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Suicide and Life-Threatening BEHAVIOR

ORIGINAL ARTICLE

A comparison of the social cognition and neurocognitive characteristics of adolescents with suicide behavior, adolescent with depression and healthy controls

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Abstract

Introduction: Deficits in neurocognition and social-cognition have been suggested to be an endophenotype for suicidal behavior. We aimed to compare the social-cognition and neurocognitive characteristics of adolescents diagnosed with depression with and without suicidal behavior and to investigate whether these functions predict suicide.

Method: Adolescents diagnosed with Major Depressive Disorder (MDD) with suicidal behavior ($n=42$); MDD without suicidal behavior ($n=44$) and age- and sex-matched controls ($n=43$) were included. The University of Pennsylvania Computerized Neurobehavioral Test Battery and Autism Spectrum Screening Questionnaire (ASSQ) were used to evaluate social-cognition and neurocognitive characteristics.

Results: Several neurocognitive domain values of MDD groups, were significantly different from the control group. Neutral emotion recognition task ($p=0.025$) and ASSQ scores were found to be significantly impaired in the patient groups ($p<0.001$). Logistic regression analysis showed that, only the increase in the Suicide Probability Scale score was found to be significant as a risk factor predicting suicide ($p=0.007$, OR: 1.246).

Conclusion: While the neurocognitive and social-cognitive performances of adolescents with MDD were significantly lower than the control group, these performances in the two depression groups were similar. When the predictors of suicidal behavior were examined, it was found that only the increase in suicidal ideation scores predicted suicide.

KEYWORDS

neurocognition and social cognition, suicide

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INTRODUCTION

Suicidal behavior in youth is considered a spectrum that can result in death-related mental preoccupations involving the individual's intention and desire to die, suicidal ideation, attempt planning, and death (Sveticic & de Leo, 2012). More specifically it is classified into three categories: suicide ideation, which refers to thoughts of engaging in behavior intended to end one's life; suicide plan, which refers to the formulation of a specific method through which one intends to die; and suicide attempt, which refers to engagement in potentially self-injurious behavior in which there is at least some intent to die (Nock et al., 2008). Suicidal behavior in young people is an important public health threat. More than 700,000 people die due to suicide every year and worldwide, suicide is the fourth leading cause of death between the ages of 15–29 (World Health Organization, 2021). The pediatric suicide rate has increased in the last decade to 2.5 deaths per 100,000 children aged 10–14 years (Curtin & Heron, 2019).

Understanding risk factors for suicidal behavior in children and adolescents is crucial for targeted prevention efforts. Over 90% of people who die by suicide have mental disorders, particularly major depressive disorder (MDD) (Dong et al., 2019), and individuals with MDD have a significantly higher risk of suicide compared to the general population (Xin et al., 2018). Suicide is influenced by a complex interplay of biological and environmental factors. Several models for suicidal behavior have been introduced. Social and general neurocognitive functioning have been suggested as potential regulators of suicide risk (Jollant et al., 2011; O'Connor & Nock, 2014). Neurocognition (NC) is a general concept that describes executive function areas such as processing speed, attention, working memory, verbal/visual learning and memory, reasoning, problem solving and verbal comprehension (Nuechterlein et al., 2004). Networks supporting executive functions have emerged as important targets in studies of youth depression and deficits in cognition are consistently reported in recent studies of depressed youth (Allott et al., 2016; Wagner et al., 2015). Several studies suggested that suicidal behavior is associated with neurocognitive deficits, particularly impairment in executive functions such as decreased attention (Thompson & Ong, 2018), episodic memory (Huber et al., 2022), working memory (Lalovic et al., 2022), response inhibition (Allen et al., 2019; Keilp et al., 2013) and decision-making (Lalovic et al., 2022; Perrain et al., 2021).

Another factor that has recently been emphasized concerning suicidal behavior is social-cognitive functionality. Social cognition (SC) is broadly defined as the ability to encode, store, and appropriately understand one's own and others' thoughts and feelings (Fiske & Taylor, 2013) and is a multi-dimensional construct that comprises functions such as: emotional processing, social perception and knowledge, theory of mind (ToM), and attributional bias (Pinkham et al., 2014). Several social-cognitive processes related to adolescent suicidal behavior have been studied, such that cross-sectional studies for adolescents have found links between suicidal attempt risk and low problem-solving ability (Xu et al., 2023) poor social problem-coping skills (Pollak et al., 2023), and cognitive distortions/negative self-perceptions (Wolff et al., 2013). Non-adaptive SC is a prominent risk factor for suicidal behavior, especially in adolescents, given the increasing importance of peer relationships in this developmental time frame. Low perceptions of social efficacy and negative relational schemas may be associated with the adolescent's suicidal belief system; The suicidal mode becomes stronger as it is repeatedly activated by such associations and relational schemas (Xu et al., 2022).

As can be seen, previous studies in youth populations have suggested that a proportion of youth with suicidal ideation will attempt suicide and that childhood depression is an important mediator of suicide risk. However, most youth with MDD never attempt suicide which reduces the positive predictive value of a diagnosis of MDD in measuring the risk of future suicidal behavior (Copeland et al., 2017; Nock et al., 2013). From this perspective, studies targeting the identification of specific risk factors for suicide in young people with depression are critical for the development of effective evaluation and intervention strategies. Although the association of suicidal ideation with greater psychopathology and poorer functional outcome is well established in youth, the literature is inconclusive on how suicidal ideation in youth relates to cognitive performance (Copeland et al., 2017). Over the past years, it was known that cognitive rigidity was closely related to suicidal behaviors, until it is being elucidated that this rigidity may be the result of some changes in executive functions that can be understood with more complex models (King et al., 2000; Miyake & Friedman, 2012).

In summary, it is assumed that SC and NC may represent a transdiagnostic endophenotype that can predict suicidal behavior, which is supported by the studies in the relevant literature (Keilp et al., 2013). Considering the high rates of suicide in depression, there are relatively few studies examining the relationships between general neurocognitive skills, SC, and suicidal behavior in adolescents both in our country and in the current literature. Therefore, studies investigating the cognitive functioning of adolescents at risk for suicidal behavior are still needed to better understand suicidal behavior patterns. The main goal of this study is to characterize the neurocognitive and social cognitive phenotype of

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adolescents at risk for suicidal behaviors by comparing them with the age–gender matched comparison group. Based on previous evidences, we suggested our hypothesis;

1. Depressed adolescents with suicidal behavior exhibit significant deterioration in social cognitive and neurocognitive functions compared to depressed adolescents without suicidal behavior and healthy controls.
2. The social cognitive and neurocognitive functions of adolescents diagnosed with depression who do not exhibit suicidal behavior deteriorate compared to healthy controls.
3. Impairment in SC and NC positively correlates with the severity of depression and suicide probability.
4. Impairments in SC and NC serve as predictors of suicidal behavior.

METHOD

Participants

Three groups who applied to Bursa Uludag University School of Medicine Hospital, Pediatric Emergency Service and Child and Adolescent Psychiatry Outpatient Clinic between May 2022 and January 2023 were included. (1) MDD cases with suicidal behavior (group 1); Having been diagnosed with MDD according to the DSM-5, scoring over 40 points on the Child Depression Rating Scale-Revised (CDRS-R) and having suicidal ideation with intent and plan within the last 1 month and/or having attempted suicide within the last 3 months according to the Columbia Suicide Severity Rating Scale (C-SSRS); (2) MDD cases without suicidal behavior (group 2); Having been diagnosed with MDD according to DSM-5, scoring over 40 points on the CDRS-R and not having suicidal thoughts with plans and intentions in the last 1 month and not attempting suicide in the last 3 months according to C-SSRS and the age- and gender-matched control group is adolescents between the ages of 11–17 who applied to our outpatient clinic after the announcement of the study and did not have any psychopathology meeting the diagnostic criteria according to DSM-5 (group 3).

Participants in the groups were diagnosed by the licensed and experienced same clinician specializing in child and adolescent psychiatry and mental retardation was clinically excluded. The diagnostic process involved extensive clinical interviews, medical examinations, and the application of semi-structured standard assessment tools that conform to the rigorous standards set forth in DSM-5. This study was conducted in accordance with the Declaration of Helsinki. After detailed description about the study, written informed consent was obtained from the volunteer children and their parents. Patient confidentiality was adhered to throughout the study. The study was approved by the Ethics Committee of Bursa Uludag University (Protocol number: 2022–11/10).

A power analysis was performed using the G*Power program, resulting in a sample size of 33 for each group. Parameters for the analysis included an effect size of 0.829, a significance level (α) of 0.05, and a power of 0.95 (1-β), providing a 95% confidence level (Ortuño-Sierra et al., 2021). A total of 129 participants were included, 42 (32.6%) in the depression group with suicidal behavior, 44 (34.1%) in the depression group without suicidal behavior, and 43 (33.3%) in the control group. The patients were selected from psychiatric wards and outpatient clinics in a single center and the control group was selected from healthy volunteers residing in and around the neighborhood where the patients lived. All participants who met the inclusion criteria and voluntarily agreed to participate in the study were included in the study consecutively, and the age and gender of the case groups and the control group were matched.

Assessment tools

1. *Sociodemographic data form*: This form was utilized to gather information regarding participants' age, sex, and socioeconomic status. The data were collected and compiled by the researchers.
2. *Schedule for Affective Disorders and Schizophrenia for School-Age Children Present and Lifetime Version, DSM-5* (*K-SADS-PL-DSM-5*): A semi-structured interview was conducted with both the adolescent and their families to review present and the past psychiatric diagnoses (Kaufman et al., 2016). A Turkish validity study of the scale was done by Unal (2019).
3. *UPPS-P Impulsive Behavior Scale Short Version* (*S-UPPS-P*): This self-report Likert scale was employed to assess impulsivity (Cyders et al., 2014) and was validated for use in Turkish by Eray et al. (2022).
4. *Suicide Probability Scale* (*SPS*): This self-report Likert scale was used to evaluate suicidal thoughts and probability (Cull & Gill, 1988) and validated for Turkish by Atli et al. (2009).
5. *The Revised Child Anxiety and Depression Scale* (*RCADS*): This self-report Likert scale was used to assess anxiety and depression symptoms (Chorpita et al., 2005) and validated for Turkish use by Gormez et al. (2017).
6. *The Shortened Level of Expressed Emotion Scale* (*EE*): This self-report Likert scale was employed to evaluate the perceived emotional expression of the most

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influential person in the participant's life (Nelis et al., 2011), and was validated for Turkish use by Vural et al. (2013).

7. *Autism Spectrum Screening Questionnaire* (*ASSQ*): Parents were asked to fill out this questionnaire to assess subthreshold autistic symptoms (Ehlers et al., 1999). The Turkish validity and reliability study of which was done by Köse et al. (2017).
8. Columbia Suicide Severity Rating Scale/C-SSRS: This scale was conducted by the researcher to question the severity of suicidal ideation, the intensity of thoughts and committed suicides (Posner et al., 2011) and validated for Turkish use by Kilincaslan et al. (2019).
9. *Child Depression Rating Scale-Revised Form* (*CDRS-R*): This semi-structured interview was utilized to measure the severity of depression (Poznanski et al., 1984) and was validated for Turkish use by Alsen et al. (2018).
10. *Clinician Affective Reactivity Index for Assessment of Irritability Scale* (*CL-ARI*): This semi-structured interview was applied to the participants to evaluate the frequency, duration, and severity of anger outbursts and irritable mood (Haller et al., 2020) and Turkish validation study of which was done by Turan et al. (2022).
11. *Penn Computerized Neurocognitive Battery* (*CNB*): This battery is a computer-based neurocognitive assessment designed to measure performance accuracy and speed across specific neurobehavioral and social cognitive domains. The tests within the Penn CNB have been validated through functional neuroimaging studies and was developed in 2010 by Ruben C. Gur et al. (2010). It was adapted for use in Turkish by Izgi et al. (2022). The Penn CNB includes tests that assess 4 neurobehavioral domains: (1) executive functions, (2) episodic memory, (3) SC (emotion identification), and (4) sensorimotor speed. On the battery, executive control domain was assessed with the Conditional Exclusion Task (PCET), the Letter and Back Task (LNB2) and the Penn Continuous Performance Test letter (SCPL) and Number (SCPN); Episodic memory domain was assessed with the Facial Memory Test (CPF) and the Late Version of the Facial Memory Test (CPFD), the Visual Object Learning Test (SVOLT) and the Late Versions of the Visual Object Learning Test (SVOLTD); SC domain was assessed with the Emotion Recognition Task (ER40); and Sensorimotor speed domain was assessed with the Motor Praxis (MP) Test and the Penn Computerized Finger Tapping Test (SCTAP).

The participants were first administered the assessment scales by the clinician. After completing the assessment scales, a 10 min break was given and then the participants were taken to the Penn CNB. The battery was administered in person. The clinician explained to each participant how to administer the battery through a demo application. Participants who successfully completed the demo were administered the original version of Penn CNB under the supervision of the clinician. The administration of the Penn CNB took approximately 30 min. No breaks were given during this time. Participants who failed to complete the battery were excluded from the study.

Statistical analysis

Analyzes were evaluated in 22 package programs of SPSS (Statistical Package for Social Sciences; SPSS Inc., Chicago, IL). In the study, descriptive data are shown with *n* and % values in categorical data and median (minimum–maximum) values in continuous data. Chi-squared analysis (Pearson chi-squared), Fisher–Freeman–Halton, and Fisher's exact chi-squared tests were used to compare categorical variables between groups. In case of significance, the Bonferroni test, one of the multiple comparison tests, was used. The conformity of continuous variables to normal distribution was evaluated with the Shapiro–Wilk test. The Kruskal–Wallis test was used to compare more than two measurement variables. The Spearman correlation test was used to examine the relationship between continuous variables. Forward Stepwise binary logistic regression analysis was performed to determine the factors predicting suicide. Effect size was calculated with eta^2 method and added to the *p* value in group comparisons. The statistical significance level in the analysis was accepted as $p < 0.05$.

RESULTS

Participants characteristics

A total of 129 participants were included in the study, 42 (32.6%) in the depression group with suicidal behavior, 44 (34.1%) in the depression group without suicidal behavior, and 43 (33.3%) in the control group. Since the participants were matched for age and gender, there was no significant difference between the groups in this respect ($p = 0.444$, $p = 0.192$).

While 23.8% of the depression group with suicidal behavior were not using a medication, 19.0% were using a single medication and 57.1% were using multiple medications. While 65.9% of the depression group without suicidal behavior were not using any medication, 25% were using a single medication and 9.1% were using multiple medications.

While 66.7% of the suicidal depression group had a previous suicide attempt, the other two groups did not and there was a significant difference between them ($p < 0.001$).

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While 92.9% of the depression group with suicidal behavior and 34.1% of the depression group without suicidal behavior had non-suicidal self-injury behavior, it was absent in the control group. There was a significant difference between the groups in terms of non-suicidal self-injury behavior and this difference was due to the difference between all groups ($p < 0.001$).

While 11.9% of the depression group with suicidal behavior and 4.5% of the depression group without suicidal behavior had a family history of suicide attempts, it was not in the control group. There was a significant difference between the groups in terms of family suicide attempts, and this difference was only due to the difference between the depression group with suicidal behavior and control group ($p = 0.033$).

Group comparisons

Comparisons between the groups in terms of RCADS, SPS, EE, S-UPPS-P, CL-ARI, and CDRS-R are given in Table 1.

Comparisons between the groups in terms of PENN-CNB SC and NC subtests are given in Table 2.

TABLE 1 Comparison of the different scale scores of the groups.

	Group 1	Group 2	Control		
RCADS	**Median (min–max)**	**Median (min–max)**	**Median (min–max)**	η^2	p*
Separation anxiety disorder	6.0 (0.0–18.0) [a]	6.0 (0.0–17.0) [a]	2.0 (0.0–13.0) [b]	0.173	**<0.001**
Social phobia	21.5 (3.0–27.0) [a]	19.0 (3.0–25.0) [a]	9.0 (0.0–22.0) [b]	0.256	**<0.001**
Obsessive-compulsive disorder	10.0 (3.0–17.0) [a]	10.0 (2.0–18.0) [a]	5.0 (0.0–11.0) [b]	0.273	**<0.001**
Panic disorder	20.0 (2.0–27.0) [a]	12.0 (0.0–27.0) [b]	7.0 (0.0–16.0) [c]	0.348	**<0.001**
Generalized anxiety disorder	13.5 (4.0–18.0) [a]	11.5 (3.0–17.0) [a]	6.0 (0.0–14.0) [b]	0.321	**<0.001**
Major depressive disorder	25.5 (6.0–30.0) [a]	21.0 (8.0–29.0) [a]	8.0 (0.0–16.0) [b]	0.636	**<0.001**
SPS					
Despair	37.5 (23.0–46.0)[a]	31.0 (17.0–48.0)[b]	21.0 (13.0–36.0)[c]	0.524	**<0.001**
Suicidal ideation	23.0 (11.0–32.0)[a]	14.5 (8.0–28.0)[b]	9.0 (8.0–23.0)[c]	0.552	**<0.001**
Negative self-evaluation	28.0 (17.0–36.0)[a]	26.5 (15.0–36.0)[a]	20.0 (11.0–29.0)[b]	0.345	**<0.001**
Hostile attitude	18.5 (11.0–28.0)[a]	14.5 (8.0–25.0)[b]	9.0 (7.0–20.0)[c]	0.399	**<0.001**
SPS-total	105.0 (74.0–138.0)[a]	84.5 (52.0–122.0)[b]	59.0 (47.0–97.0)[c]	0.488	**<0.001**
EE					
Lack of emotional support	42.5 (15.0–60.0)[a]	40.0 (16.0–60.0)[a]	27.0 (15.0–51.0)[b]	0.150	**<0.001**
Irritability	23.0 (11.0–44.0) [a]	18.0 (11.0–41.0)[a,b]	15.0 (11.0–34.0)[b]	0.104	**0.001**
Interventionism	15.0 (8.0–24.0)	13.5 (6.0–23.0)	13.0 (6.0–24.0)	0.023	0.082
S-UPPS					
Positive urgency	8.0 (4.0–16.0) [a]	11.0 (5.0–16.0) [b]	11.0 (5.0–16.0)[b]	0.159	**<0.001**
Lack of perseverance	8.0 (6.0–11.0)	8.0 (4.0–10.0)	8.0 (4.0–11.0)	0.01	0.710
Lack of premeditation	11.0 (6.0–15.0)	11.0 (7.0–14.0)	12.0 (7.0–15.0)	0.008	0.581
Sensation-seeking	8.0 (4.0–16.0)[a,b]	9.0 (4.0–16.0)[a]	8.0 (4.0–13.0) [b]	0.031	0.048
Negative urgency	7.0 (4.0–14.0) [a]	10.0 (4.0–16.0) [b]	11.0 (4.0–15.0) [b]	0.161	**<0.001**
CL-ARI					
Outbursts of rage	9.5 (0.0–19.0) [a]	5.0 (0.0–17.0) [b]	3.0 (0.0–10.0)[c]	0.357	**<0.001**
Irritable mood	3.0 (0.0–8.0) [a]	2.0 (0.0–8.0) [b]	1.0 (0.0–4.0) [c]	0.222	**<0.001**
Loss of functionality	3.0 (0.0–12.0) [a]	1.0 (0.0–12.0) [b]	0.0 (0.0–4.0) [c]	0.277	**<0.001**
CDRS-R	63.0 (37.0–84.0) [a]	52.5 (43.0–72.0) [b]	21.0 (17.0–30.0) [c]	0.691	**<0.001**

Note: [a,b,c] The group from which the difference originates. Group 1: Depression group with suicidal behavior, Group 2: Depression group without suicidal behavior. The statistical significance level in the analysis was accepted as $p < 0.05$ indicated as bold.

Abbreviations: CDRS-R, Child Depression Rating Scale-Revised; CL-ARI, Clinician Affective Reactivity Index; EE, Shortened Level of Expressed Emotion Scale; RCADS, Revised Anxiety and Depression Scale for children; SPS, Suicide Probability Scale; S-UPPS-P, UPPS-P Impulsive Behavior Scale Short Version.

*Kruskal–Wallis analysis was applied.

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TABLE 2 Comparison of the social cognition and neurocognition subtests of the groups.

	Group 1	Group 2	Control		
	Median (min–max)	Median (min–max)	Median (min–max)	η^2	p*
Restricted and repetitive behaviors	3.5 (0.0–15.0) [a]	2.0 (0.0–13.0) [a]	0.0 (0.0–7.0) [b]	0.190	**<0.001**
Social interaction	3.0 (0.0–16.0) [a]	2.0 (0.0–10.0) [a]	0.0 (0.0–7.0) [b]	0.232	**<0.001**
Communication problems	3.0 (0.0–12.0) [a]	3.0 (0.0–8.0) [a]	0.0 (0.0–6.0) [b]	0.142	**<0.001**
Penn CNB social cognition					
Emotion recognition–correct response	32.0 (25.0–38.0)	34.0 (13.0–38.0)	34.0 (26.0–39.0)	0.022	0.091
Emotion recognition–correct response speed	1679.0 (1195.50–2336.0)	1708.0 (1352.0–3175.50)	1824.0 (1268.50–3059.0)	0.016	0.329
Emotion recognition–angry	5.5 (2.0–8.0)	6.0 (2.0–8.0)	6.0 (2.0–8.0)	0.011	0.761
Emotion recognition–fear	7.0 (3.0–8.0)	7.0 (1.0–8.0)	7.0 (3.0–8.0)	0.026	0.064
Emotion recognition–happy	8.0 (5.0–8.0)	8.0 (3.0–8.0)	8.0 (6.0–8.0)	0.008	0.607
Emotion recognition–no emotion	7.0 (1.0–8.0)[a,b]	6.0 (2.0–8.0)[a]	7.0 (3.0–8.0)[b]	0.042	**0.025**
Emotion recognition–sad	6.0 (3.0–8.0)	7.0 (2.0–8.0)	7.0 (3.0–8.0)	0.006	0.257
Penn CNB sensorimotor speed					
Motor praxis test speed	633.50 (119.20–899.0)	687.50 (441.50–1075.50)	662.0 (469.0–1372.0)	0.024	0.218
Finger tapping–dominant hand response speed	56.0 (28.90–223.33)	54.1667 (18.33–275.67)	58.0 (20.33–88.33)	0.011	0.150
Finger tapping–both hands response speed	107.0 (57.80–467.0)	102.4999 (11.83–564.67)	113.33 (26.90–144.0)	0.018	0.157
Penn CNB episodic memory					
Facial memory–correct response	29.0 (20.0–36.0)	29.0 (19.0–35.0)	29.0 (22.0–36.0)	0.005	0.268
Facial memory–correct response speed	1520.0 (976.0–287.0)	1517.75 (892.0–3019.50)	1624.0 (1135.50–3033.0)	0.015	0.292
Facial memory delayed–correct response	30.5 (15.0–39.0)[a,b]	29.0 (19.0–39.0)[a]	32.0 (24.0–37.0)[b]	0.058	**0.009**
Facial memory delayed–correct response speed	1392.0 (568.0–2512.0)	1364.0 (236.0–2744.0)	1492.0 (1047.0–2512.0)	0.056	**0.043**
Visual object learning task–correct response	14.0 (11.0–19.0)[a]	14.0 (9.0–19.0)[a]	16.0 (10.0–20.0)[b]	0.061	**0.008**
Visual object learning task–correct response speed	1384.0 (776.0–2116.0)	1475.50 (232.0–2223.0)	1481.0 (970.50–2423.0)	0.022	0.188
Visual object learning task–delayed-correct response	13.0 (7.0–18.0)[a]	13.5 (5.0–18.0)[a]	16.0 (11.0–19.0)[b]	0.092	**0.001**
Visual object learning task–delayed-correct response speed	1432.0 (784.0–2096.0)	1458.0 (968.0–2344.0)	1507.0 (920.0–2523.50)	0.020	0.500

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TABLE 2 (Continued)

	Group 1	Group 2	Control		
	Median (min–max)	Median (min–max)	Median (min–max)	η^2	p^*
Penn CNB executive control					
Conditional exclusion task–correct response	40.0 (19.0–72.0)	37.0 (24.0–69.0)	38.0 (2.0–58.0)	0.002	0.397
Conditional exclusion task–correct response speed	1563.0 (1136.50–3198.0)	1799.25 (1157.0–3581.0)	1682.0 (1159.50–5062.50)	0.025	0.063
Continuous performance number test–correct response	24.0 (0.0–30.0)	24.5 (7.0–30.0)	27.0 (11.0–30.0)	0.017	0.124
Continuous performance number test–correct response speed	492.0 (406.0–655.0)	502.50 (312.0–637.0)	501.0 (405.0–663.0)	0.010	0.904
Continuous performance letter test–correct response	24.0 (0.0–30.0)	25.5 (3.0–30.0)	26.0 (1.0–30.0)	0.014	0.146
Continuous performance letter test–correct response speed	533.50 (298.0–683.0)	523.25 (333.0–711.0)	510.50 (281.0–708.50)	0.014	0.555
Letter- and-back task–correct response	41.0 (24.0–45.0)	41.0 (30.0–45.0)	42.0 (27.0–45.0)	0.004	0.292
Letter- and-back task–correct response speed	505.0 (387.0–803.0)	509.50 (375.0–627.0)	486.0 (400.0–851.0)	0.014	0.369

Note: [a,b] The group from which the difference originates. Group 1: depression group with suicidal behavior, Group 2: Depression group without suicidal behavior. The statistical significance level in the analysis was accepted as $p < 0.05$ indicated as bold.

Abbreviation: ASSQ: Autism Spectrum Screening Questionnaire.

*Kruskal–Wallis analysis was applied.

Correlations

RCADS score and PENN battery results were compared in the patient group; There was a positive correlation between panic disorder scores and PCET.CR ($r = 0.214$, $p = 0.050$); A negative significant correlation was determined between panic disorder scores and SVOLTD.CR ($r = -0.298$, $p = 0.006$); and ER40.CR ($r = -0.263$, $p = 0.015$).

CDRS-R score and PENN battery results were compared in the patient group, a significant negative correlation was found between CDRS-R total score and SVOLT.CR ($r = -0.230$, $p = 0.033$); SVOLTD.CR ($r = -0.231$, $p = 0.032$); and ER40.CR ($r = -0.260$, $p = 0.016$).

S-UPPS-P score and PENN battery results were compared in the patient group, a significant positive correlation was found between positive urgency and SVOLTD.CR ($r = 0.266$, $p = 0.013$); and ER40.CR ($r = 0.329$, $p = 0.002$). There was a significant positive correlation between negative urgency; SVOLT.CR ($r = 0.258$, $p = 0.017$); SVOLTD.CR ($r = 0.252$, $p = 0.019$); and ER40.CR ($r = 0.232$, $p = 0.032$).

CL-ARI score and PENN battery results were compared in the patient group a significant negative correlation was determined between the outbursts of anger and SVOLTD.CR ($r = -0.293$, $p = 0.006$); irritable mood and anger-related loss of functionality and SVOLT.CR ($r = -0.216$, $p = 0.046$), ($r = -0.336$, $p = 0.002$) and SVOLTD.CR ($r = -0.235$, $p = 0.030$), ($r = -0.406$, $p \leq 0.001$).

In the patient group, there was a positive correlation between the total score of SPS and the sub-dimensions of RCADS, sub-dimensions of the CLARI scale, and the total score of CDRS-R; On the other hand, there was a significant negative correlation between the total score of the SPS and positive urgency and negative urgency.

Regression analysis

The forward stepwise binary logistic regression analysis (Table 3) identified key predictors of suicide attempt susceptibility. These findings emphasize the importance of these dependent variables "Prior suicide attempt and non-suicidal self-injury." Additionally, only the suicidal ideation score in the Suicide Probability Scale remained significant in the model, highlighting its predictive value. Other variables were deemed insignificant and excluded.

DISCUSSION

In our study, we compared neurocognitive and social cognitive performances among adolescents diagnosed with depression with and without suicidal behavior, and healthy controls. As hypothesized, adolescents with

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TABLE 3 Results of stepwise forward binary logistic regression analysis of factors predicting suicide.

	B	Standard error	*p*	OR	OR 95% confidence interval	
					Lower	Upper
Prior suicide attempt (yes)	−21.469	6975.441	0.998	0.000	0.000	
Non-suicidal self-injury (yes)	1.762	0.903	0.051	5.822	0.991	34.189
Suicide Probability Scale; suicidal ideation	0.222	0.081	**0.007**	1.246	1.062	1.461

Note: The statistical significance level in the analysis was accepted as $p < 0.05$ indicated as bold.

suicidal behavior exhibited lower neurocognitive and social cognitive skills compared to non-suicidal adolescents. However, when examining factors predicting suicide, it was found that impairment in these functions was insufficient, with suicidal ideation as the sole predictor, as assessed by the Suicide Probability Scale.

In our study, we observed active and passive suicidal ideation were more prevalent in the depression group with suicidal behavior compared to other groups. A study conducted in adults reported that individuals reporting passive suicidal thoughts had similar lifetime suicide attempt rates to those reporting active suicidal thoughts. This underscores the importance of passive suicidal thoughts as a clinical marker for suicide risk (Baca-Garcia et al., 2011). Therefore, it is crucial to inquire extensively about both active and passive suicidal ideation during clinical follow-up with depressed patients, as they may not spontaneously disclose such thoughts, particularly when not prompted.

When we moved on to the anxiety symptoms, in our study, anxiety symptoms were found to be higher in the patient group compared to the control group. Another remarkable finding is that only panic disorder symptoms from the anxiety spectrum symptoms were seen more frequently in the depressive group with suicidal behavior compared to the non-suicidal group. The emergence of symptoms that may cause panic attacks with increasing anxiety draws attention to the role of anxiety in suicidal behavior. This finding is consistent with a recent study reporting that panic symptoms in early adolescence predict depression and suicidal ideation in later years (Barzilay et al., 2020) and another study found in the suicidal people was most prominent for mood and anxiety symptoms (Barzilay et al., 2019).

In our study, it was found that depressed adolescents who exhibited suicidal behavior tended to behave more impulsively and experienced more irritable moods. This finding is consistent with the studies suggesting that, impulsivity associated with positive and negative affect is strongly associated with suicide risk in American children (Assari, 2020), that chronic irritability in childhood is a high-risk factor for suicide, especially when combined with depressive/anxious mood (Orri et al., 2018), and that adolescents with high levels of irritability are more likely to respond disproportionately to emotional stressors and engage in impulsive suicidal behavior (Benarous et al., 2019).

When we focused on the assessment of SC, the SC profiles of the groups were evaluated with two basic tests, which are the Emotion Recognition Task in the Penn CNB and ASSQ. While the evaluation of the adolescent's social interaction and communicative skills by parent-reported ASSQ provides us with subjective data, the Penn CNB applied to the participants provides us with objective data about the adolescent in this area. As hypothesized, it was determined that communication problems and deterioration in social interaction was higher in depressed adolescents. Our findings are consistent with the previous studies showing that depressed patients with previous suicide attempts scored significantly lower on test performances assessing ToM (Ferrer et al., 2020; Senna et al., 2022). In light of this evidence, it is thought that interpersonal problems may lead to the deterioration of social support systems, thus posing a potential risk for the development of depression and suicidal behavior.

Patients with MDD show a lack of emotion recognition, which is mainly characterized by a bias toward the recognition of negative emotions. Therefore, these patients tend not to recognize happy faces and to recognize neutral faces as sad faces (Leppänen et al., 2004). In our study, no difference was found between the groups in terms of recognizing happy, angry, scared and sad faces and only neutral emotion recognition skills were found to be lower in depressed adolescents without suicidal behavior compared to the control group. Our findings are consistent with the study suggesting that participants with MDD may have difficulty accurately recognizing neutral expressions due to their overactive amygdala and their tendency to attribute sadness to neutral faces (Leppänen et al., 2004) and with the findings of a recent meta-analysis reporting that depressed participants had more difficulty in neutral expression recognition (Krause et al., 2021). However, in our study, it was found that depressed adolescents gave more false positive responses to negative facial expressions

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(sadness and fear) compared to their non-depressed peers. These results support the hypothesis that individuals with major depression exhibit bias against negative stimuli (Bento de Souza et al., 2014).

In addition, in our study it was found that an increase in anxiety levels in depressed individuals were also associated with a decrease in facial emotion recognition performance. In this field, our findings are consistent with the studies suggesting that facial emotion processing is impaired in patients with high anxiety and is influenced by a negative bias, that is, affected individuals tend to manifest peculiar processing of pictures with negative facial displays of emotion (Baez et al., 2023) and that children with anxiety disorders showed attentional bias toward angry faces compared to healthy controls (Schmidtendorf et al., 2018). Facial emotion recognition is a basic skill (Gobbini & Haxby, 2007), that is essential for successful social interactions and informs our understanding of the other person's intentions and determines our behavior accordingly. Difficulties in recognizing facial emotions and in particular increased attention to negative facial expressions, can lead to misinterpretation of social cues, making the process of social interaction more difficult (Trautmann et al., 2009). This can worsen feelings of rejection or alienation in social settings, hence the tendency to form cognitive schemas that make them more vulnerable to depression. They become accustomed to a ruminative cognitive style in which both themselves and their environment are processed in a negative way, which may increase the risk of developing suicidal behavior (Scher et al., 2005).

As for we consider the assessment of NC, in our study, in Penn CNB subtests in which neurocognitive profile was examined between the groups; Facial Memory Test Late Version correct response number, Facial Memory Test Late Version correct response speed, Visual Object Learning Test Late Version correct response number and Visual Object Learning Test correct response number test performances were found to be higher in the control group.

In the Facial Memory Tests and Visual Object Learning Tests, they are asked to remember whether the faces or visual objects shown in the previous application overlap with the faces and objects in the later versions. These tests measure episodic memory and learning ability, which includes any set of historical information we have for faces and shapes. A lower number of correct response and prolonged reaction times are associated with reduced episodic memory function. In our study, in the most of these tests measuring episodic memory and learning, it was observed that, the number of correct responses in adolescents with depression was significantly lower than that of healthy controls, and they answered questions more slowly. Our findings are consistent with the broad literature suggesting a relationship between suicidal ideation and low cognitive function in adolescence and young adulthood (Naifeh et al., 2017; Rutter et al., 2020). When the relationship between neurocognitive impairments and suicide is examined, it has been reported that some executive functions, especially those related to emotion regulation and decision-making, constitute a permanent defect in information processing that may contribute to the risk of suicidal behavior (Allen et al., 2019). Taken together, these findings suggest that cognitive difficulties in young people are predictive of occupational and daily functioning and should be considered in targeted interventions.

In our study we hypothesized that, impairment in SC and NC was positively correlated with the severity of depression. According to our findings it was observed that, correct recognition of facial emotions, learning and episodic memory functions are impaired with increasing severity of depression in the patient groups. Our results are in line with data from previous studies reporting a stable association between depression severity and deficits in neurocognitive and social-cognitive functions (Kriesche et al., 2023; Schwert et al., 2019).

In conclusion, as we stated in our hypothesis, our study showed that adolescents with suicidal behavior had lower neurocognitive and social cognitive skills than non-suicidal adolescents. In the light of all these evidences, when we look at the clinical reflections of these deficits and their association with suicidal behavior, we observe that executive function deficits can lead to a wide range of difficulties, such as difficulty controlling emotions, thoughts and actions. They may also be associated with difficulty controlling thoughts about self-harm or difficulty shifting to more positive or adaptive thinking in response to stress. All these deficits in cognitive domains are thought to play a role in the transition from suicidal ideation to action (Saffer & Klonsky, 2018). It is of critical importance to recognize these factors associated with suicide risk and to arrange pharmacological treatment for patients found to be at high risk as a result of risk assessment, as well as inpatient treatment for rapid intervention.

When we look at the predictors of suicidal behavior in our study; It was found that only the presence of suicidal ideation predicted suicide attempt. In this respect, our study seems to be compatible with studies reporting the presence of suicidal ideation and suicidal plans associated with susceptibility to suicide attempts (Baca-Garcia et al., 2011; Majidi et al., 2020). Suicidal individuals often experience an internal struggle between wanting to live and wanting to die (Brown et al., 2005; Kovacs & Beck, 1977) and that this death wish may be an important predictor of

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future completed suicide (O'Hare & Kenny, 2013; Palacio et al., 2007). Patients often do not talk about their suicidal plans unless they are asked and asking directly does not encourage or give someone the idea of attempting suicide (Law et al., 2015). It is clear that routine questioning of nature and content of suicidal thoughts at every examination in these patients is the first step for the implementation of effective suicide prevention interventions.

Limitations and strengths

The findings of our study should be interpreted with consideration of several limitations. First, the study was conducted solely with a Turkish adolescent population, and participants were recruited from psychiatric services and outpatient clinics in a single center, while the control group consisted of healthy volunteers from nearby neighborhoods. Although the similarity in environmental conditions across the three groups strengthens the study, the focus on a specific demographic group and race/ethnicity, as well as the small sample size, may limit the generalizability of the results and their external validity. Caution should be exercised when extrapolating these findings to larger populations, and replication in larger studies with more extensive samples is warranted. Moreover, as a cross-sectional case-control study within a clinical group, our study underscores the need for long-term prospective follow-up studies to establish clearer causal relationships between diseases and their etiological factors. Additionally, variations in education duration and qualifications among individuals in our study sample may have influenced the results of neurocognitive and SC tests. Furthermore, some participants diagnosed with depression were taking medication at the time of the study, potentially impacting cognitive function, particularly attention (Goswami et al., 2009).

Despite all these limitations, the strengths of our study include the fact that the diagnosis of depression was made with the scale and performance test and with the semi-structured interview form of the K-SADS, that confounding factors such as age, gender, ethnicity, sociodemographic characteristics and intelligence level were minimized by matching the patient and control groups, and that the neurocognitive and social cognitive profiles of the participants were objectively evaluated with a computerized test battery.

CONCLUSION

Our study contributes to the existing literature and future studies to be conducted in our country by examining suicidal behavior, which is an important public health problem among young people, multi-dimensionally and evaluating possible factors with objective assessment tools. In addition, when many factors predicting suicide were considered together, it was observed that suicidal ideation was the most important factor in predicting suicide. This draws attention to the importance of questioning suicidal behaviors, which is a public health problem, by clinicians.

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CONFLICT OF INTEREST STATEMENT

We declared that we have no commercial, financial, and other relationships in any way related to the subject of this article all that might create any potential conflict of interest.

DATA AVAILABILITY STATEMENT

Data supporting the findings of this study are available by request from the corresponding author.

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REFERENCES

Allen, K. J. D., Bozzay, M. L., & Edenbaum, E. R. (2019). Neurocognition and suicide risk in adults. *Current Behavioral Neuroscience Reports*, *6*, 6.

Allott, K., Fisher, C. A., Amminger, G. P., Goodall, J., & Hetrick, S. (2016). Characterizing neurocognitive impairment in young people with major depression: State, trait, or sar? *Brain and Behavior: A Cognitive Neuroscience Perspective*, *6*, e00527.

Alsen, G. S., Baykara, H. B., & Inal, E. N. (2018). Psychometric properties of the Turkish adaptation of the children's depression rating scale: Revised in Turkish adolescents. *Anadolu Psikiyatri Dergisi*, *19*, 41–48.

Assari, S. (2020). Racial variation in the association between suicidal history and positive and negative urgency among American children. *Journal of Education and Culture Studies*, *4*(4), 39–53.

1943278x, 0, Downloaded from https://onlinelibrary.wiley.com/doi/10.1111/sltb.13090 by Bursa Uludag University, Wiley Online Library on [17/05/2024]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

Atli, Z., Eskin, M., & Dereboy, C. (2009). İntihar Olasılığı Ölçeğinin (İOÖ) Klinik Örneklemde Geçerlik ve Güvenirliği. *Klinik Psikiyatri Dergisi*, *12*, 111–124.

Baca-Garcia, E., Perez-Rodriguez, M. M., Oquendo, M. A., Keyes, K. M., Hasin, D. S., Grant, B. F., & Blanco, C. (2011). Estimating risk for suicide attempt: Are we asking the right questions? Passive suicidal ideation as a marker for suicidal behavior. *Journal of Affective Disorders*, *134*(1–3), 327–332.

Baez, S., Tangarife, M. A., Davila-Mejia, G., Trujillo-Güiza, M., & Forero, D. A. (2023). Performance in emotion recognition and theory of mind tasks in social anxiety and generalized anxiety disorders: A systematic review and meta-analysis. *Frontiers in Psychiatry*, *14*, 1192683.

Barzilay, R., Calkins, M. E., Moore, T. M., Boyd, R. C., Jones, J. D., Benton, T. D., Oquendo, M. A., Gur, R. C., & Gur, R. E. (2019). Neurocognitive functioning in community youth with suicidal ideation: Gender and pubertal effects. *The British Journal of Psychiatry*, *215*(3), 552–558.

Barzilay, R., White, L. K., Moore, T. M., Calkins, M. E., Taylor, J. H., Patrick, A., Huque, Z. M., Young, J. F., Ruparel, K., Pine, D. S., Gur, R. C., & Gur, R. E. (2020). Association of anxiety phenotypes with risk of depression and suicidal ideation in community youth. *Depression and Anxiety*, *37*(9), 851–861.

Benarous, X., Consoli, A., Cohen, D., Renaud, J., Lahaye, H., & Guilé, J. M. (2019). Suicidal behaviors and irritability in children and adolescents: A systematic review of the nature and mechanisms of the association. *European Child & Adolescent Psychiatry*, *28*(5), 667–683.

Bento de Souza, I. B. M., Barbosa, F. F., Lacerda, A. M., dos Santos, N. A., & Torro-Alves, N. (2014). Evaluation of facial expressions in women with major depression: Is there a negative bias? *Psychology & Neuroscience*, *7*(4), 513–519.

Brown, G. K., Steer, R. A., Henriques, G. R., & Beck, A. T. (2005). The internal struggle between the wish to die and the wish to live: A risk factor for suicide. *The American Journal of Psychiatry*, *162*, 1977–1979.

Chorpita, B. F., Moffitt, C. E., & Gray, J. (2005). Psychometric properties of the Revised Child Anxiety and Depression Scale in a clinical sample. *Behaviour Research and Therapy*, *43*(3), 309–322.

Copeland, W. E., Goldston, D. B., & Costello, E. J. (2017). Adult associations of childhood suicidal thoughts and behaviors: A prospective, longitudinal analysis. *Journal of the American Academy of Child and Adolescent Psychiatry*, *56*, 958–965.

Cull, J. G., & Gill, W. S. (1988). *Suicide probability scale manual*. Western Psychological Services.

Curtin, S. C., & Heron, M. (2019). Death rates due to suicide and homicide among persons aged 10–24: United States, 2000-2017. *NCHS Data Brief*, *352*, 1–8.

Cyders, M. A., Littlefield, A. K., Coffey, S., & Karyadi, K. A. (2014). Examination of a short English version of the UPPS-P Impulsive Behavior Scale. *Addictive Behaviors*, *39*(9), 1372–1376.

Dong, M., Zeng, L. N., Lu, L., Li, X. H., Ungvari, G. S., Ng, C. H., Chow, I. H. I., Zhang, L., Zhou, Y., & Xiang, Y. T. (2019). Prevalence of suicide attempt in individuals with major depressive disorder: A meta-analysis of observational surveys. *Psychological Medicine*, *49*(10), 1691–1704.

Ehlers, S., Gillberg, C., & Wing, L. (1999). A screening questionnaire for Asperger syndrome and other high-functioning autism spectrum disorders in school age children. *Journal of Autism and Developmental Disorders*, *29*(2), 129–141.

Eray, S., Sigirli, D., Yavuz, B. E., Şahin, V., Liu, M., & Cyders, M. A. (2022). Turkish adaptation and validation of the short-UPPS-P in adolescents and examination of different facets of impulsivity in adolescents with ADHD. *Child Neuropsychology*, *1-17*, 503–519.

Ferrer, I., Alacreu-Crespo, A., Salvador, A., Genty, C., Dubois, J., Sénèque, M., Courtet, P., & Olié, E. (2020). I cannot read your eye expression: Suicide attempters have difficulties in interpreting complex social emotions. *Frontiers in Psychiatry*, *11*, 543889.

Fiske, S. T., & Taylor, S. E. (2013). Social cognition from brains to culture. *Reference & Research Book News*, *28*(2), 672.

Gobbini, M. I., & Haxby, J. V. (2007). Neural systems for recognition of familiar faces. *Neuropsychologia*, *45*, 32–41.

Gormez, V., Kilincaslan, A., Orengul, A. C., Ebesutani, C., Kaya, I., Ceri, V., et al. (2017). Psychometric properties of the Turkish version of the Revised Child Anxiety and Depression Scale—Child version in a clinical sample. *Psychiatry and Clinical Psychopharmacology*, *27*, 84–92.

Goswami, U., Sharma, A., Varma, A., Gulrajani, C., Ferrier, I. N., Young, A. H., Gallagher, P., Thompson, J. M., & Moore, P. B. (2009). The neurocognitive performance of drug-free and medicated euthymic bipolar patients do not differ. *Acta Psychiatrica Scandinavica*, *120*(6), 456–463.

Gur, R. C., Richard, J., Hughett, P., Calkins, M. E., Macy, L., Bilker, W. B., Brensinger, C., & Gur, R. E. (2010). A cognitive neuroscience-based computerized battery for efficient measurement of individual differences: Standardization and initial construct validation. *Journal of Neuroscience Methods*, *187*(2), 254–262.

Haller, S. P., Kircanski, K., Stringaris, A., Clayton, M., Bui, H., Agorsor, C., Cardenas, S. I., Towbin, K. E., Pine, D. S., Leibenluft, E., & Brotman, M. A. (2020). The Clinician Affective Reactivity Index: Validity and reliability of a clinician-rated assessment of irritability. *Behavior Therapy*, *51*(2), 283–293.

Huber, R. S., Sheth, C., Renshaw, P. F., Yurgelun-Todd, D. A., & McGlade, E. C. (2022). Suicide ideation and neurocognition among 9- and 10-year old children in the Adolescent Brain Cognitive Development (ABCD) Study. *Archives of Suicide Research*, *26*(2), 641–655.

Izgi, B., Moore, T. M., Yalcinay-Inan, M., Port, A. M., Kuscu, K., Gur, R. C., & Yapici, E. H. (2022). Test-retest reliability of the Turkish translation of the Penn computerized neurocognitive battery. *Applied Neuropsychology. Adult*, *29*(5), 1258–1267.

Jollant, F., Lawrence, N. L., Olié, E., Guillaume, S., & Courtet, P. (2011). The suicidal mind and brain: A review of neuropsychological and neuroimaging studies. *World Journal of Biological Psychiatry*, *12*(5), 319–339.

Kaufman, J., Birhamer, B., Axelson, D. A., Brent, D., Perepletchikova, F., & Ryan, N. (2016). *The KSADS-PL DSM-5*. Kennedy Krieger Institute.

Keilp, J. G., Gorlyn, M., Russell, M., Oquendo, M. A., Burke, A. K., Harkavy-Friedman, J., & Mann, J. J. (2013). Neuropsychological function and suicidal behavior: Attention control, memory and executive dysfunction in suicide attempt. *Psychological Medicine*, *43*(3), 539–551.

Kilincaslan, A., Gunes, A., Eskin, M., & Madan, A. (2019). Linguistic adaptation and psychometric properties of the Columbia-Suicide Severity Rating Scale among a heterogeneous sample of adolescents in Turkey. *International Journal of Psychiatry in Medicine*, *54*(2), 115–132.

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King, D. A., Conwell, Y., Cox, C., Henderson, R. E., Denning, D. G., & Caine, E. D. (2000). A neuropsychological comparison of depressed suicide attempters and nonattempters. *The Journal of Neuropsychiatry and Clinical Neurosciences*, *22*, 64–70.

Köse, S., Özbaran, B., Yazgan, Y., Bildik, T., Erermiş, S., Aydın, C., & Baytunca, M. B. (2017). The psychometric properties of Turkish version of autism Spectrum screening questionnaire in children aged 6–18 years. *Türk Psikiyatri Dergisi*, *28*(4), 268–277.

Kovacs, M., & Beck, A. T. (1977). The wish to die and the wish to live in attempted suicides. *Journal of Clinical Psychology*, *33*, 361–365.

Krause, F. C., Linardatos, E., Fresco, D. M., & Moore, M. T. (2021). Facial emotion recognition in major depressive disorder: A meta-analytic review, *293*, 320–328.

Kriesche, D., Woll, C. F. J., Tschentscher, N., Engel, R. R., & Karch, S. (2023). Neurocognitive deficits in depression: A systematic review of cognitive impairment in the acute and remitted state. *European Archives of Psychiatry and Clinical Neuroscience*, *273*(5), 1105–1128.

Lalovic, A., Wang, S., Keilp, J. G., Bowie, C. R., Kennedy, S. H., & Rizvi, S. J. (2022). A qualitative systematic review of neurocognition in suicide ideators and attempters: Implications for cognitive-based psychotherapeutic interventions. *Neuroscience and Biobehavioral Reviews*, *132*, 92–109.

Law, M. K., Furr, R. M., Arnold, E. M., Mneimne, M., Jaquett, C., & Fleeson, W. (2015). Does assessing suicidality frequently and repeatedly cause harm? A randomized control study. *Psychological Assessment*, *27*(4), 1171–1181.

Leppänen, J. M., Milders, M., Bell, J. S., Terriere, E., & Hietanen, J. K. (2004). Depression biases the recognition of emotionally neutral faces. *Psychiatry Research*, *128*(2), 123–133.

Majidi, S., O'Donnell, H. K., Stanek, K., Youngkin, E., Gomer, T., & Driscoll, K. A. (2020). Suicide risk assessment in youth and young adults with type 1 diabetes. *Diabetes Care*, *43*(2), 343–348.

Miyake, A., & Friedman, N. P. (2012). The nature and organisation of individual differences in executive functions: Four general conclusions. *Current Directions in Psychological Science*, *21*(1), 8–14.

Naifeh, J. A., Nock, M. K., Ursano, R. J., Vegella, P. L., Aliaga, P. A., Fullerton, C. S., Kessler, R. C., Wryter, C. L., Heeringa, S. G., & Stein, M. B. (2017). Neurocognitive function and suicide in U.S. army soldiers. *Suicide & Life-Threatening Behavior*, *47*(5), 589–602.

Nelis, S. M., Rae, G., & Liddell, C. (2011). The level of Expressed Emotion Scale: A useful measure of expressed emotion in adolescents? *Journal of Adolescence*, *34*(2), 311–318.

Nock, M. K., Borges, G., Bromet, E. J., Cha, C. B., Kessler, R. C., & Lee, S. (2008). Suicide and suicidal behavior. *Epidemiologic Reviews*, *30*(1), 133–154.

Nock, M. K., Green, J. G., Hwang, I., McLaughlin, K. A., Sampson, N. A., Zaslavsky, A. M., & Kessler, R. C. (2013). Prevalence, correlates, and treatment of lifetime suicidal behavior among adolescents: Results from the National Comorbidity Survey Replication Adolescent Supplement. *JAMA Psychiatry*, *70*(3), 300–310.

Nuechterlein, K. H., Barch, D. M., Gold, J. M., Goldberg, T. E., Green, M. F., & Heaton, R. K. (2004). Identification of separable cognitive factors in schizophrenia. *Schizophrenia Research*, *72*(1), 29–39.

O'Connor, R. C., & Nock, M. K. (2014). The psychology of suicidal behaviour. *The Lancet Psychiatry*, *1*(1), 73–85.

O'Hare, C., & Kenny, R. (2013). The passive death wish and the frailty syndrome: An opportunity for active intervention. *Irish Journal of Medical Science*, *182*, S214-S214. 10.

Orri, M., Galera, C., Turecki, G., Forte, A., Renaud, J., Boivin, M., Tremblay, R. E., Côté, S. M., & Geoffroy, M. C. (2018). Association of childhood irritability and depressive/anxious mood profiles with adolescent suicidal ideation and attempts. *JAMA Psychiatry*, *75*(5), 465–473.

Ortuño-Sierra, J., Aritio-Solana, R., Del Casal, A. D. G., & Fonseca-Pedrero, E. (2021). Neurocognitive functioning in adolescents at risk for suicidal behaviors. *Archives of Suicide Research*, *25*(3), 657–671.

Palacio, C., Garcia, J., Diago, J., Zapata, C., Lopez, G., Ortiz, J., & Lopez, M. (2007). Identification of suicide risk factors in Medellin, Colombia: A case–control study of psychological autopsy in a developing country. *Archives of Suicide Research*, *11*, 297–308.

Perrain, R., Dardennes, R., & Jollant, F. (2021). Risky decision-making in suicide attempters, and the choice of a violent suicidal means: An updated meta-analysis. *Journal of Affective Disorders*, *280*, 241–249.

Pinkham, A. E., Penn, D. L., Green, M. F., Buck, B., Healey, K., & Harvey, P. D. (2014). The social cognition psychometric evaluation study: Results of the expert survey and RAND panel. *Schizophrenia Bulletin*, *40*(4), 813–823.

Pollak, O. H., Cheek, S. M., Rudolph, K. D., Hastings, P. D., Nock, M. K., & Prinstein, M. J. (2023). Social problem-solving and suicidal behavior in adolescent girls: A prospective examination of proximal and distal social stress-related risk factors. *Journal of Psychopathology and Clinical Science*, *132*(5), 610–620.

Posner, K., Brown, G. K., Stanley, B., Brent, D. A., Yershova, K. V., Oquendo, M. A., Currier, G. W., Melvin, G. A., Greenhill, L., Shen, S., & Mann, J. J. (2011). The Columbia-Suicide Severity Rating Scale: Initial validity and internal consistency findings from three multisite studies with adolescents and adults. *The American Journal of Psychiatry*, *168*(12), 1266–1277.

Poznanski, E. O., Grossman, J. A., Buchsbaum, Y., Banegas, M., Freeman, L., & Gibbons, R. (1984). Preliminary studies of the reliability and validity of the Children's Depression Rating Scale. *Journal of the American Academy of Child Psychiatry*, *23*(2), 191–197.

Rutter, S. B., Cipriani, N., Smith, E. C., Ramjas, E., Vaccaro, D. H., Martin Lopez, M., Calabrese, W. R., Torres, D., Campos-Abraham, P., Llaguno, M., Soto, E., Ghavami, M., & Perez-Rodriguez, M. M. (2020). Neurocognition and the suicidal process. *Current Topics in Behavioral Neurosciences*, *46*, 117–153.

Saffer, B. Y., & Klonsky, D. E. (2018). Do neurocognitive abilities distinguish suicide attempters from suicide ideators? A systematic review of an emerging research area. *Clinical Psychology: Science and Practice*, *25*, 12227.

Scher, C. D., Ingram, R. E., & Segal, Z. V. (2005). Cognitive reactivity and vulnerability: Empirical evaluation of construct activation and cognitive diatheses in unipolar depression. *Clinical Psychology Review*, *25*(4), 487–510.

Schmidtendorf, S., Wiedau, S., Asbrand, J., Tuschen-Caffier, B., & Heinrichs, N. (2018). Attentional bias in children with social anxiety disorder. *Cognitive Therapy and Research*, *42*(3), 273–288.

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Schwert, C., Stohrer, M., Aschenbrenner, S., Weisbrod, M., & Schröder, A. (2019). Neurocognitive profile of outpatients with unipolar depressive disorders. *Journal of Clinical and Experimental Neuropsychology*, *41*(9), 913–924.

Senna, S., Schwab, B., Melo, H. M., Diaz, A. P., & Schwarzbold, M. L. (2022). Social cognition and suicide-related behaviors in depression: A cross-sectional, exploratory study. *Revista Brasileira de Psiquiatria*, *44*(6), 639–643.

Sveticic, J., & de Leo, D. (2012). The hypothesis of a continuum in suicidality: A discussion on its validity and practical implications. *Mental Illness*, *4*(2), e15.

Thompson, C., & Ong, E. L. C. (2018). The association between suicidal behavior, attentional control, and frontal asymmetry. *Frontiers in Psychiatry*, *14*(9), 79.

Trautmann, S. A., Fehr, T., & Herrmann, M. (2009). Emotions in motion: Dynamic compared to static facial expressions of disgust and happiness reveal more widespread emotion-specific activations. *Brain Research*, *1284*, 100–115.

Turan, S., Ermiş, C., Eray, S., Yavuz, B. E., Uzman, S., Ozbek, M. M., Tunçtürk, M., Çıray, R. O., & İnal, N. (2022). Psychometric properties of The Clinician Affective Reactivity Index for Assessment of Irritability in a clinical sample of Turkish children and adolescents. *Scandinavian Journal of Child and Adolescent Psychiatry and Psychology*, *10*(1), 24–32.

Unal, F. (2019). Okul Çağı Çocukları için Duygulanım Bozuklukları ve Şizofreni Görüşme Çizelgesi-Şimdi ve Yaşam Boyu Şekli Türkçe Uyarlamasının (ÇDŞG-ŞY-DSM-5-T) Geçerlik ve Güvenirliği. *Turk psikiyatri dergisi*, *30*(1), 42–50.

Vural, P., Sigirli, D., Eray, S., Ercan, I., & Kilic, E. Z. (2013). The reliability and validity study of shortened level of expressed emotion scale in adolescents Ergenlerde Kısaltılmış Duygu Dışavurum Ölçeği Güvenilirlik ve Geçerlilik Çalışması. *Turkiye Klinikleri Journal of Medical Sciences*, *33*(1), 191–199.

Wagner, S., Müller, C., Helmreich, I., Huss, M., & Tadić, A. (2015). A meta-analysis of cognitive functions in children and adolescents with major depressive disorder. *European Child & Adolescent Psychiatry*, *24*, 5–19.

Wolff, J., Frazier, E. A., Esposito-Smythers, C., Burke, T., Sloan, E., & Spirito, A. (2013). Cognitive and social factors associated with NSSI and suicide attempts in psychiatrically hospitalized adolescents. *Journal of Abnormal Child Psychology*, *41*(6), 1005–1013.

World Health Organization. (2021). *Suicide worldwide in 2019: Global health estimates*. World Health Organization.

Xin, L.-M., Chen, L., Su, Y.-A., Yang, F.-D., Wang, G., Fang, Y.-R., Lu, Z., Yang, H.-C., Hu, J., Chen, Z.-Y., Huang, Y., Sun, J., Wang, X.-P., Li, H.-C., Zhang, J.-B., & Si, T.-M. (2018). Risk factors for recent suicide attempts in major depressive disorder patients in China: Results from a national study. *Frontiers in Psychiatry*, *9*, 300.

Xu, L., Zhang, H., Zhou, C., Zhang, Z., Li, G., Lu, W., Tian, X., Huang, H., Li, D., Schinke, R. J., Yuan, T., Yin, J., & Lin, K. (2023). Deficits in psychological resilience and problem-solving ability in adolescents with suicidal ideation. *Child and Adolescent Psychiatry and Mental Health*, *17*(1), 31.

Xu, M., Rosario-Williams, B., Kline, E. A., & Miranda, R. (2022). Social cognitive mechanisms between psychological maltreatment and adolescent suicide ideation: Race/ethnicity and gender as moderators. *Psychology of Violence*, *12*(6), 393–402.

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