



# Irritability and Suicidality in Clinically Referred Youth: Clarifying the Link by Examining the Roles of Age and Hope

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## Abstract

Research has found an association between irritability and suicidal thoughts and behaviors (STB) in children and adolescents, but the overall evidence has been mixed and the nature of this association remains unclear. In this study, we investigated whether the link between irritability and STB might be more pronounced among older youth and those with lower levels of hope. Participants were 142 children and adolescents (ages 6–18) referred for mental health services at a university outpatient clinic. At intake, clinicians administered self-report measures assessing irritability, STB, hope, and depression. Multiple regression models with robust maximum likelihood estimation were used to test irritability's association with STB, as well as age and hope as moderators. Irritability, hope, and age all showed significant associations with STB. Further, hope and age moderated the associations between irritability and STB; specifically, the link between irritability and STB was evident only at older ages (among adolescents, not children) and only at lower levels of hope. These findings are consistent with the view that hope may be a protective factor, and adolescence a vulnerability factor, in the association between irritability and STB. Results may help explain previous mixed findings on this association while also underscoring the role of irritability as a risk factor. Further research is warranted to better understand irritability and hope as transdiagnostic mechanisms in STB from childhood through adulthood, and through other informants and methods.

**Keywords** Irritability · Suicidality · Hope · Development · Child and adolescent mental health · Transdiagnostic

## Introduction

Suicide is one of the leading causes of death among young people around the globe (World Health Organization [WHO], 2023). In the US, rates of death by suicide have increased by 30% in recent decades; it is now the second leading cause of death in children and adolescents ages 10–14 and the third leading cause of death in ages 15–19 (Centers for Disease Control and Prevention [CDC], 2023). Deaths by suicide are usually preceded by a pattern of suicidal thoughts and behaviors (STB) which, if detected, can offer critical opportunities for prevention and intervention

(Klonsky & May, 2015). Notably, teenagers have the highest rates of STB in the population (Bingham et al., 1994; Grøholt et al., 1997; Lee et al., 2019; Seo et al., 2015; Spiller et al., 2019); however, STBs are common in both school-age children and adolescents, and in a variety of mental health and primary care settings (Gardner et al., 2010; Martin et al., 2016; Roaten et al., 2021).

Given the clinical and public health importance of suicide and STBs, there is a pressing need to better understand what clinical presentations are associated with STB, and what protective and vulnerability factors might play a role in the development of STB. Such knowledge could facilitate better identification, prevention, and treatment of STB in youth (Franklin et al., 2017; Millner et al., 2020; Ribeiro et al., 2016). Accordingly, the present study investigates the link between irritability and STB in a clinically referred outpatient sample of children and adolescents, while testing hope and age as potential moderators in this association. Below we first review the general evidence concerning the link between irritability and STB in youth, and then we review the narrower evidence supporting hope and

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adolescence as putative protective and vulnerability factors in this association.

### The Link Between Irritability and Suicidal Thoughts and Behaviors (STB)

Severe irritability, defined as an elevated proneness to anger that is clinically impairing (Vidal-Ribas et al., 2016), is one of the most common reasons for referrals in youth mental health outpatient settings (Evans et al., 2022). Nosologically, irritability is a transdiagnostic feature central to more than a dozen mental disorders (e.g., anxiety, depressive, stress-related, and disruptive behavior disorders) and associated with many more (e.g., autism spectrum disorder, attention-deficit/hyperactivity disorder; American Psychiatric Association [APA], 2022). It predicts various forms of psychopathology, especially in youth, including oppositional defiant disorder, anxiety disorders, and depression (Evans et al., 2017; Evans et al., 2020; Vidal-Ribas et al., 2016). There is strong meta-analytic evidence for a medium-sized association between STB and reactive aggression—a construct closely related to irritability (Hartley et al., 2018). Importantly, accumulating evidence shows that irritability is cross-sectionally and longitudinally linked to STB (e.g., Conner et al., 2004; Frazier et al., 2016; Galera et al., 2021; Levy et al., 2020). This association has attracted recent attention suggesting irritability could be an important factor for understanding and preventing suicide in young people (Benarous et al., 2019; Forte et al., 2021; Orri et al., 2018a, 2019; Stringaris & Vidal-Ribas, 2019).

However, the evidence does not all tell the same story; some of the research on the link between irritability and STB has been more mixed than suggested above. Two recent systematic reviews arrived at somewhat different conclusions about the irritability-STB link. Summarizing 27 child and adolescent studies, Benarous et al. (2019) found that irritability was cross-sectionally and longitudinally associated with STB in population and clinical settings, and across disorders. In contrast, Orri et al. (2018b) reviewed 39 youth and adult studies and found that the irritability-STB link was consistently evident in community samples and among inpatient/outpatient adults, but not in clinical youth samples. This inconsistency is also reflected within individual empirical studies. For example, one study showed that self-reported irritability, but not parent-reported irritability, was associated with suicidal ideation among adolescents (Frazier et al., 2016).

In addition to the findings being mixed, there are methodological limitations and sampling considerations in this literature that must be considered; two limitations are particularly relevant here. First, many studies used ad hoc item scales from existing measures and datasets to assess

irritability rather than measures specifically designed and validated for that purpose. Second, there has been limited attention to moderators, which could help explain for whom and under what conditions irritability confers risk for STB (Benarous et al., 2019). The present study overcomes these limitations, using well-established measures to test the direct link between irritability and STB, as well as putative moderators (hope and age) in a sample of clinically referred youth.

### Protective and Vulnerability Factors in the Irritability-STB Link

To recap, some evidence suggests that irritability is a *risk factor* for STB in youth. Although this is useful, the mixed nature of the research suggests that it is not the whole story. A more useful understanding of risk factors involves clarifying what variables might influence the strength or direction of the relationship between a risk factor and an outcome—i.e., a moderation. Developmental and clinical scientists often conceptualize two types of moderators in risk-outcome relationships: a *protective factor*, which attenuates the risk and promotes more favorable outcomes; and a *vulnerability factor*, which amplifies risk and promotes less favorable outcomes (Rose et al., 2004). Following this perspective, we tested hope as a protective factor and adolescent age as a vulnerability factor, as explained in more detail below.

**Hope as a Protective Factor.** Snyder (1995) defined hope as a future-oriented process of thinking about one's goals, along with the motivation (agency) and means (pathways) to achieve those goals. Building on this definition, considerable research in developmental and clinical psychology has conceptualized and supported hope as being a protective factor in youth mental health. For example, prior research has shown that hope is a protective factor in associations between stressful life events and adolescent wellbeing (Valle et al., 2006), perfectionism and anxiety (Karababa, 2020), depression/delinquency and substance use (Fite et al., 2014), negative life events and depressive symptoms (Visser et al., 2013), and family/school influences and adolescent adjustment (Gerard & Booth, 2015). Relevant to the present study, hope has been found to protectively moderate against STB in terms of attenuating the risk conferred from depressive symptoms (Kwok & Gu, 2019), rumination (Tucker et al., 2013), thwarted belongingness, perceived burdensomeness (Hollingsworth et al., 2016), hopelessness (Huen et al., 2015), and most recently, COVID-19 impact (Knowles et al., 2022). Such findings have important theoretical implications (Anestis et al., 2014; Joiner et al., 2009; Klonsky & May, 2015) and clearly situate hope conceptually as a protective factor, testable via moderation models (Rose et al., 2004). Despite all this evidence, less is known about

hope in relation to irritability specifically. However, there is evidence that hope moderates the association between reactive aggression—a construct very closely related to irritability (Brotman et al., 2017; Evans et al., 2021)—and STB in clinically referred youth (Fite et al., 2017). That is, reactive aggression was positively associated with STB but only among youth with low levels of hope. Taken together, these findings suggest that hope may buffer the association between irritability and STB, and therefore could be a clinically and theoretically important protective factor. To our knowledge, this hypothesis of hope as a moderator of the irritability-STB link has not previously been tested.

**Adolescent Age as a Vulnerability Factor.** Over a century after G. Stanley Hall popularized adolescence as a time of “storm and stress,” we now have substantial evidence pointing to this developmental period as conferring unique risk for psychopathology, emotion dysregulation, social stress, peer influence, and health risk behaviors (e.g., Cicchetti & Rogosch, 2002; Powers & Casey, 2015). Indeed, most lifetime cases of mental health disorder (Kessler et al., 2005; Merikangas et al., 2010) as well as STB (Nock et al., 2013; Voss et al., 2019) have their onset during adolescence. Similarly, developmental considerations are critical to understanding both irritability (Leibenluft & Stoddard, 2013) and STB (Turecki & Brent, 2016). Although adolescents and young adults show the highest absolute rates of suicide, these phenomena occur and can be clinically significant across the lifespan (Malhi et al., 2019). Longitudinal evidence shows that chronically elevated irritability during childhood predicts suicidal outcomes during adolescence (Galera et al., 2021; Orri et al., 2018a). Moreover, rising irritability (as compared to persistent irritability) in childhood presents as the most significant and direct risk for STB in adolescence, above and beyond the presence of depressive symptoms (Orri et al., 2019; Stringaris & Vidal-Ribas, 2019). These findings underscore the vulnerability of the adolescent period for the association between irritability and STB. Considering this evidence, we anticipated that adolescent age would constitute a vulnerability factor for the irritability-STB link, such that irritability would be more strongly associated with STB among teenagers as compared to younger children. If supported, such findings could help clinicians and researchers better identify youths at higher risk for STB.

## The Current Study

In light of these questions in the literature reviewed above, we investigated irritability as a direct predictor of STB in a clinical sample; and we tested hope and age as possible moderators (protective and vulnerability factors, respectively) in that association. Analyses used baseline symptom measures

administered to a heterogeneous sample of youths referred for outpatient services. We hypothesized that higher levels of irritability, lower levels of hope, and older age would all be associated with higher levels of STB. We also expected that the link between irritability and STB would be stronger for older youths and for those with lower levels of hope.

## Method

### Participants and Procedures

Participants were 142 youths (age  $M=10.51$  years, range=6–18; 80% white; 42% female) referred for psychological services at a university outpatient youth clinic in the U.S. Midwest. These cases were consecutive referrals between February 2013 and March 2019 for whom data on study variables were available. Data were used only if families provided informed consent for data to be used for research purposes (>90% consent rate). The age range of 6–18 was selected to facilitate comparison of children vs. adolescents, as this range spans developmental periods that differ in ways that are relevant to study variables (e.g., elementary school to high school, before to after puberty onset). Further, age 6 was the minimum at which study measures were routinely given in this clinic. Age 18 was not the maximum age of administration, but the highest age at which most patients were typically still in high school and living with their parents/caregivers (defining features of adolescence).

The present sample was drawn from a larger dataset ( $N=237$ ; Evans et al., 2021), which represented all cases ages 3–18 seen during this period with any parent- and/or youth-reported measures collected at intake and consent/assent for research purposes. Focusing only on cases ages 6–18 with any youth report data narrowed the possible sample to 161. Of these, 142 (88%) had STB data and were included in analyses. There were no differences between those included vs. excluded for this analysis in any clinical, study, or sociodemographic variables ( $ps=0.63$  to  $0.95$ ), except that those with STB data were marginally older ( $M$  age =  $10.51$ ,  $SD=2.98$ ) than those who were missing STB data ( $M=9.21$ ,  $SD=2.54$ ;  $N=19$ ),  $t=1.81$ ,  $p=.07$ . Among those included for analysis, data availability rates for scores used in analyses ranged from 133 (94%) for depressive symptoms to 142 (100%) for irritability, STB, and age. This sample has been characterized previously (Evans et al., 2021).

The study clinic is staffed by doctoral trainees in clinical child psychology and offers assessment and therapy services on a sliding fee scale for youth and families in the community. Common reasons for referral include disruptive

behavior, anxiety, depression, inattention/hyperactivity, learning challenges, trauma/stress, and developmental concerns. Of the cases included in the present analysis, approximately 45% came to the clinic for treatment, 45% for assessment, and 10% for both. Although diagnostic codes were not required for services provided, diagnostic data were available in the records for a majority ( $N=90$ ; 63%) of the present sample. Among these 90 participants, the most commonly assigned diagnoses were attention-deficit/hyperactivity disorder (57%), anxiety disorders (34%), learning disorders (28%), oppositional defiant disorder (20%), major depressive disorder (14%), and autism spectrum disorder (10%); the median number of diagnoses was 2.

At intake, clinicians administered youth-report measures of irritability, STB, hope, and depressive symptoms. Family and parent-report data (demographics and other measures not used here) were provided by a primary caregiver, usually the mother. Youth self-report data were routinely collected from all children and adolescents ages 6–18, except in rare cases where this was not appropriate based on clinical judgment (e.g., due to low child cognitive ability). For younger children (ages 6–12), the standard practice was for clinicians to read measures aloud interview-style and allow youths to respond verbally or by pencil and paper. This research was approved by the institutional review board affiliated with the university.

## Measures

**Suicidal Thoughts and Behaviors (STB).** The Suicide Behavior Questionnaire (SBQ; Cotton & Range, 1993) is a 4-item measure asking youths to rate their STBs across varying Likert scales: “Have you ever thought about or tried to kill yourself?” (0 = *Never* to 5 = *All the Time*), “How many times have you thought about killing yourself?” (0 = *Never* to 5 = *All the Time*), “Have you ever told someone that you were going to kill yourself?” (0 = *Never* to 2 = *Often*), and “Do you think you might kill yourself someday?” (0 = *Never* to 4 = *Definitely Will*). Item responses are summed, with higher scores indicating higher STB. The SBQ has shown good internal consistency among clinically referred youth (Abel et al., 2020; Fite et al., 2017). Evidence supports the SBQ as a valid and reliable measure of STB in clinical and nonclinical youth samples (Cotton & Range, 1993; Osman et al., 2001). The STB showed good internal consistency in the present sample ( $\alpha=0.85$ ).

**Irritability.** Youth irritability was measured using the self-report version of the Affective Reactivity Index (Stringaris et al., 2012). Youths are asked to respond to 6 items related to irritability over the past 6 months using a 3-point Likert scale (0 = *Not True*, 1 = *Sometimes True*, 2 = *Certainly True*). Example items include “am easily annoyed

by others” and “often lose my temper.” A single total sum score is computed, with higher values reflecting higher overall irritability. The ARI includes a 7th item measuring irritability-related impairment, which does not contribute to the total irritability score and was not used in this analysis. Previous research supports the reliability, validity, and internal consistency of the ARI for assessing irritability by self-report in a variety of youth samples (Dougherty et al., 2021; Evans et al., 2021; Stringaris et al., 2012). The ARI showed good internal consistency in the present study ( $\alpha=0.80$ ).

**Hope.** Hope was assessed via the Children’s Hope Scale (Snyder et al., 1997). The CHS is a 6-item measure in which youth respond on a 6-point Likert scale (1 = *None of the time* to 6 = *All of the time*). Items reflect two components of hope: pathways (e.g., “I can think of many ways to get the things in life that are most important to me”) and agency (e.g., “I think I am doing pretty well”). Items are summed to create a total score; higher scores indicate greater levels of hope or hopefulness. The CHS has been established as a valid and reliable measure of hope in children and adolescents (Snyder et al., 1997), and has shown adequate internal consistency (Fite et al., 2017). Considering the link between hopelessness and depression (Liu et al., 2015), we examined the item content of the CHS as a measure of hope, and the CDI-2-SF (below) as a measure of depression and found no direct overlap; thus, both measures were scored as originally designed. It also bears noting that the CHS measures hope (an adaptive construct) rather than hopelessness (a maladaptive construct), a distinction which is theoretically and psychometrically meaningful. Internal consistency of the CHS was adequate ( $\alpha=0.71$ ) in this sample.

**Age.** Youths’ age was reported by their primary caregiver on a demographic/background questionnaire collected at intake. Values were recorded in whole years and analyzed as a continuous variable ranging from 6 to 18.

**Depressive Symptoms.** The Children’s Depression Inventory-2, Short Form (CDI-2-SF; Kovacs, 2011) is a 12-item measure in which youths are asked to rate the option that best describes them over the past 2 weeks, using a 3-point scale corresponding to three levels of symptomatology (0 = *Absence of symptoms* to 2 = *Definite symptoms*). The CDI-2-SF and its predecessors include items tapping sadness, self-depreciation, and loneliness, with strong evidence for unidimensionality, convergent validity, diagnostic efficiency, and criterion validity for identifying depressive disorders (Ahlen & Ghaderi, 2017; Allgaier et al., 2012). Responses are summed, with higher scores indicating higher levels of depressive symptoms. Prior research has found the CDI-2-SF to be valid and reliable in evaluating depression and symptom severity, performing comparably to the long-form CDI or CDI-2 (Kovacs, 2011). The CDI-2-SF showed good internal consistency ( $\alpha=0.81$ ).

**Table 1** Descriptive Statistics and Correlations Among Study Variables

	Bivariate Correlations					Univariate Characteristics				
	1	2	3	4	5	<i>N</i>	<i>M</i>	<i>SD</i>	Min	Max
1. STB	--					142	1.39	2.61	0	12
2. Irritability	0.23**	--				142	4.22	3.06	0	12
3. Hope	-0.35***	-0.23**	--			134	23.43	5.99	6	36
4. Age	0.21*	-0.17*	-0.12 <sup>+</sup>	--		142	10.51	2.98	6	18
5. Depression	0.52***	0.43***	-0.46***	0.18*	--	133	5.15	3.96	0	20

Note. STB = Suicidal thoughts and behaviors. <sup>+</sup> $p < .10$ , \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

## Analytic Plan

Analyses were conducted in SPSS and R. Univariate and bivariate characteristics of the data were examined first. Considering the distributional characteristics of the data, bivariate correlations were examined as Pearson's coefficients, and regression models used maximum likelihood estimation with robust (Huber-White) standard errors. Two hierarchical regression models were estimated to examine hypothesized associations of irritability, hope, age, and depression with STB, with all variables mean-centered. Model 1 consisted of two steps: Step 1 included irritability and hope as predictors of STB, and Step 2 added the irritability  $\times$  hope interaction term. Similarly, Model 2 included irritability and age in Step 1 and added the irritability  $\times$  age interaction term in Step 2. We did not test 3-way interactions due to limited power and precision for detecting such an effect. Interactions were probed at high vs. low levels of each variable—i.e., at sample  $M \pm 1SD$  for the hope variable, and at 8 vs. 14 years of age for the age variable (roughly corresponding to sample  $M \pm 1SD$ , rounded to integers). Supplementary analyses were conducted to re-estimate the models after controlling for depressive symptoms. Depressed mood is one of the strongest predictors of STB (Balazs et al., 2013; Detullio et al., 2020; Hawton et al., 2013); and yet, in many cases of STB, depression is not present (Ribeiro et al., 2018). Given these considerations, our primary analyses do not control for depression (Rogers et al., 2018); rather, this question is examined secondarily in the supplement.

## Results

Univariate descriptive statistics and bivariate correlations are presented in Table 1. The outcome variable STB showed a medium negative correlation with hope and small positive correlations with irritability and age. Correlations among predictors and moderators (irritability, hope, age) were small. The main covariate, depressive symptoms, showed medium to large correlations with STB, irritability, and hope, and a small correlation with age.

**Table 2** Model 1: Irritability and Hope as Predictors of Suicidal Thoughts and Behaviors

	Step 1: Base Model	Step 2: Hope as Protective Factor
Predictor Variables		
Intercept	4.14 (0.99)***	1.71 (1.37)
Irritability	0.13 (0.07) <sup>+</sup>	0.75 (0.26)**
Hope	-0.14 (0.04)***	-0.04 (0.05)
Irritability $\times$ Hope	--	-0.03 (0.01)*
Model Results		
<i>F</i>	11.12***	9.77***
<i>df</i>	2,131	3,130
<i>R</i> <sup>2</sup>	0.15	0.18
Adjusted <i>R</i> <sup>2</sup>	0.13	0.17

Note. Estimates are standardized coefficients (standard errors). See Table S1 for corresponding results after controlling for depressive symptoms. <sup>+</sup> $p < .10$ , \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

**Table 3** Model 2: Irritability and Age as Predictors of Suicidal Thoughts and Behaviors

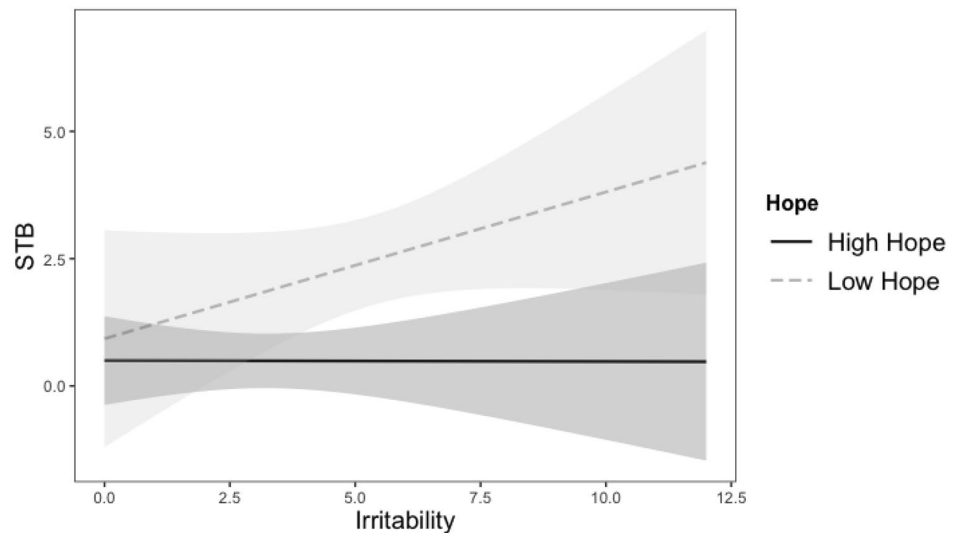
	Step 1: Base Model	Step 2: Adolescence as Vulnerability Factor
Predictor Variables		
Intercept	1.85 (1.35)	4.49 (1.62)**
Irritability	0.16 (0.07)*	-0.48 (0.24)*
Age	0.17 (0.07)*	-0.08 (0.11)
Irritability $\times$ Age	--	0.06 (0.02)**
Model Results		
<i>F</i>	9.67***	9.61***
<i>df</i>	3,130	4,129
<i>R</i> <sup>2</sup>	0.18	0.23
Adjusted <i>R</i> <sup>2</sup>	0.16	0.21

Note. Estimates are standardized coefficients (standard errors). See Table S1 for corresponding results after controlling for depressive symptoms. <sup>+</sup> $p < .10$ , \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

Results of hierarchical multiple regression models 1 and 2 are presented in Tables 2 and 3, respectively. In Model 1 Step 1, irritability and hope showed marginal to significant effects in predicting STB ( $ps < 0.10$ ), accounting for about 13–15% of the variance in STB. In Step 2, the association between irritability and STB was significantly moderated by hope ( $p < .05$ ). This model accounted for about 17–18% of the variance in STB. The interaction effects are probed and interpreted below. Of note, adding the irritability  $\times$  hope

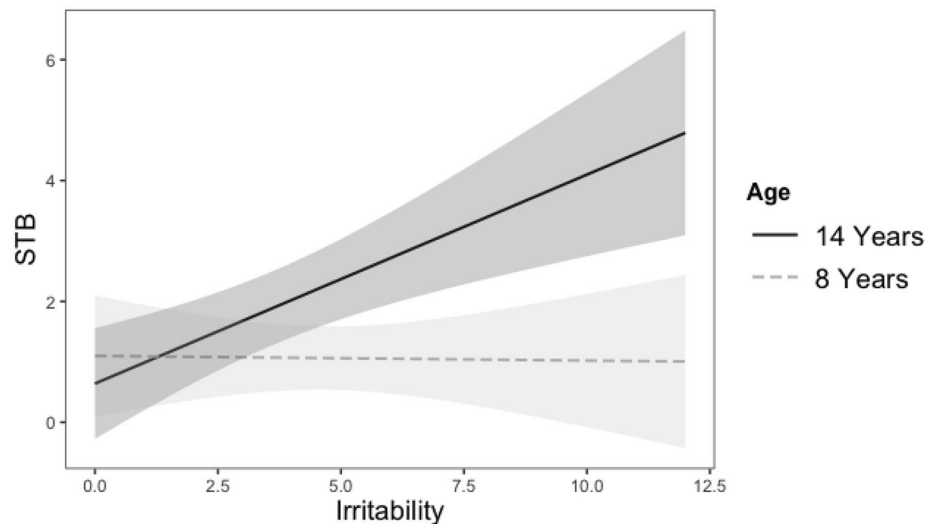
**Fig. 1** Hope Moderates the Link Between Irritability and Suicidal Thoughts and Behaviors (STB)

Note Results are from the model presented in Table 2 (Step 2). Shaded regions reflect 95% confidence intervals. The interaction effect ( $b = -0.024$ ,  $SE = 0.011$ ,  $t = -2.232$ ,  $p = .027$ ) was probed at high and low levels of hope specified at the sample mean + 1SD and - 1SD, respectively. See Figure S1 for corresponding results after controlling for depressive symptoms.



**Fig. 2** Age Moderates the Link Between Irritability and Suicidal Thoughts and Behaviors (STB)

Note Results are from the model presented in Table 3 (Step 2). Shaded regions reflect 95% confidence intervals. Age was measured and modeled as continuous variable (range: 6–18 years). The interaction effect ( $b = 0.059$ ,  $SE = 0.021$ ,  $t = 2.809$ ,  $p = .006$ ) was probed at 8 years and 14 years of age, approximating the sample mean age + 1SD and - 1SD, respectively. See Figure S2 for corresponding results after controlling for depressive symptoms.



term attenuated the main effect of hope to nonsignificance, which suggests that the true effect of hope may operate interactively with irritability in predicting STB.

In Model 2, Step 1, irritability and age showed significant, unique, direct effects in predicting STB ( $ps < .05$ ), overall accounting for about 16–18% of the variance in STB. Step 2 showed that age moderated the association between irritability and STB, accounting for about 21–23% of the variance in STB. These effects are probed and interpreted below. Adding the irritability  $\times$  age interaction term attenuated the main effect of age to nonsignificance, suggesting that the interactive effect of irritability  $\times$  age accounted for the link between age and STB.

To better understand these moderation results, we plotted the interactions in Figs. 1 and 2. As shown in Fig. 1, at low levels of hope (-1SD), the link between irritability and STB was positive and significant ( $p < .01$ ); but at high levels

of hope (+1SD), the link between irritability and STB was nonsignificant ( $p = .99$ ). Figure 2 shows a similar interaction effect for age, where irritability predicted STB in adolescents but not in children. Plotted at specified values of 8 (child) and 14 (adolescent) years of age, the slope between irritability and STB was significant at age 14 ( $p < .01$ ) and nonsignificant at age 8 ( $p = .71$ ).<sup>1</sup>

<sup>1</sup> Both models were re-estimated controlling depression, and results changed slightly (see Supplement, Tables S1 and S2). To summarize, depression was a significant predictor of STB ( $p < .001$ ) in all models and steps. Including depression resulted in a sizable increase in variance accounted for in both Model 1 (from 15–17% without depression to 32–33% with depression) and Model 2 (from 18–23% without depression to 30–33% with depression). The depression-STB link tended to overshadow other terms in these models, attenuating the hope  $\times$  irritability interaction term to nonsignificance ( $p = .162$ ) while the age  $\times$  irritability interaction term remained robust ( $p = .047$ ). Nonetheless, the overall protective effect of hope and the vulnerability effect of adolescence remained apparent (see Figures S1 and S2).

## Discussion

We investigated the association between irritability and suicidal thoughts and behaviors (STB) in clinically referred youth, while testing two potential moderators of this association: hope as a protective factor and adolescent age as a vulnerability factor. Irritability, hope, and age all showed significant effects in predicting STB, and the link between irritability and STB was moderated by both hope and age. Specifically, irritability predicted STB only among youth with lower levels of hope and only at older ages (i.e., for adolescents but not for children). Taken together, these results underscore the importance of considering age, and hope in transdiagnostic research on vulnerability and protective factors for STB. Additionally, these findings can help inform the advancement of prevailing theoretical models of STB, which implicate irritability, hope, and development as contributing factors in STB (Bridge et al., 2006; Hausmann-Stabile et al., 2021; Joiner et al., 2009; Klonsky & May, 2015; Turecki & Brent, 2016).

The present findings are in line with prior work indicating a link between irritability and STB, particularly during adolescence (e.g., Benarous et al., 2019; Forte et al., 2021; Galera et al., 2021). Although some studies have yielded discordant findings—i.e., that irritability predicts STB in adults but not in youth clinical samples (Orri et al., 2018b)—the developmental perspective adopted by the present study helps clarify the nature of irritability-STB link in clinical youth samples. It is notable that this age moderation effect was significant and robust, even after controlling for depressive symptoms (see supplement), suggesting that age can act as a vulnerability factor even in the presence of symptoms other than irritability. These findings concur with evidence on the presence of irritability-STB link across disorders for adolescents in clinical settings (Benarous et al., 2019). Future studies should evaluate the effects of irritability and other moderators in youth and adult populations while controlling for prevalent concerns such as anxiety, depression, and disruptive behavior problems.

Findings also suggest that hope moderates the association between irritability and STB; the irritability-STB link was significant only among those with low levels of hope. Thus, hope may serve as a protective factor in the irritability-STB link. Still, clarifying the exact roles of hope and hopelessness as moderators (protective or vulnerability factors) or mediators of suicide risk is an important question that requires investigation with longitudinal data. For example, among a larger sample of adolescents with depression, hope may play a moderating role in the developmental pathway from irritability to STB. It is important to note that hope does serve as an important transdiagnostic protective factor for STB, as has been shown in prior research with

community samples (Huen et al., 2015; Tucker et al., 2016), including those buffering specific risks such as childhood neglect (Kwok & Gu, 2019) and aggression (Fite et al., 2017). Additionally, these findings align with the integrated psychological theories within an ideation-to-action framework, implicating hopelessness as a crucial risk factor for STB (Joiner et al., 2009; Klonsky & May, 2015). The open question at this point is not whether irritability and hope are relevant to STB risk, but rather, how and for whom these transdiagnostic risk and protective factors unfold over time.

## Limitations and Future Directions

This study has some limitations. First, the sample was moderate in size, with limited racial/ethnic diversity, somewhat truncated in terms of developmental range (few young children, few older adolescents), and without reference to specific mental health diagnoses or referral problems. Future research should include larger and more diverse clinically referred samples, with attention to relevant diagnostic categories. Second, because this study was cross-sectional, directionality and causality cannot be inferred without additional research including longitudinal studies. Still, the inferences of multiple regression are applicable and clinically useful for the assessment and identification of STB cross-sectionally. Third, due to practical constraints, constructs were assessed using brief rating scales and mostly with a single informant using clinic data that was not uniformly available for all patients seen. Future research should strive to include multiple informants and comprehensive assessment instruments. Nonetheless, using scales specifically designed to measure their intended constructs is an improvement over much of the irritability and STB literature which has relied on single items or ad hoc item scales historically. Fourth, given issues related to sample size, cross-sectional design, model complexity, and the complementary protective and vulnerability factor hypotheses, we did not pursue more complicated models such as simultaneous moderation, three-way interactions (irritability  $\times$  hope  $\times$  age), or combining moderation with mediation. These may be fruitful ideas worth pursuing in future work, perhaps with hope as a protective factor and adolescence as a vulnerable period, given these results.

Despite these limitations, the present findings suggest that it is important to assess irritability in clinically referred youth, and that self-report methods can be useful for this, although caregivers also remain valuable informants (Stringaris et al., 2018). Measures like the ARI (Stringaris et al., 2012) could help clinicians identify and mitigate suicide risk while also informing treatment for problems related to irritability.

## Conclusion

This study showed that irritability, hope, and age were all associated with suicidal thoughts and behaviors (STB) in clinically referred youth. Hope emerged as a protective factor, and age as a vulnerability factor, moderating the association between irritability and STB. Specifically, irritability was associated with STB in adolescents (but not in younger children) and among youth with lower levels of hope (but not in those with higher levels of hope). Findings help clarify who is most at risk for STB, while also pointing to hope as a potentially useful target for future prevention and intervention efforts. Overall, these findings both substantiate and clarify the irritability-STB link among youth referred for clinical services. Clinical assessment of irritability and hope could be useful for identifying, treating, and preventing STB.

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## Declarations

**Ethical Approval** Human Research Protection Program, University of Kansas.

**Conflict of interest** None.

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