Iran J Psychiatry 2025; 20: 4: 1-11

Original Article

Embodied Self and Metaphor Comprehension Predict Comprehension of Boundary Concept in Patients with Schizophrenia

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Abstract

Objective: The embodied self refers to the sense of self intertwined with the physical body and its experiences, which is impaired in schizophrenia. Comprehension of metaphors that are cognitive tools to help the comprehension of abstract ideas is also impaired in patients with schizophrenia. The Conceptual Metaphor Theory (CMT) links embodied experiences and metaphors to boundaries, indicating that these disruptions may lead to difficulties in understanding boundaries in schizophrenia. This study explores the role of embodied self and metaphor comprehension in predicting boundary concept comprehension in patients with schizophrenia.

Method: This study employed a cross-sectional correlational design to examine the relationships among variables. The current study recruited 85 Male patients who were diagnosed with schizophrenia (mean age = 47.84 years, SD = 7.58) through a convenience sampling method. All participants completed the Embodied Sense of Self scale, the Montreal Evaluation of Communication (MEC) Metaphor subtest, and a researcher-developed questionnaire assessing comprehension of the boundary concept. Multiple linear regression analyses were applied to assess the associations between the embodied self, metaphor comprehension, and understanding of the boundary concept.

Results: The suggested Model predicts 50% of the total variance ($P < 0.01$, $R2 = 0.50$). Metaphor comprehension predicts boundary concept understanding ($\beta = 0.67$, $P \leq 0.01$, $R2 = 0.50$), while the embodied self ($\beta = -0.13$, $P = 0.1$, $R2 = 0.50$) does not.

Conclusion: Our findings indicate that impairments in metaphor comprehension are significantly related to the understanding of boundary concepts in schizophrenia, while no such relationship was observed with the embodied self. These results highlight the role of metaphorical cognitions in boundary perception, potentially extending to issues with the self-other boundary and representing relations of self-other boundary disturbances and Metaphorical cognition.

Key words: *Boundary; Cognition; Embodiment; Metaphor; Schizophrenia*

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Article Information:
Received Date: 2025/04/22, Revised Date: 2025/06/21, Accepted Date: 2025/07/19

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Schizophrenia is a severe disorder that affects several cognitive functions, including thoughts, emotions, language processing, and particularly Metaphor comprehension (1–6). Boundary perception is one of the cognitive processes that is impaired in individuals with schizophrenia (7, 8).

Individuals establish boundaries to structure and manage unorganized experiences. These boundaries operate as dynamic mechanisms necessary for the development and maintenance of self-experience. Under optimal circumstances, boundaries function as transitional realms that paradoxically join and separate areas of experience. This function gives people the opportunity to stay receptive to fresh possibilities while maintaining a coherent sense of self (9, 10). Boundaries provide a methodology of awareness, within internal awareness and between individuals (11) and play an essential role in mental organization by offering a framework for connection and separation (12, 13). This structure helps individuals preserve a balanced relationship with the world, assuring they neither become dominated by it nor lose their association (9, 14).

In patients with schizophrenia, this boundary perception is impaired and this impairment is reflected in self-other boundary difficulties (7, 8). Self-other boundary problems contribute to difficulties in distinguishing between what is self and what is not (other), and result in a loss of balance between self and other (7, 15).

The imbalance between self and the other, caused by the boundary defects between self and other in patients with schizophrenia gives rise to two distinct patterns: A diminished or an inflated sense of self. The first pattern - diminished sense of self- is followed by an exaggerated perception of the other (everything that is not self), which is evident in Schneiderian first-rank symptoms such as delusions of control, thought insertion, and experiences of alienation (7, 8). The second pattern - inflated sense of self- results in a diminished recognition of the other (all that is not self), reflected in delusions of reference and persecutory delusions (8).

Despite significant advances in schizophrenia studies, the specific mechanisms behind this boundary dysfunction remain poorly understood. Therefore, in this study, we decided to investigate this impairment considering the Conceptual Metaphor Theory (CMT).

Based on Lakoff and Johnson's assertions in CMT, boundaries are intricately connected with embodied experiences and metaphor structures (16–18). To elaborate, the human body, particularly the skin, is a boundary that separates humans from the world and establishes a distinction between what is inside the body/skin and what is outside the body/skin. This embodied boundary structure forms the basis for understanding the boundary concept. After the formation of the boundary concept through embodiment, abstract boundaries can be conceptualized through the structure of metaphors that map sensory embodied experiences with abstract concepts to make them comprehensible. In this context, boundaries are shaped through embodied processes and comprehended through the mind's metaphorical structure (19).

According to the CMT, embodiment and metaphor are two components involved in the comprehension of the boundary. Moreover, based on the literature review, Patients with schizophrenia have problems with embodiment and metaphor comprehension (20–22). The embodied sense of self (ESS), which is an integral part of embodiment, is the subjective experience of selfhood grounded in the body and sensorimotor system. Impairments in the ESS (20, 23) are well-documented in schizophrenia psychopathology (24, 25). Likewise, Metaphor comprehension problems characterized by problems in recognizing, producing, and comprehending metaphors, especially novel metaphors, have been reported in patients with schizophrenia (6, 21, 26).

All in all, problems in embodiment, metaphor comprehension, and boundary concepts seem to be associated with each other and prevalent in patients with schizophrenia (19, 27, 28). Furthermore, these elements can be investigated in relation to the CMT.

The boundary concept comprehension can be considered as a phenomenological element, such as the ability to distinguish between what is self and what is not self (other) (9) or as a linguistic comprehension, such as the ability to distinguish between what is inside and what is outside (16–18, 29). In this study, given that boundary perception in patients with schizophrenia is impaired, we aim to assess the relationship between linguistically based boundary perception and other cognitive-linguistic elements, such as metaphor comprehension and Embodiment of the self.

In this paper, we explore the role of the embodied self (as a signifier of embodiment) and metaphor comprehension in understanding the boundary concept, investigating the well-known boundary problems in patients with schizophrenia from the perspective of CMT. If the results confirm the hypothesis of this research, then a connection between perceptual and cognitive domains would be indicated. Specifically, phenomenological experiences such as boundary perception may be related to cognitive constructs like metaphor comprehension and embodiment. Also, this interplay would highlight the potential for integrating linguistic and cognitive approaches in understanding perceptual experiences. Consequently, this study aims to explore such relationships, with the broader goal of informing the development of linguistically grounded interventions for individuals exhibiting related cognitive-perceptual patterns. Furthermore, if no significant relationship is found, we should concentrate on alternative perspectives to examine the boundary problem in patients with schizophrenia.

Building on findings of disturbances in figurative language (i.e., metaphor) and the embodied sense of self problems in patients with schizophrenia, we aim to

construct a comprehensive model of the boundary concept based on CMT by integrating the concepts of the embodied self, metaphorical cognition, and the boundary concept. This study hypothesizes that deficits in metaphor comprehension and abnormalities in the embodied self can predict disturbances in comprehension of the boundary concept. Therefore, in this research, we examine whether boundary concept disturbances in patients with schizophrenia are related to the difficulties in Metaphor comprehension (Hypothesis 1) and disruptions in the embodied self (Hypothesis 2).

Materials and Methods

Study Design

This study employed a fundamental cross-sectional correlational design. For this purpose, we applied a convenient sampling method to recruit participants.

Participants and Procedure

Between June and August 2024, 85 inpatient participants diagnosed with schizophrenia were enrolled in this study from the chronic psychiatric ward of the Razi Psychiatric Hospital in Tehran, Iran. The required sample size was calculated using G*Power 3.1 (30), assuming an alpha level of 0.05, a statistical power of 0.80, and a medium effect size ($f^2 = 0.15$) appropriate for multiple linear regression analysis. Participants with diverse educational backgrounds, from primary school to higher education levels, have participated in this research. All interviewees were in the age range of 32 to 63 and had different marital statuses, from married and unmarried to divorced.

The inclusion and exclusion criteria followed the DSM-5 criteria and were approved by psychiatrists. In order to ensure diagnostic stability, the inclusion criteria included individuals who experienced chronic schizophrenia. Patients who were experiencing an acute outbreak or a first psychotic episode were not involved in the study. Moreover, to eliminate effects other than schizophrenia on cognitive abilities, participants who experienced schizoaffective disorder or post-substance use psychosis were removed in the first step.

Caregivers and participants signed written consent forms and were informed of the study's goals and instructions. Participants received a small gift for their participation.

Every experiment day started at 8 am and finished at 1.30 pm (After breakfast until before lunch). All interviews were administered in the psychology office of each ward, which was a quiet area. For each interviewee and on each test day, the interviewer orally administered the Metaphor questionnaire, an embodied self-survey, and a boundary concept scale. Each interview lasted two to four hours, depending on the participants' level of collaboration. Finally, 90 participants completed the forms, and the answers of five participants were excluded from the data due to incomplete questionnaires.

Table 1. Demographic (Age, Education, Marital Status) and Descriptive Characteristics of the Patients with Schizophrenia

Demographic Variable	Range	N	% (n)	Mean	Std. Deviation
Age	32-42	25	30%	47.84	7.58
	42-52	37	44%		
	52-62	23	26%		
Education	Primary School	20	24%	9.01	2.77
	≤ High school	62	72%		
	College and above	3	4%		
Marital status	Unmarried	47	56%		
	Married	15	17%		
	Divorced	23	27%		

Valid N = 85.

Measures

Embodied Sense-of-Self (ESS) Scale (20) is a 25-item questionnaire designed to assess the sense of self associated with bodily experiences. Items (e.g., "*Sometimes the clothes I am wearing feel heavy*") are rated on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree), with total scores ranging from 25 to 125. Higher scores indicate greater abnormalities in the embodied sense of self. The original ESS has demonstrated good internal consistency ($\alpha = 0.84$), as well as predictive, convergent, and discriminant validity (20). In a study by Zargarani (31) the Persian version of the ESS showed good validity and reliability with a Cronbach's alpha of 0.82 among Iranian students. According to our results, the Cronbach's alpha was 0.80.

Montreal Evaluation of Communication (MEC)-Metaphor Sub-Test (32) was used to assess metaphor comprehension. MEC is a 20-item measure consisting of

10 novel metaphors (Metaphors that are not common or generally used in the Persian language) and 10 conventional metaphors (Metaphors that are common in the Persian language). Sample Items (e.g., "*This book is a goldmine*") are rated on a 3-point Likert scale ranging from 0 (completely incorrect answers) to 2 (completely correct answers), with total scores ranging from 0 to 40. Higher scores indicate greater metaphor comprehension. The original MEC has demonstrated strong internal consistency and validity ($\alpha \geq 0.70$; Janet *et al*., 2004). Modarresi Tehrani *et al*. (2020) (33) reported good reliability and validity ($0.70 \leq \alpha \leq 0.90$) for the Persian version of the MEC in an Iranian population. Our obtained Cronbach's alpha was 0.72.

Researcher-Designed Questionnaire for Assessing the Boundary Concept

The ability to distinguish between inside and outside, and understanding what is bound and what is not bound, is crucial for perceiving boundaries (34–37). Based on Lakoff and Johnson's cognitive linguistic theory, comprehending inside-outside distinctions can serve as a measure of boundary concept comprehension (17). In the present study, an 18-item questionnaire in which some questions were associated with pictures was designed (Based on Lakoff and Johnson's cognitive linguistic theory) to evaluate linguistic comprehension of the boundary concept and of being bound. Items (e.g., *Which sentence represents the boundary: a- A man walking inside a tunnel-is he within a boundary? or b- A man walking outside the tunnel- is he within a boundary?")* are rated on a two-point scale ranging from 0 (completely incorrect answers) to 1 (completely correct answers), with total scores ranging from 0 to 18. Higher scores indicate greater comprehension of the boundary concept. Initially, and before administering this questionnaire to the main subjects, it was tested on a non-clinical population to assess the comprehensibility of the items. The appropriateness of the items was confirmed. Content validity was assessed using Lawshe's method (38). A panel of five experts in linguistics and clinical psychology rated each item based on three choices: the item is "essential", "useful but not essential", and "not necessary." The Content Validity Ratio (CVR) for this questionnaire was reported as 0.99. This high CVR underscores the robustness and suitability of the instrument for evaluating the intended construct. In addition, this scale's convergent validity has been confirmed based on the Pearson correlation coefficients report. The items were significantly correlated with one another ($P < 0.05$). The correlation coefficients among items ranged from $r = 0.30$ to $r = 0.65$**,** indicating moderate to strong associations between the items. As this questionnaire is unidimensional, discriminant validity was not applicable. Additionally, the Cronbach's alpha of this questionnaire was 0.89.

Statistical Analysis Strategy

The research was conducted with a final sample size of 85 for the regression analysis. We used skewness, kurtosis, and multiple regression tests (standard model) in IBM SPSS (version 22) to examine the data. The skewness and kurtosis were used to test the distribution of variables and indicated that all of the variables were distributed normally (All parameters were in the range of +2 to -2). Kurtosis and skewness results are represented in Table 2. Also, multiple linear regression analyses were performed using the standard (Enter method) regression model to identify variables that might predict the boundary concept, with demographic variables (age and education), embodied self, and metaphor included as predictors. The Durbin-Watson value in this study was 1.79, indicating no autocorrelation. A significance level of $P < 0.05$ was applied for all analyses.

Ethical Consideration

All procedures performed in studies involving human participants were in accordance with the ethical standards of the Human Research Ethics Committee of the University of Tabriz (HRECs) with reference number IR.TABRIZU.REC.1403.023 and complied with the 1964 Helsinki Declaration and its later amendments or other comparable ethical standards.

Table 2. Skewness and Kurtosis Test Results for Assessing Normality of Study Variables

	Skewness		Kurtosis	
	Statistics	**Std.Error**	**Statistics**	**Std.Error**
Age	0.221	0.261	-0.820	0.517
Education	0.029	0.261	-0.819	0.517
Boundary- Concept	-0.121	0.261	-1.408	0.517
Embodied-Self	-0.319	0.261	-0.556	0.517
Metaphor	-0.545	0.261	-0.527	0.517

All variables' skewness and kurtosis fell within the range of -2 to 2, which indicated that they were distributed normally.

Results

Descriptive Statistics

Table 2 provides demographic and descriptive statistics of the study population. Furthermore, the variance inflation factor (VIF) values confirmed that the dataset did not show evidence of multicollinearity, ensuring the regression model's robustness. The result suggests that deficits in metaphor comprehension are related to impairments in understanding the concept of boundaries (Hypothesis 1).

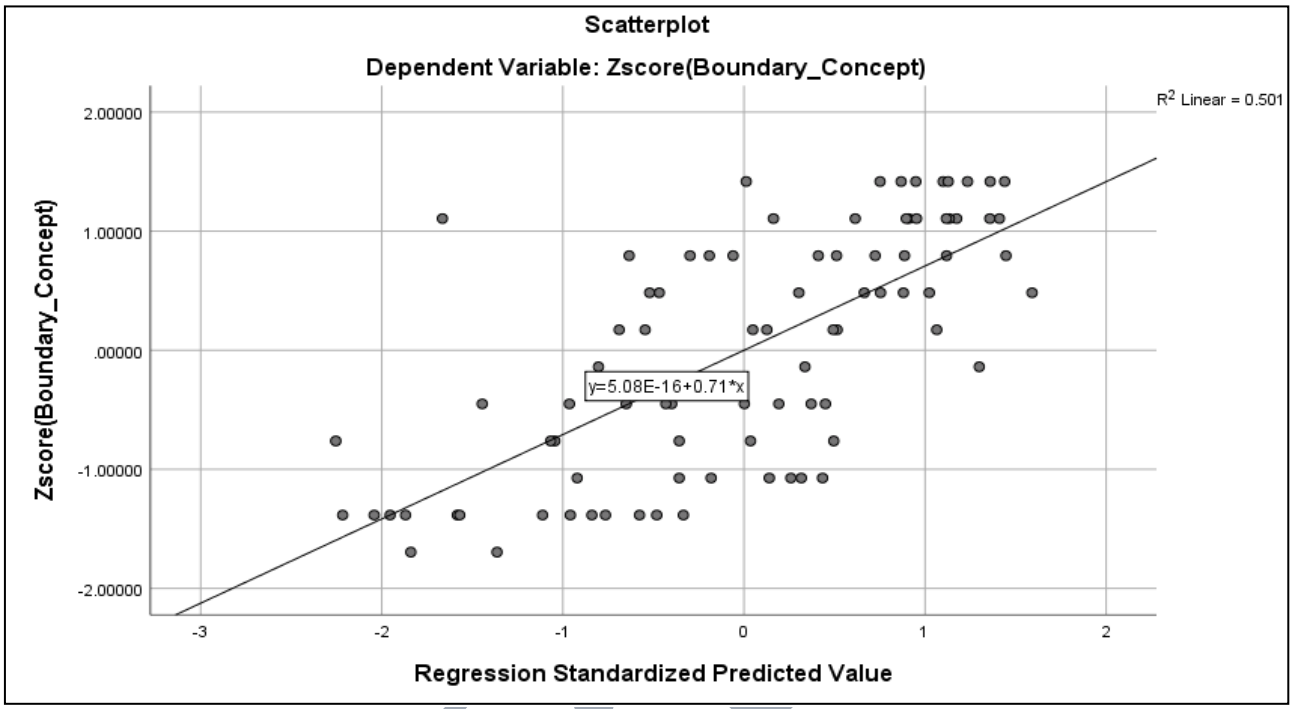


Figure 1. Scatterplot Illustrating the Linearity Assumption between Predictor Variables and the Criterion Variable

The scatterplot diagram in Figure 1 depicts the relationship between the predictive values and the boundary concept, indicating a positive relationship between the boundary concept and the predictive values (embodied-self, metaphor comprehension, age, and education). The diagonal line with points clustering around it depicts the regression model's predictions, indicating a good model fit. Also, Variations from the line present some residual variance in the predictions.

Multiple Regression Analysis

We conducted multiple linear regression analyses (Enter method) at a 95% confidence interval to test the data and assess the relationship between the boundary concept and comprehension of metaphor and the embodied self. The multiple regression model was significant ($F(4, 80) = 20.10$, $P < 0.01$), collectively accounting for 50% of the variance in boundary concept comprehension. The metaphor comprehension significantly predicted 67% of the variance in comprehension of the boundary concept ($\beta = 0.67$, $t = 7.86$, $P \leq 0.01$).

Table 3. Linear Multiple Regression on Boundary Concept in Response to Embodied-Self, Metaphor, and Demographic Variables

	Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval for B	
	B	St. Error	Beta	T	Sig	Lower Bound	Upper Bound
Age	0.07	0.18	0.07	1.00	0.32	-0.07	0.23
Education	-0.12	0.31	0.08	-1.52	0.13	-0.28	0.03
Embodied-Self	-0.13	0.22	0.08	-1.61	0.15	-0.30	0.02
Metaphor	0.67	0.15	0.08	7.89	0.000	0.50	0.83

Model: $F = 20.10$; $df = 4, 80$; $P < 0.01$

However, the embodied self did not predict comprehension of the boundary concept (β = -0.13, t = -1.61, P = 0.1), resulting in the rejection of the second hypothesis. Additionally, the control variables of age (β = 0.07, t = 1, P = 0.3) and education (β = -0.12, t = -1.52, P = 0.8) showed no significant effects on boundary concept comprehension. The detailed results of multiple linear regression are presented in Table 3 and Figure 1. Overall, demographic variables did not predict boundary comprehension.

Discussion

Our results indicated that the prediction of the boundary concept, with the total model explaining 50% of the variance. In fact, we constructed a model based on patients' comprehension of the boundary concept, metaphor comprehension, and the embodied self to see if the defects of the boundary concept are related to metaphor comprehension and embodied self.

Our proposed model indicates that comprehension of metaphor, as a cognitive and linguistic function, is closely linked to the comprehension of boundary concepts (the first hypothesis).

Indeed, based on our results that were obtained from patients with schizophrenia, the stronger the comprehension of metaphor, the better the comprehension of the boundary concept. This result supports the CMT by showing the relationship between understanding of the boundary concept and the comprehension of Metaphors (17, 29).

Our results are consistent with Caghan's study (9), demonstrating a connection between metaphor comprehension and the boundary concept. In other words, to Caghan, the boundary concept is related to language and symbolization, which is in line with our study's results on the relation between the comprehension of boundary concept and the comprehension of Metaphor in patients with schizophrenia. To broaden this idea, Metaphor is a core function of language that shapes symbolic representation. Therefore, a better comprehension of metaphor indicates a better symbolization of language, which is related to a better grasp of the boundary concept.

Also, Caghan demonstrated that under mental health conditions (schizophrenia for example), boundaries such as the boundary between inside and outside, or self and other, do not act flexibly (9). In other words, boundaries have varying degrees of openness under differing circumstances and textures that give them the power to keep the balance of different things. Additionally, our results indicate that a higher comprehension of metaphors was related to a higher comprehension of boundary concepts, suggesting that a better understanding of metaphorical structures in patients with schizophrenia reveals that different domains (source domain and target domain) are seamlessly connected. Therefore, this leads to cognitive flexibility and, thus, causes a better understanding of the boundary-related concepts. On the other hand, poor comprehension of metaphors in patients with schizophrenia points out that the cognitive impairment lies in the connection-making between concepts, and this contributes to lower flexibility and further problems in understanding boundary-related concepts. Therefore, understanding boundaries in nature depends on the metaphorical system (9).

Furthermore, Lívia Mathias Simão's framework emphasizes that boundaries are figurative and are shaped by cultural dynamics in nature (26). Hence, this figurative mechanism of boundaries functions as a dynamic construct, allowing the self and the other to determine and renegotiate their positions. Likewise, our findings showed that greater comprehension of Metaphor in patients with schizophrenia (as a form of figurative language) is related to a higher understanding of boundary concepts, which highlights the symbolic nature of boundaries and the relation of this symbolic system to boundary concept comprehension.

Lastly, Edwardes's research (39) provides a framework to elaborate on our results regarding the boundary concept and metaphor understanding. This research proposed a metaphor -"Self is other"- and indicates that the boundary between self and not-self (other) is neither fixed nor rigid, but instead flexible. This study identifies two key points. First, the boundary between self and other is flexible and can shift based on cognitive and contextual factors. Second, this metaphor highlights that the boundary between self and other is innately metaphorical (39). These findings can be applied to our study's results, as they support the idea that difficulties or disruptions in metaphor comprehension in patients with schizophrenia could directly impact the understanding of boundary concepts, including the self-other boundary.

On the other hand, the effect of the embodied self -as a subjective sense of self rooted in embodiment- on boundary concept comprehension has been theoretically established based on the CMT. However, our results in patients with schizophrenia did not support the second hypothesis, which proposed the effect of the embodied self in predicting the comprehension of boundary concepts' (β = -0.13, P = 0.1). Hence, our results suggest that, although embodiment is an essential element of human cognitive functions, higher-order cognitive processes, such as metaphor comprehension, are involved in understanding boundaries.

These results suggest the need for a longitudinal study to examine the connection between the embodied self and boundary concept comprehension in patients with schizophrenia. The embodied self is a developmental element, and its effects can probably be tracked gradually over a lifespan as part of an ongoing developmental process.

Future Studies

Overall, these results emphasize how disruptions in

metaphor processing may jointly contribute to the altered understanding of boundary-related concepts in individuals with schizophrenia. However, to achieve a more comprehensive perspective on boundary concept impairments in this population, future research should also consider the roles of parameters such as executive dysfunction, language disorganization, and emotional dysregulation. Additionally, the study's restriction to male participants, due to institutional constraints, limits the generalizability of the findings. This highlights the need for future research to include both genders to ensure broader applicability. Moreover, given the relationships identified in the current study, future research may also pursue structural modeling approaches with a larger sample size.

Limitation

Due to the difficulty of interviewing patients with schizophrenia, we were able to recruit only 85 participants. Additionally, hospital authorities' permission for visiting men's wards alone limited this study to male participants, restricting the generalizability of the findings to female patients. Future research should address this limitation by including female participants.

Conclusion

In conclusion, to predict boundary concept comprehension in patients with schizophrenia, we examined the roles of the embodied self and metaphor comprehension in boundary concept, using multiple regression analysis. The results indicated that metaphor comprehension accounted for 67% of the variance in boundary concept comprehension ($\beta = 0.67$), while the embodied self did not emerge as a significant predictor. These findings highlight the critical influence of the mind's metaphorical structure on forming the boundary concept, which is a fundamental aspect of cognition. Specifically, the self-other boundary, which is impaired in schizophrenia, appears closely linked to metaphorical processing. All in all, the impairment of the boundary in patients with schizophrenia, which manifests in self-other boundary problems, stems from the mind's conceptual system, where the boundary concept is related to metaphorical cognition.

This connection highlights the possibility of interventions based on linguistic approaches, such as enhancing metaphor comprehension to improve self-other boundary discrimination in this population. Such interventions could include cognitive remediation schedules and language-based treatments designed to boost metaphor understanding and boundary perception.

Considering impairments in metaphorical comprehension, which are observed in these individuals, therapies concentrating on abstract cognitive functioning and metaphor comprehension maintain promise for addressing boundary-related deficits. These results underscore the importance of integrating cognitive and metaphor-based techniques into clinical practices, thereby paving the way for innovative treatments that support enhanced cognitive and social functioning in this population.

Acknowledgment

We extend our gratitude to both patients and colleagues at the Razi Psychiatric Hospital, particularly those in the Clinical Research Department, for their valuable support. Special thanks to Dr. Hamed Abdollahpour Ranjbar and Mohammad Saied Miri for their assistance and contributions throughout this study. This research was funded by the Türkiye Bursları program (grant number 23IR010068) in collaboration with Koç University.

Conflict of Interest

None.

Appendix

Boundary Concept Questionnaire:

This questionnaire tests linguistic comprehension of the boundary concept and being bound.

First, the concepts of bound and boundary should be explained using a concrete example of a bag and key by the interviewer. For instance, I have a bag and a key. When the key is inside my bag, it is bound within a specific area. And when I take it out of the bag and place it on the table, it is no longer bound. Do you agree with me? In this example, my bag's wall acts as a boundary for the key. Do you have questions? Now I will ask 18 questions, each with two options. Choose the best option that conveys the meaning of "being bound" or the meaning of "within a boundary".

These inquiries are hypothetical, and some pictures are provided for better clarification. When responding, concentrate only on the meaning of 'boundary' and 'being bound,' instead of the real precision of the sentences.

1- Choose the best option:

A cat that is inside a box, is in a bounded area.

Or

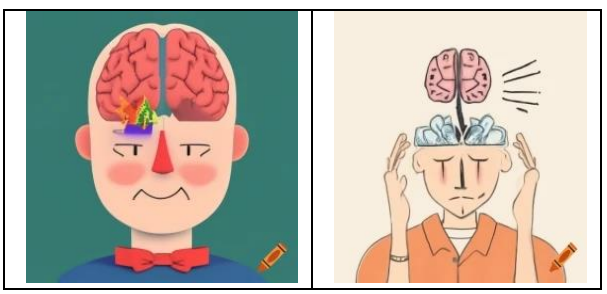
A cat that is outside the box, is in a bounded area.

2. I have a drawing of a person with a head.

If I draw this person's brain inside the head, it will be bounded.

Or

If I draw it outside of the head, it will be bounded?



3. A bird is inside the cage; it is in a bounded area.

Or

A bird is outside the cage; it is in a bounded area.

4. A dog that is playing inside the home is bounded.
Or
A dog playing outside the home is bounded.

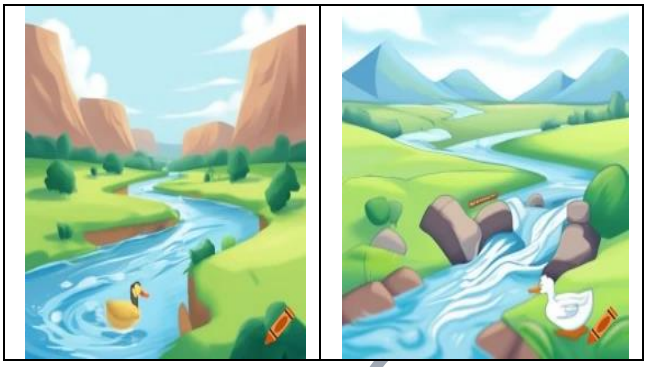
5. Keys that are inside the drawer are bounded
Or
Keys that are outside the Drawer are bounded.

6. I have a drawing of a flowerpot,
If the plants' roots are inside the pot, are they bounded in an area?
Or
If the plants' roots are outside of the pot, are they bounded in an area?

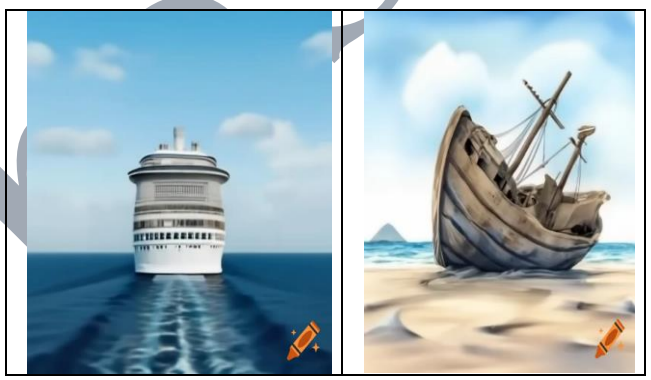
7- The children who are playing inside the playground are playing in a boundary
Or
The children wandering around the playground are within a boundary.

8- I have a drawing of an aquarium and fish. (Answer this question regardless of the fact that fish cannot survive without water.)
Fish that swim slowly inside the water are bounded in an area.
Or
Fish that quickly jump out of the aquarium are bounded in an area.

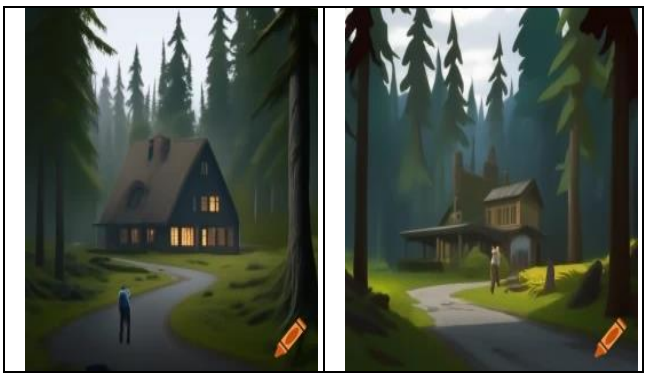
9. I n this picture, there is a flowing river and a duck. Tell me which option represents a boundary:
A duck that swims within the river is within a boundary.
Or
A duck that is beside the river is within a boundary.



10. I have a picture of the sea and a ship. Tell me which option represents a boundary:
If the ship passes within the sea route, it passes through a boundary.
Or
If the ship deviates from the route road and reaches the beach, it passes through a boundary.

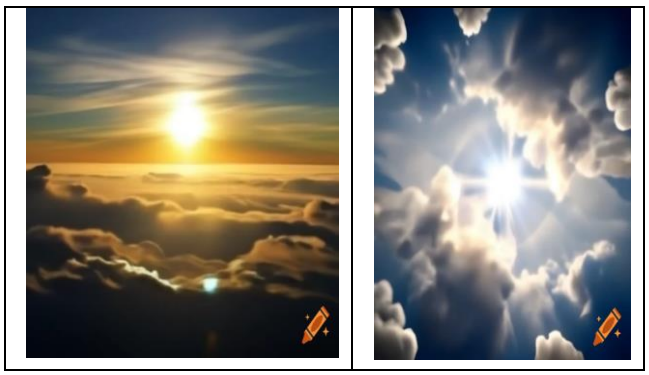


11. I have a picture. There is a house, a road and a man. Tell me which option represents a boundary:
The man passing within the road is within a boundary.
Or
He man beside the road is within a boundary.

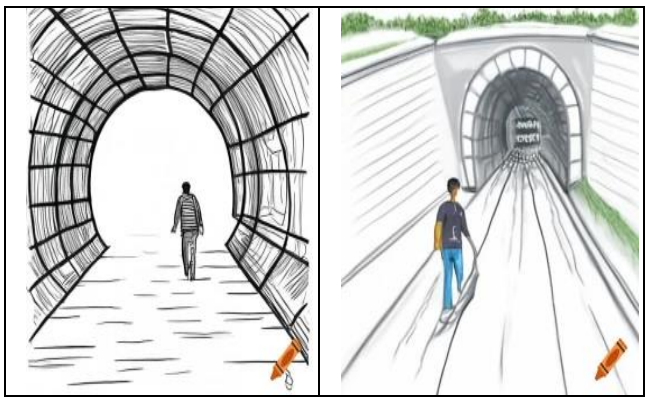


12. I have a picture of a snake and a road,
If the snake moves within the road, is within a boundary?
Or
If the snake moves beside the road, is within a boundary?

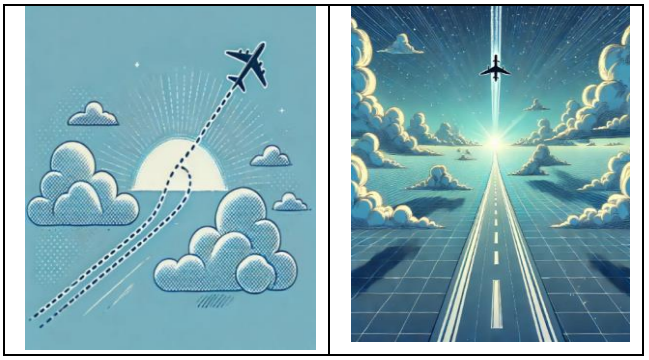
13. I have a picture of the sky, clouds, and the sun:
The sun above the clouds is bounded.
Or
The sun among the clouds is bounded.



14. A man walking inside a tunnel-is he within a boundary?
Or
A man walking outside the tunnel- is he within a boundary?

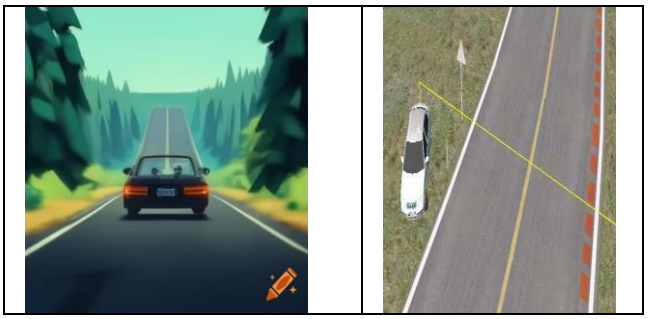


15. The pilot guided the airplane within the airspace, is it within a boundary.
Or
The airplane deviated from its airspace, within a boundary.



16. There is a turtle:
A turtle that is in its shell is bounded.
Or
A turtle that comes out of its shell is bounded.

17. I have a picture of a car and a road. The car is within the road boundary.
Or
The car outside of the road is within a boundary.



18- I have a picture of two books and a pencil:
The pencil between the two books is within a boundary.
Or
The pencil beside one of the books is within a boundary.

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