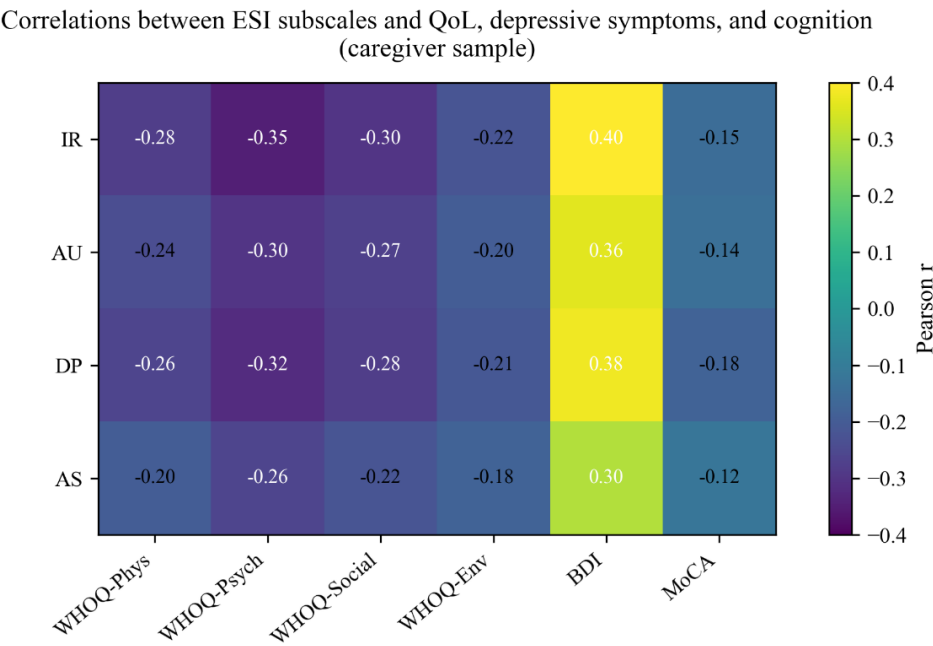


Figure 2. Heatmap of ESI subscales and caregiver outcome measures in family caregivers. Heatmap displaying Pearson correlation coefficients between Eppendorf Schizophrenia Inventory (ESI) subscales, including Ideas of Reference (IR), Auditory Uncertainty (AU), Deviant Perception (DP), and Attention/Speech Impairment (AS), and caregiver outcome measures, including WHOQOL-BREF domain scores, Beck Depression Inventory (BDI) scores, and Montreal Cognitive Assessment (MoCA) scores. The color scale represents the magnitude and direction of correlation coefficients, with exact r values indicated. Correlations are presented for descriptive purposes to illustrate overall association patterns; inferential interpretation of individual coefficients should be made cautiously.

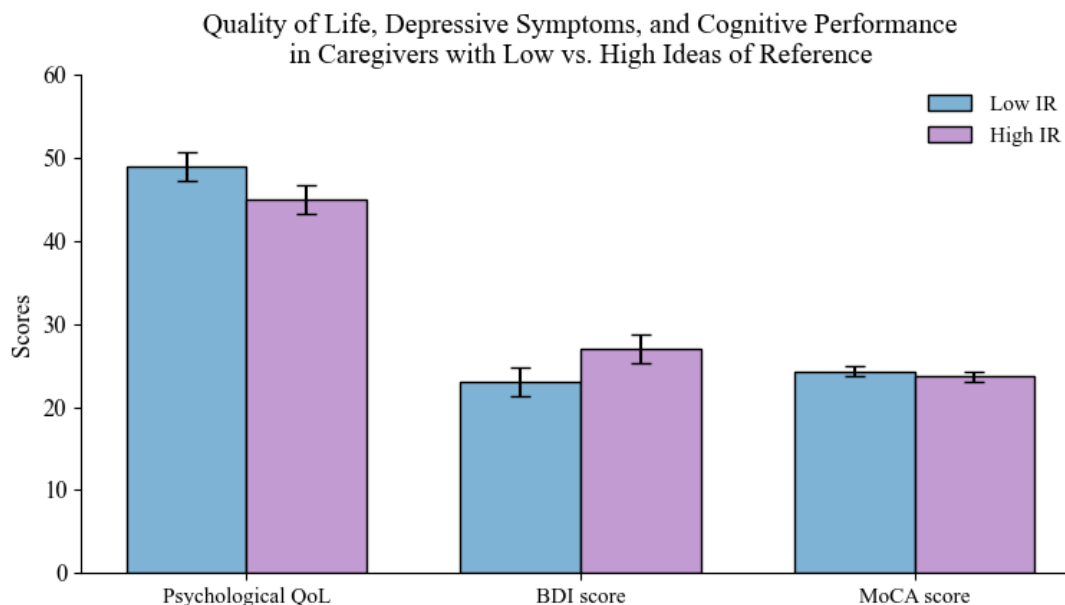


Figure 3. Bar plots of psychological quality of life, depressive symptoms, and cognitive performance by Ideas of Reference group in caregivers. The bar chart displays mean scores (\pm standard error) for the WHOQOL-BREF Psychological Domain, Beck Depression Inventory (BDI), and Montreal Cognitive Assessment (MoCA) among caregivers stratified into low and high Ideas of Reference (IR) groups based on a median split of the ESI Ideas of Reference subscale.

For non-parametric group comparisons, effect sizes were calculated from standardized z statistics ($r = z/\sqrt{N}$) and fell within the small-to-moderate range.

Discussion

Restatement of key findings

This study builds on our previously published implementation of the Romanian version of the Eppendorf Schizophrenia Inventory (ESI) and provides exploratory evidence that family caregivers of individuals with schizophrenia reported moderately elevated scores on stress-linked cognitive-perceptual domains, with the largest group differences observed on the Ideas of Reference (IR) subscale, compared with a matched hybrid control group. Within the caregiver group, higher reported IR subscale scores co-occurred with lower psychological quality of life and higher depressive symptomatology, whereas correlations with cognitive performance were minimal. These within-group associations do not appear to account for the previously observed group difference in cognitive performance (MoCA) between caregivers and controls. Overall, the pattern of findings is consistent with the observation that subtle cognitive-perceptual tendencies are reported alongside sustained psychiatric caregiving contexts; however, the cross-sectional design precludes

causal inference. Moreover, given the heterogeneous composition of the comparison group, these findings should be interpreted as reflecting differences between schizophrenia caregivers and a non-psychiatric, mixed caregiving and illness context, rather than as evidence of schizophrenia-specific caregiving effects.

Interpretation of findings

For the purposes of the present analysis, findings involving ESI subscales should be interpreted as descriptive patterns of self-reported cognitive-perceptual experiences within a specific caregiving context, rather than as evidence for distinct or validated psychological constructs.

Stress-linked cognitive-perceptual tendencies in caregivers

Family caregivers reported moderately elevated scores across several ESI subscales, most notably Ideas of Reference, with additional elevations observed in Deviant Perception and Attention/Speech Impairment, whereas Auditory Uncertainty showed minimal separation between groups. These elevations remained within the subclinical range and were observed in a non-clinical caregiving sample. Within this caregiving context, these patterns of self-reported cognitive-perceptual experiences are best interpreted as variations that co-occur with sustained caregiving demands rather than indicators of manifest psychopathology.

Previous theoretical and empirical work has described increased vigilance, heightened sensitivity to ambiguity, and shifts in interpretive processing under conditions of prolonged stress exposure [14–16]. In the context of schizophrenia caregiving, relatives are routinely exposed to fluctuating symptom severity, uncertainty regarding illness course, and ongoing responsibility for monitoring changes in behavior or functioning. Such contextual features may help to situate why higher ESI subscale scores were more frequently reported in caregivers than in the heterogeneous non-psychiatric control group, although the present data do not allow conclusions regarding underlying mechanisms [17–19].

In routine caregiving for individuals with schizophrenia, relatives are often required to monitor for early signs of relapse, changes in symptom severity, and potential situational risks. These ongoing caregiving conditions are commonly accompanied by sustained vigilance and heightened attention to ambiguous environmental or interpersonal cues. Such patterns are consistent with stress-adaptation and cognitive-load frameworks that describe shifts in attentional focus and interpretive processing under prolonged stress exposure [16,20,21], as well as with prior research documenting the cognitive and emotional burden associated with psychiatric caregiving in comparable populations [22–24].

Associations with psychological quality of life and depressive symptoms

Within the caregiver group, higher Ideas of Reference scores were modestly associated with lower psychological quality of life and higher depressive symptom levels. These associations indicate that caregivers reporting more frequent cognitive–perceptual experiences of this type also tended to report poorer psychological well-being. Comparable patterns have been described in cognitive models linking stress-related interpretive processes with emotional distress and depressive symptomatology [25–27], as well as in studies of caregiver burden in psychiatric populations, including Romanian samples [9,28].

Across ESI subscales, positive correlations with depressive symptoms were observed, suggesting that cognitive–perceptual tendencies and affective distress co-occur in caregivers experiencing higher overall burden. This pattern aligns with broader literature conceptualizing caregiver stress as a multidimensional phenomenon encompassing emotional, cognitive, and contextual components [29–32]. However, given the cross-sectional design, no conclusions can be drawn regarding the temporal or causal relationships among these domains.

Relationship with cognitive performance

Associations between ESI subscales and cognitive performance, as measured by the MoCA, were small in magnitude. This finding is consistent with earlier work showing lower mean MoCA scores in caregivers compared with controls, while indicating that variability in cognitive–

perceptual tendencies within the caregiver group does not strongly correspond to cognitive performance differences [5]. The present analyses therefore suggest that elevations in ESI scores are observed alongside, rather than being tightly linked to, objective cognitive performance within this sample.

Similar dissociations between subjective cognitive or perceptual experiences and objective cognitive test performance have been reported in other populations exposed to chronic stress [33–35]. Together, these observations support the interpretation that the cognitive–perceptual tendencies captured by the ESI reflect experiential dimensions of caregiver strain rather than measurable neurocognitive impairment.

Positioning the findings within Romanian caregiving research

Research conducted in Romania has consistently documented substantial emotional burden, reduced quality of life, and elevated depressive symptoms among family caregivers of individuals with schizophrenia [5,36]. These challenges are often compounded by socioeconomic strain and limited access to structured psychosocial support [5,37–39]. The present study extends this body of work by examining cognitive–perceptual experiences as an additional descriptive dimension of caregiver burden in a Romanian context.

By focusing on stress-linked cognitive–perceptual tendencies, the findings contribute data on a psychological domain that has received limited empirical attention in Romanian caregiver research. The observed associations with psychological quality of life and depressive symptoms highlight intersections between perceptual experiences and emotional well-being, while underscoring the need for longitudinal and psychometrically robust studies to clarify their development, stability, and clinical relevance.

Limitations

Several limitations should be considered when interpreting the present findings. First, the cross-sectional design precludes causal inference regarding the directionality of associations between cognitive–perceptual tendencies, caregiving stress, depressive symptoms, and quality of life. Second, although the sample size was appropriate for exploratory analyses, it limited statistical power and precluded the use of more complex analytic approaches, such as multivariable modeling or mediation analyses. Third, the hybrid control group comprised heterogeneous caregiving and somatic illness profiles, which may have introduced unmeasured variability despite the application of an a priori frequency-based matching strategy. Given this hybrid composition, observed between-group differences cannot be attributed specifically to schizophrenia caregiving per se. Instead, these contrasts should be interpreted as contextual comparisons between schizophrenia caregiving and a heterogeneous non-

psychiatric illness and caregiving context, reflecting differing constellations of chronic stress exposure rather than diagnosis-specific effects. Rather, these differences reflect comparisons between schizophrenia caregivers and a heterogeneous non-psychiatric comparison group exposed to varying forms of chronic illness, caregiving demands, and role-related stress. Consequently, the present findings should be interpreted cautiously and not as evidence of schizophrenia-specific caregiving effects. Importantly, no covariate-adjusted or sensitivity analyses were conducted; as a result, observed group differences and associations cannot be interpreted as independent of demographic or caregiving-related factors such as age, sex, caregiving duration, or co-residence. Fourth, the study relied primarily on self-report measures, which may be influenced by subjective reporting biases, coping-related response shift, and contextual factors associated with the COVID-19 period during data collection. Fifth, while the MoCA provides a brief screening of global cognitive functioning, it may lack sensitivity to detect subtle cognitive changes or stress-related attentional fluctuations in high-stress but otherwise nonclinical populations. Finally, as the Romanian version of the ESI has not yet undergone full psychometric validation, interpretations of its subscales should be considered preliminary pending future studies establishing its reliability and factorial structure. Although internal consistency was estimated in the present sample, full psychometric validation of the Romanian ESI—including factor structure, test–retest reliability, and construct validity—remains necessary. In addition, the absence of covariate-adjusted analyses limits the ability to disentangle the independent contribution of sociodemographic factors to observed group differences. Furthermore, subgroup comparisons based on median splits of continuous variables are inherently arbitrary and may reduce statistical power; in the present study, such stratified analyses were included solely to facilitate visualization of patterns observed in continuous associations and should be interpreted as illustrative rather than as evidence of discrete caregiver subgroups.

Clinical implications

From a clinical perspective, the present findings suggest that consideration of subtle cognitive–perceptual stress responses may be relevant when assessing caregivers providing long-term psychiatric care. Elevations in tendencies such as increased vigilance or interpretive bias may reflect psychological strain that is not fully captured by traditional burden or quality-of-life measures. These observations may inform future research examining whether psychoeducational or support-oriented interventions could address aspects of cognitive load, vigilance, or perceptual sensitivity in caregiver populations. Any such interventions would require prospective evaluation, as the present findings

are exploratory and do not establish the effectiveness of specific clinical approaches.

Conclusion

This study builds on our previously published implementation of the Romanian version of the Eppendorf Schizophrenia Inventory (ESI) and provides exploratory evidence that family caregivers of individuals with schizophrenia reported moderately elevated stress-related cognitive–perceptual tendencies relative to matched hybrid controls. These self-reported cognitive–perceptual tendencies, particularly higher scores on the Ideas of Reference subscale, were modestly associated with lower psychological quality of life and higher depressive symptoms, whereas associations with cognitive performance were minimal. The findings highlight the relevance of considering subtle cognitive–perceptual processes when evaluating caregiver well-being and point to the complexity of caregiver experiences under conditions of chronic stress. Future longitudinal and psychometric research is needed to explore the temporal dynamics of these associations and to further validate the Romanian version of the ESI.

Declaration of generative AI and AI-Assisted technologies in the writing process

The authors used generative artificial intelligence (AI) tools in a limited, assistive capacity during the preparation of this manuscript. Specifically, digital writing aids such as the rewrite, grammar, and style-suggestion functions in Microsoft® Word and Grammarly™ were consulted to support linguistic refinement, clarify phrasing, and improve readability. No AI system generated, analyzed, or interpreted research data, nor did any AI tool contribute to the conceptualization, methodology, results, or scientific conclusions of the study.

All AI-assisted suggestions were critically reviewed, revised, and edited by the authors, who retained full control over the intellectual content and writing process. The final manuscript represents original scholarly work produced by the authors, and all interpretations, arguments, and conclusions are solely the authors' own.

Because generative AI systems can introduce stylistic patterns that may occasionally be misclassified by automated AI-detection tools, the authors affirm that human oversight was applied throughout the drafting and revision process to ensure accuracy, academic integrity, and adherence to disciplinary standards.

Responsibility for the content of the final manuscript rests entirely with the authors.

Data availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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