

ORIGINAL ARTICLE

Impulsivity and Suicide Attempts in Adolescence: A New Perspective on the Old Story

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Abstract

Background: The common risk factors of suicidality in adolescents could be psychological, behavioral, cognitive, interpersonal, and personal. Major depressive disorder and impulsive behavior are crucial predictors or mediators for suicidality. This study aims to show the multidirectional links between the predictors of suicidality in adolescents.

Methods: The study included 49 suicide attempters (15.82±1.24 years) and 41 controls (15.67±1.40 years). The instruments were sociodemographic form and Barratt Impulsivity Scale-11 (BIS-11). The Kiddie Schedule for Affective Disorders and Schizophrenia was used to assess the psychiatric diagnoses.

Results: Among the suicide attempters, 93.9% (n = 46) were female, while 58.5% (n = 24) of the control group were female ($\chi^2=16.131$, $p<0.001$). More adolescents in suicide attempters had motor, cognitive and non-planning impulsivity problems, major depressive disorder, and family history of suicide attempt than in the control ($p<0.05$). Cognitive impulsivity, major depressive disorder, and family history of suicide were found to predict suicidality in logistic regression analyses. The mediation model reveals that effect of depression or family history of suicide on suicidality were not mediated through the severity of cognitive impulsivity.

Conclusion: Although cognitive impulsivity, depression, and family history of suicide directly enhance suicidality, the indirect path between depression/ family history of suicide and suicidality were not mediated by cognitive impulsivity. This study provides a novel perspective on established risk factors that have been shown to predict suicide in adolescents and helps clarifying their role. Understanding multidimensional risk factors of suicide attempts might ultimately help to reduce completed suicide in adolescents.

Keywords: Adolescence, Suicide, Impulsivity, Depressive disorder.

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INTRODUCTION

According to Turkish Statistical Association and Center for Disease Control, second leading cause of death in adolescents was completed suicide (1, 2). However, the underlying psychobiological processes contributing to suicidal behavior remain poorly understood. The common risk factors of suicidality in adolescents could be either psychological, behavioral, cognitive, interpersonal, and personal (3, 4). While completed suicides are 25 to 60 times less frequent than attempted ones, the scope of the problem is significant; in 2014 alone, approximately 100,000 adolescents aged 12 to 17 were treated in emergency departments following suicide attempts (2).

Among psychological risk factors, depressive symptoms are especially prominent (5, 6). Major depressive disorder (MDD) is associated with a five-fold increase in suicide attempts, even when controlling for comorbid conditions (7). A recent meta-analysis found that MDD increases the likelihood of suicidal ideation nearly four-fold among adolescents in educational settings, underscoring its central role in suicide risk (8). Despite the strong link between psychiatric conditions and suicidality (9), most individuals with these conditions do not attempt suicide, indicating the influence of additional risk factors (10). Impulsivity has been identified as one such factor, with both self-report (11) and behavioral performance-based studies (12, 13) linking it to suicidality in both adults and adolescents (14–16).

Impulsivity is broadly defined as a tendency toward rapid, unplanned reactions to internal or external stimuli without regard for negative consequences (17) and is considered a multidimensional construct (18, 19). The UPPS-R (Urgency, Premeditation, Perseverance, Sensation Seeking- Revised) Impulsive Behavior Scale assesses various dimensions of impulsivity: sensation seeking (SS)—the pursuit of novel and intense experiences; lack of premeditation (LPM)—acting without forethought; lack of perseverance (LPS)—difficulty maintaining goal-directed behavior; and urgency—impulsive actions in response to emotional states, distinguished as negative urgency (NUR) and positive urgency (PUR). Among these, affective impulsivity—particularly negative urgency—has been associated with suicide attempts (20), depressive symptoms (21), borderline personality disorder symptoms (22, 23), impulse-control disorders (9), and non-suicidal self-injury (24), all of which are closely linked to suicidality. Moreover, depressive disorders,

personality pathology, and emotionally driven impulsive behaviors have been found to predict a faster onset of suicide attempts (25). This growing body of evidence suggests that emotional impulsivity has complex, multidimensional associations with various suicidal behaviors.

Recent studies have further demonstrated a strong cognitive link between emotion regulation and impulsivity, with cognitive impulsivity often assessed via the Barratt Impulsiveness Scale (BIS-11) (26, 27). Despite the increasing focus on adolescent suicidality, the specific roles and interactions of impulsivity, depression, and suicide attempts remain vague. While impulsivity has both emotional and executive dimensions, most studies assess only a single, unitary aspect. Herewith, it is still unknown which dimension of impulsivity is most significantly related to suicidal behavior, and whether impulsivity functions as a key predictor or mediator of suicidality. Understanding these associations could inform clinical interventions aimed at high-risk adolescent populations.

To clarify these specific associations, this study aims to 1) identify the predictors of suicidality in adolescents and 2) explore the multidirectional associations between these predictors.

Based on the current literature and our clinical observations, we hypothesized that:

1. Major depressive disorder would have a direct positive effect on adolescent suicidality.
2. A family history of suicide attempt would have a direct positive effect on adolescent suicidality.
3. Cognitive impulsivity would independently predict suicidality, regardless of depression or family history of suicide attempts.
4. Cognitive impulsivity would mediate the relationship between (a) depression and suicidality, and (b) family history of suicide attempts and suicidality.

MATERIALS AND METHODS

Study Population

This case control study was carried out between January 1, 2017, and December 1, 2017 at the Child and Adolescent Psychiatry outpatient clinic and emergency service. The study included of 90 adolescents aged 13 and 18 years. A total of 78 adolescents who were admitted to the emergency service following a suicide attempt were invited to participate; 49 of them agreed and were included as the

suicide attempters group. The control group consisted of 41 adolescents with various psychiatric diagnosis who were admitted to the outpatient clinic with symptoms other than suicide attempt and voluntarily agreed to participate. These individuals were randomly selected from eligible participants. Adolescents and their parents were informed about the study, and written informed consent was obtained from both adolescents and their parents after verbal invitation. Diagnoses were made based on clinical examination and Kiddie-Schedule for Affective Disorders and Schizophrenia for School-Age Children, Present and Lifetime Version (K-SADS-PL). Adolescents with intellectual disability, severe neurological or medical problems, autism spectrum disorders or schizophrenia were excluded from the study. A total of 90 adolescents (49 case group, and 41 control group) who agreed to participate the study, and whose forms have reliable information were included in the study. The flow of participant selection and inclusion is presented in Figure 1. The study protocol was approved by the Ethics Committee of Marmara University School of Medicine (Approval Date: 15.11.2024, Approval Number: 09.2024.1334). The study protocol was performed in accordance with the ethical standards of the institutional and national research committee, and with the 1964 Declaration of Helsinki. Informed consent was obtained from all individual participants included in the study. No animal data were used in this study.

Demographic information and impulsivity domains were evaluated using a researcher-developed sociodemographic form and the Barratt Impulsiveness Scale-11 (BIS-11), respectively.

Sociodemographic Form

A detailed sociodemographic form was developed by the researchers to collect data including parental age and educational level, marital and relation status of the parents, number of the family members, level of income per person, developmental milestones, current psychiatric symptoms of parents, and family history of suicide attempt. In the sociodemographic form, income level was defined based on the minimum wage as low, average, and high.

Schedule for Affective Disorders and Schizophrenia for School-Age Children – Present and Lifetime Version (K-SADS-PL)

Kaufman et al. (1997) developed K-SADS-PL as semi-structured measure to screen psychiatric disorders

in children and adolescents aged between 6-18 years (28). The Turkish validity and reliability study for K-SADS-PL was performed by Gökler et al. in 2004 (29). The K-SADS-PL was used to determine the presence of current psychiatric disorders of the adolescents.

Barratt Impulsivity Scale-11 (BIS-11)

The BIS-11 is a 30-item self-reporting questionnaire designed to measure impulsiveness. All items are measured on a 4-point Likert scale (1=rarely/never; 2=occasionally; 3=often; 4=almost always/always). Statistical factor analysis revealed three components as follows: (1) cognitive impulsiveness, (2) motor impulsiveness, and (3) non-planning impulsiveness. The cognitive impulsiveness subscale assesses the ability to focus on the task at hand and the cognitive speed in decision making. The motor impulsiveness subscale assesses acting without thinking and restlessness, and the non-planning impulsiveness subscale assesses the lack of future-oriented problem-solving strategies (30). The higher the impulsiveness level corresponds to the higher BIS-11 total score. BIS-11 is a valid and reliable instrument for Turkish healthy and psychiatric populations (31). Cronbach's alphas for internal consistency were 0.78 (students) and 0.81 (patients), and the two-month test-retest reliability was 0.83 (students) (31).

Statistical Analyses

SPSS v.20.0 for Windows (SPSS, Inc. Chicago, IL) was used to analyze the data. Chi-square tests were used to analyze differences in categorical variables. Mann-Whitney U and Student t-test were used to analyze differences in continuous variables. Two main questions were addressed in the analyses. (1) what are the predictors of suicidality in adolescents? 2) Are there any multidirectional associations between the predictors of suicidality in adolescents? The path model for suicidality in adolescents were tested using the PROCESS macro for SPSS v2.16.3 (Hayes, 2008) based on ordinary least squares (OLS) regression (32). In this study, model 4 in the Hayes's PROCESS was used to test the mediating effect (see Fig. 1). Prior to model the test, family history of suicide attempt, presence of MDD, and BIS-11 cognitive impulsivity subscore, which differ statistically between the suicide attempters and control group, were entered in a binary logistic regression analyses to test for possi-

ble effects on primary criterion. Gender was included into the path model as covariate when testing models regarding the multidirectional associations between depression, cognitive impulsivity and suicidality. In all analyses, the significance level was set to $p < 0.05$.

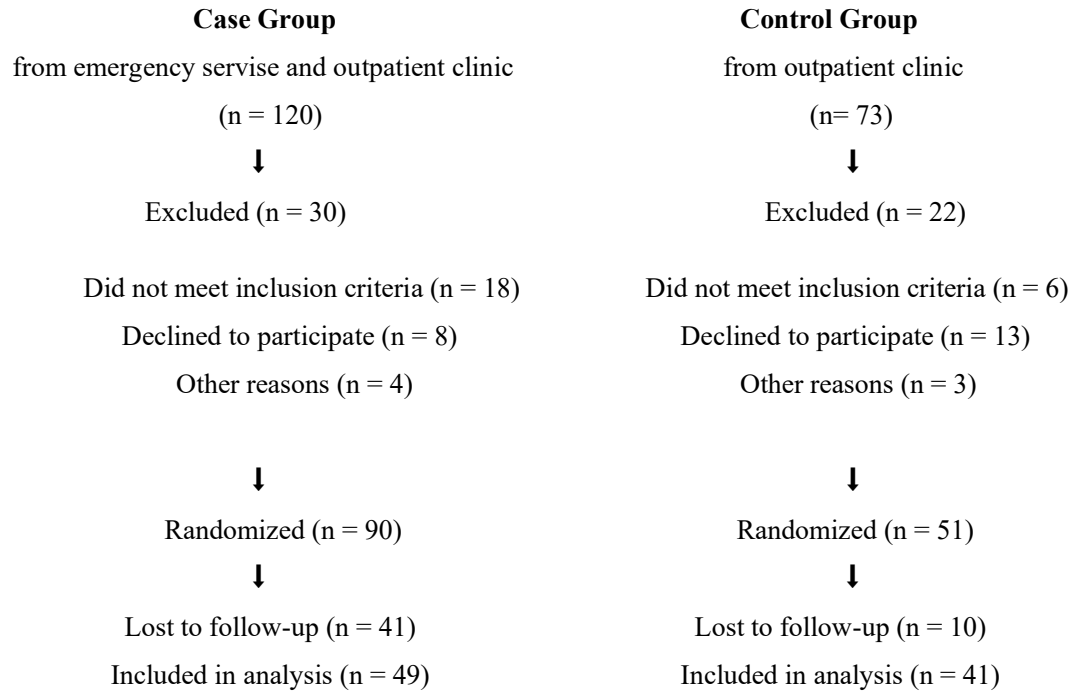


Figure 1: Patient Flow Diagram

RESULTS

Overall, 90 adolescents, suicide attempters (n=49) and controls (n=41), were included in the study. The suicide attempters (mean age: 15.82±1.24 years) and control group (mean age: 15.67±1.40 years) were similar with respect to age ($Z = -0.417$, $p = 0.676$). 93.9% of the suicide attempters (n=46) and 58.5% of the control group (n=24) was female ($\chi^2 = 16.131$, $p > 0.001$). Sociodemographic characteristics and certain developmental milestone achievements are shown in Table 1.

Family characteristics of suicide attempters and control group were similar except family history of suicide attempt. The suicide attempters had more family history of suicide attempt than the control group ($\chi^2 = 8.573$, $p = 0.003$) (Table 2).

In all, 79.6% (n = 39) of the suicide attempters and 65.9% (n=27) of the control group had ≥ 1 comorbid diagnosis ($\chi^2 = 2.154$, $p = 0.142$). The rates of the comorbid diag-

noses were as follows: attention-deficit/hyperactivity disorder: 40.8%, 41.5%; oppositional defiant disorder: 24.5%, 12.2%; conduct disorder: 6.1%, 4.9%; major depressive disorder: 57.1%, 17.1%; bipolar disorder: 8.2%, 7.3%; psychotic attack 2%, 0%; social phobia: 8.2%, 12.2%; specific phobia: 18.4%, 14.6%; general anxiety disorder: 20.4%, 22%; panic disorder: 2%, 2.4%; obsessive compulsive disorder: 4.1%, 12.2%; anorexia nervosa: 8.2%, 0%; post-traumatic stress disorder: 14.3%, 7.3%, substance abuse: 2%, 2.4% in suicide attempters and control group, respectively. Only major depressive disorder rates were higher in suicide attempters than the control group ($\chi^2 = 15.081$, $p < 0.001$).

The BIS-11 scores obtained by the suicide attempters and control group are shown in Table 3. The suicide attempters had significantly higher scores in all domains of BIS-11; cognitive impulsiveness, motor impulsiveness, non-planning impulsiveness, and total score (Table 3).

Table 1. Sociodemographic characteristics and achievement of certain developmental milestones in suicide attempters and control groups

Demographic Characteristics	Control (n=41) mean±SD	Suicide Attempters (n=49) mean±SD	Statistical Analysis
Age	15.67±1.40	15.82±1.25	Z= -0.417, p=0.676 ^a
Maternal Age	42.65±5.61	42.45±5.40	Z= -0.203, p=0.839 ^a
Paternal Age	46.17±5.11	46.59±6.24	Z= -0.297, p=0.767 ^a
Number of people in the family	4.43±1.07	4.65±1.28	Z= -0.568, p=0.570 ^a
Developmental milestones			
First word (month)	10.95±3.13	9.45±3.19	Z= -2.607, p=0.009 ^a
First sentence (month)	20.97±6.66	17.48±5.82	Z= -2.626, p=0.009 ^a
Walking (month)	12.02±1.62	11.64±1.98	Z= -1.972, p=0.049 ^a
Toilet training (month)	23.34±5.57	25.92±7.14	Z= -0.152, p=-1.432 ^a

Note. SD; Standard Deviation, ^aMann-Whitney U; Significant comparisons are denoted in bold font.

Table 2. Comparisons between the suicide attempters and control group, according to family characteristics

	Control Group (n=41)	Suicide Attempters (n=49)	Statistical Analyses
Educational Level of the Mother			
Illiterate	3 (7.3%)	4 (8.2%)	$\chi^2=2.363$, p=0.669 ^a
Primary school	15 (36.6%)	24 (49%)	
Secondary school	3 (7.3%)	4 (8.2%)	
High school	12 (29.3%)	12 (24.5%)	
University	8 (19.5%)	5 (10.2%)	
Educational Level of the Father			
Illiterate	1 (2.4%)	2 (4.1%)	$\chi^2=5.819$, p=0.213 ^a
Primary school	20 (48.8%)	18 (36.7%)	
Secondary school	3 (7.3%)	11 (22.4%)	
High school	11 (26.8%)	8 (16.3%)	
University	6 (14.6%)	10 (20.4%)	
Togetherness of Parents	31(75.6%)	39 (79.6%)	$\chi^2=2.445$, p=0.295 ^a
Current Psychiatric Symptoms of Parents	21 (51.2%)	27 (55.1%)	$\chi^2=0.135$, p=0.713 ^a
Family History of Suicide Attempt	2 (4.9%)	14 (28.6%)	$\chi^2=8.573$, p=0.003 ^a
Level of Income per Person			
Low	18 (43.9%)	25 (51%)	$\chi^2=0.729$, p=0.694 ^a
Average	20 (48.8%)	22 (44.9%)	
High	3 (7.3%)	2 (4.1%)	

Note. ^aChi-Square Test; Significant comparisons are denoted in bold font.

Table 3. The Barrett Impulsivity Scale-11 scores of the suicide attempters and control group

	Control Group (n=41) mean±SD	Suicide Attempters (n=49) mean±SD	Statistical Significance
Cognitive Impulsiveness	17.29±3.93	20.44±4.47	t= -3.519, p=0.001 ^a
Motor Impulsiveness	20.22±3.86	23.96±5.37	t= -3.830, p<0.000 ^a
Non-planning Impulsiveness	28.02±5.19	31.22±5.83	t= -2.725, p=0.008 ^a
Total	65.54±10.06	75.63±12.92	t= -4.075, p<0.001 ^a

Note. ^aStudent T Test; Significant comparisons are denoted in bold font.

The first question of the study was tested using binary logistic regression that assess the impact of a number of factors on the suicidality in adolescents. The model contained three independent variables (presence of family history of suicide attempt, presence of MDD, and BIS-11 cognitive impulsivity subscore). The full model containing all predictors was statistically significant, χ^2 (3, N = 90) = 38.351, $p < 0.001$, indicating that the model was able to distinguish between suicide attempters and the control group. Between 34.7 per cent and 46.4 percent of the variability is explained by this set of variables (Table 4).

Table 4. Outline of the regression model, indicating the variables that affect suicide attempts in adolescents

Independent Variables	Beta	Standard Error	Exp (Beta)	P	95% CI for EXP (B)	Wald
Constant	-5.542	1.549	0.004	<0.001		12.795
Family history of suicide attempts	2.512	0.896	12.328	0.005	(2.128) - (71.427)	7.853
Presence of MDD	2.076	0.591	7.976	<0.001	(2.502) - (25.423)	12.324
BIS-11 CI subscore	0.246	0.076	1.278	0.001	(1.101) - (1.484)	10.436

Note. Cox&Snell R Square= 0.347, Nagelkerke R Square=0.464, MDD; Major Depressive Disorder, BIS; Barrett Impulsivity Scale, CI; Cognitive Impulsivity

The second question was tested using a path model between suicidality, cognitive impulsiveness, family history of suicide attempt and depression. Four conditions were tested in the path model: (a) a direct effect of depression on suicidality; (b) a direct effect of family history of suicide attempts on suicidality; (c) a direct effect of cognitive impulsiveness on suicidality; and (d) a significant enhancement of the direct path from depression or family history of suicide attempt to suicidality in the presence of the mediator, cognitive impulsiveness. The latter condition was assessed by testing the significance of the indirect path coefficient from depression or

family history of suicide attempt to suicidality through cognitive impulsivity; because the total effect of depression or family history of suicide attempt on suicidality is made up of both direct and indirect effects. In this path model, gender was treated as a covariate to control for pre-existing differences between the groups. Using this approach to significance testing, a significant pathway linking depression/ family history of suicide to suicidality via cognitive impulsivity can be tested in the present study. Standardized beta coefficients are presented with their accompanying standard error to indicate the significance level of each analysis (Figure 2).

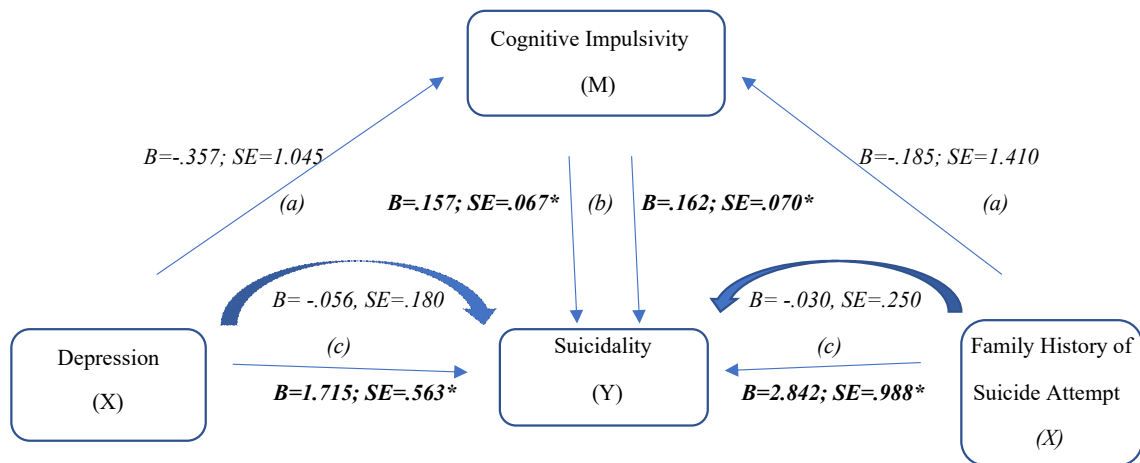


Figure 2: Suicidality path model for the full sample testing the direct effects of depression, family history of suicide attempt and cognitive impulsivity on suicidality and a schematic model of cognitive impulsivity as the mediator in the relationship between depression/family history of suicide attempt and suicidality (Andrew Hayes's mediation model 4).

Note. Standardized path coefficients are presented with the mediational paths in bold. * $p < 0.05$.

Depression or Family History of Suicide Attempt Effect on Cognitive Impulsivity and Suicidality

An initial model that excluded cognitive impulsiveness but included paths from depression and family history of suicide attempt to suicidality was fit to establish the unconditional direct path (the first and second hypothesis). These paths were significant, $Beta = 1.715$, $t = 3.046$, $p = 0.002$ and $Beta = 2.842$, $t = 2.875$, $p = 0.004$; respectively, confirming that depression or family history of suicide attempt enhance suicidality. Whereas direct paths from depression or family history of suicide attempt to cognitive impulsiveness remained insignificant ($Beta = -0.357$, $t = -0.341$, $p = 0.733$ and $Beta = -0.185$, $t = -0.131$, $p = 0.895$; respectively). Two independent path models that excluded depression or family history of suicide attempt but included a path from cognitive impulsivity to suicidality showed significance, $Beta = 0.157$, $t = 2.341$, $p = 0.019$ and $Beta = 0.162$, $t = 2.322$, $p = 0.020$; respectively, confirming that cognitive impulsivity lead to suicidality in both models (the third hypothesis). With this foundation in place, we proceeded to test mediation (the forth hypothesis).

Mediation Model

The mediation model included an indirect path from depression or family history of suicide attempt to suicidality through cognitive impulsivity (see Figure 2) to

test the significance of the mediated pathway in the covariance of gender. The indirect paths between both depression or family history of suicide attempt to suicidality were insignificant, $Beta = -0.056$, $SE = 0.166$, $p = 0.735$ and $Beta = -0.030$, $SE = 0.206$, $p = 0.883$; respectively, that is, the effect of depression or family history of suicide on increase in suicidality were not mediated through the severity of cognitive impulsivity.

DISCUSSION

Adolescent suicide is a major public health issue in Turkey which concerns healthcare providers from different disciplinary including child and adolescent psychiatry, forensic medicine, emergency medicine, and clinical psychology. Even though suicide phenomenon concerned with many areas of the medicine, there are not enough studies to clarify the constituents of this problem. Our study examined several domains of impulsivity, familial characteristics and comorbid diagnoses in adolescent with and without suicide attempt to enlighten some of the risk factors for suicidality in adolescents. Our results showed that majority of the adolescent suicide attempters had motor, cognitive and non-planning impulsivity problems, major depressive disorder, and family history of suicide attempt. Furthermore, this study aimed to expand the knowledge about the multidirectional associations between impulsivity

and suicidality in adolescents. Our present findings regarding the direct relationship between emotional/cognitive impulsivity and suicidality were congruent with previous reports (33, 34).

We established that having a diagnosis of major depressive disorder was a significant discriminating factor between adolescents with or without suicide attempt. These findings are consistent with the previous literature which states that major depressive disorder is one of the most prominent factors for increased risk of suicide attempts in adolescents (35-37). Even though depression creates a major and significant variance in suicide attempt, it is still unclear whether the depressive core symptoms such as hopelessness and anhedonia trigger the initial suicide attempt or impulsivity mediates the suicide attempt in adolescents with depressive symptoms. One of the recent studies conducted in adults with major depressive disorder found that depression severity was associated with hopelessness, impulsivity and suicidal ideation (34).

Previous meta-analytic studies have shown that another major reliable and drastic risk factor for suicidal ideation and suicide attempt was a family history of suicide (38-40). Positive family history of suicide and high motor impulsivity were found to be as a distinctive factor between attempting suicide and suicide ideation (41). In addition to Wang's findings (2017) our study showed that, family history of suicide increases the risk of suicide by 12 times but does not show its effect through impulsivity. This finding may indicate that in the etiology of adolescence suicides, the attribution of suicide history in the immediate vicinity has a more dominant familial contagion rather than genetic predispositions.

Moreover, some of the studies showed a strong association between impulsivity and suicidality and emotional/cognitive impulsivity was found to be uniquely associated with suicide attempts, even after current psychiatric diagnoses and symptoms have been controlled (33, 42). For instance, Auerbach et al. (33) examined 381 adolescents in a residential treatment setting and found that emotion-driven impulsivity predicted suicide attempts, even after controlling for psychiatric diagnoses. One of the meta-analytical review showed a strong association between impulsivity and depression, which persists despite of remission (42). However, findings remain inconsistent. For instance, Baca-Garcia et al.

(43) found that in 278 suicide attempters, trait impulsivity, assessed using Barratt Impulsiveness Scale, did not predict impulsive attempts, which were less lethal and less related to depression. In contrast, Ekinci et al. (44) found elevated impulsivity in 71 euthymic bipolar patients, particularly among those with depressive polarity and suicide attempt history, suggesting that impulsivity may reflect a stable trait influenced by the clinical course of affective disorders. These contrasting results highlight the mediator effect of impulsivity between depression severity and suicidal ideation after for age, gender and illness duration were controlled (34). Our findings suggest depression and impulsivity directly increase suicide attempt risk in adolescents, but impulsivity does not play a mediator role between depression and suicidality. These results are consistent with certain studies (43, 44) while contradicts with others (34, 42). These contradictory results might be explained through the difference in sample characteristics (major depressive disorder versus suicide attempters, adults versus adolescents) and sample size, alternating domains of impulsivity used in the studies, and statistical methods used for analyses.

One of the main limitations in our study was it had small sample size and only included adolescents of local population in Istanbul. Furthermore, age of study population was limited between 13 and 18, we could not separate the age groups because of lacking enough adolescents who accepted to participate the study. Although, impulsivity is a multidimensional construct hence that all of the domains should be investigated in the studies, BIS gives an idea regarding cognitive, motor and non-planning domains of impulsivity but not the domains such as sensation seeking and lack of perseverance. Another limitation of our study was that it relied on self-report interviews and measures, which might have introduced biased responses, particularly due to subjectivity. One limitation of the study is that the control group also included adolescents with psychiatric diagnoses. Although only major depressive disorder differed significantly between groups, the presence of comorbidities in both groups may have limited the ability to clearly distinguish the effects of specific psychopathological factors. Additionally, we only investigated suicide attempters but not completed suicides. Therefore, passive suicidal ideation, active suicidal planning,

and suicidal attempts were not evaluated separately concerning different domains of impulsivity.

Future researches might benefit from including objective measures of impulsivity such as performance-based experimental tasks which can provide a direct multifaceted evaluation. In addition, including both clinical and non-clinical control groups to more precisely identify the distinct effects of psychopathological factors on suicidality. Assessments of the relationship between suicidal behavior and impulsivity in completed suicides would take our results a step forward. For these reasons, the role of impulsivity might be assessed through each step of suicide behavior including ideation, attempt and completion. Furthermore, extensive and multicenter studies with larger populations and narrower age ranges are needed.

In addition to the limitations represented afore, there are some strengths of the current study that should be noted as well. Aside from being one of the first studies to examine the adolescent suicidality in Turkey, we used a detailed socio-demographic form and performed a semi structural interview with each of the adolescent to determine the comorbidities. Moreover, we evaluated recent suicidal and impulsive behaviors which might provide more precise and new information when compared to lifetime suicidal attempts. Finally, we used statistical methods outlined by Hayes which provided us a different perspective of path analyses with the mediation model.

In conclusion, our study re-examines the most known risk factors that have predicted suicide in adolescents and reconsider them with a different perspective. Understanding multidimensional risk factors of suicide attempts might ultimately help to reduce completed suicide in adolescents.

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Abbreviations list

ADHD: Attention-Deficit/Hyperactivity Disorder
 BIS-11: Barratt Impulsiveness Scale – Version 11
 CI: Cognitive Impulsivity
 GAD: Generalized Anxiety Disorder
 LPM: Lack of Premeditation
 LPS: Lack of Perseverance
 MDD: Major Depressive Disorder
 NUR: Negative Urgency
 OLS: Ordinary Least Squares
 OCD: Obsessive-Compulsive Disorder
 PUR: Positive Urgency
 PTSD: Post-Traumatic Stress Disorder
 SS: Sensation Seeking
 UPPS-R: Urgency, Premeditation, Perseverance, Sensation Seeking – Revised

Ethics approval and consent to participate

The study protocol was approved by the Ethics Committee of Marmara University School of Medicine (Approval Date: 15.11.2024, Approval Number: 09.2024.1334). The study protocol was performed in accordance with the ethical standards of the institutional and national research committee, and with the 1964 Declaration of Helsinki. Informed consent was obtained from all individual participants included in the study. No animal data were used in this study.

Consent for publication

There is no data on any individual in our study.

Availability of data and materials

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

Competing interests

There are no competing interests.

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Authors' contributions

Conceptualization and methodology: A.B.E.Y., E.B.U.G., G.Ö.B., and G.B. Data curation and project administration: A.B.E.Y., E.B.U.G., G.Ö.B., and G.B. Investigation and data analysis: A.B.E.Y., E.B.U.G., G.Ö.B., G.B., and İ.C.E. Manuscript writing—original draft: A.B.E.Y., E.B.U.G., G.Ö.B., G.B., and İ.C.E. Manuscript editing and manuscript review: A.B.E.Y., E.B.U.G., G.Ö.B., G.B., and İ.C.E. This manuscript has been read and approved by all the authors and that each author believes that the manuscript represents honest work.

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