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## Developmental Course of Impulsivity and Capability from Age 10 to Age 25 as Related to Trajectory of Suicide Attempt in a Community Cohort

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### Abstract

Hierarchical linear models were used to examine trajectories of impulsivity and capability between ages 10 and 25 in relation to suicide attempt in 770 youths followed longitudinally: intercepts were set at age 17. The impulsivity measure assessed features of urgency (e.g., poor control, quick provocation, and disregard for external constraints); the capability measure assessed aspects of self-esteem and mastery. Compared to nonattempters, attempters reported significantly higher impulsivity levels with less age-related decline, and significantly lower capability levels with less age-related increase. Independent of other risks, suicide attempt was related significantly to higher impulsivity between ages 10 and 25, especially during the younger years, and lower capability. Implications of those findings for further suicidal behavior and preventive/intervention efforts are discussed.

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Certain personality traits or cognitive styles are hypothesized to increase risk for suicide. In particular, individual qualities that reflect a lack of impulse control (e.g., a disregard for social constraints, acting rashly and without forethought, excitement-seeking, or easily provoked or prone to anger) have been linked to elevated rates of suicide and suicide attempt (e.g., Beautrais, Joyce, & Mulder, 1999; Brent et al., 1994; Brent et al., 2002; Brodsky, Malone, Ellis, Dulit, & Mann, 1997; Cuomo, Sarchiapone, Giannantonio, Mancini, & Roy, 2008; Diaconu & Turecki, 2009; Frances & Blumenthal, 1992; Greening et al., 2008; Hyde, Kirkland, Bimler, & Pechtel, 2005; Maloney, Degenhardt, Darke, & Nelson, 2009; Melhem et al., 2007; Rotheram-Borus, Trautman, Dopkins, & Shrout, 1990; Swann, Lijffijt, Lane, Steinberg, & Moeller, 2009; Wu et al., 2009; Yang & Clum, 2000). That body of research is based predominantly on psychiatric or incarcerated samples, however, whereas comparable work based on population-based samples is limited. Moreover, findings typically are based on a single assessment of impulsivity, and do not take into account the potential for age-related change in personality traits (Roberts & DelVecchio, 2000). In fact, longitudinal change in impulsivity has been implicated in subsequent change in impulsivity-related disorders known to increase risk for suicidality (Warner et al., 2004), suggesting that this

probable risk pathway to suicide behavior may be interrupted. Nonetheless, to date, developmental change in the relation between impulsivity and suicidality has been inferred from evidence based primarily on psychological autopsy that differences in impulsivity levels are related to the age at which suicide completers died (McGirr et al., 2008).

As impulsivity is a multifaceted construct (Evenden, 1999), it is not surprising that studies differ substantially as to how it is defined and assessed. Existing measures constitute a not insignificant assortment of (sometimes overlapping) scales of related but distinct personality facets labeled excitability, cognitive impulsivity, novelty-seeking, sensation-seeking, lack of constraint, adventurousness, and susceptibility to boredom (Depue & Collins, 1999), to name a few. To increase understanding of this heterogeneous construct, Whiteside and Lynam (2001) utilized exploratory factor analysis to identify four separate personality facets associated with impulsive behaviors from among several commonly used measures of impulsivity, including, the Temperament and Character Inventory (Cloninger, Przybeck, & Svrakic, 1991); the Personality Research Form Personality Scale (Jackson, 1984); the I-7 Impulsiveness Questionnaire (Eysenck, Pearson, Easting, & Allsopp, 1985); the Barratt Impulsiveness Scale-II (Patton, Stanford, & Barratt, 1995); and the Revised NEO Personality Inventory (NEO-PI-R; Costa & McCrae, 1992), which used the Five Factor Model (FFM) of personality as a framework (McCrae & Costa, 1990). The first personality facet in Whiteside and Lynam's model, labeled Urgency, corresponds to the NEO-PI-R impulsivity facet (FFM Neuroticism domain) and centers on poor impulse control, often in the circumstance of negative affect. The second facet, labeled Premeditation, corresponds to the NEO-PI-R deliberation facet (FFM Conscientiousness domain) and focuses on the (lack of) ability to evaluate an action's consequences before acting, the most common conceptualization of impulsivity. The third facet, labeled Perseverance, corresponds to the NEO-PI-R self-discipline facet (FFM Conscientiousness domain) and reflects the (lack of) ability to follow through on tasks that may be tedious or difficult. The fourth facet, Sensation-Seeking, corresponds to the NEO-PI-R excitement-seeking facet (FFM Extraversion domain) and entails engaging in risk-taking for the sake of excitement or new experiences.

Our measure of impulsivity, albeit unique to our study, is comprised of items adapted from established measures utilized by Whiteside and Lynam (2001) (or from earlier versions). Although not in perfect alignment, scale items best reflect the poor behavioral control, lack of regard for external (social) constraints, quick provocation, and maladaptive or inappropriate response as described by the Urgency factor. This form of impulsivity was shown to have the most robust association with psychopathology compared to forms of impulsivity that center on (not) assessing potential repercussions prior to acting (Premeditation), persisting (vs. giving up) on dull or hard tasks (Perseverance), or seeking out novel or dangerous activities (Sensation-Seeking), also implicated in impulse-related disorders (e.g., borderline personality disorder, substance abuse disorders) (Whiteside & Lynam, 2001, 2003; Whiteside, Lynam, Miller, & Reynolds, 2005). Empirical correspondence with features of neuroticism may make this form of impulsivity a key risk for suicide attempt. Nonetheless, Yen et al. (2009) found that premeditation was the sole type of impulsivity from among those forms to be related to suicide attempt independent of negative affectivity as well as additional putative risks, indicating that more than one form of impulsivity may be implicated in increased vulnerability to suicidal behaviors.

Others have focused on individual characteristics that may act as a deterrent to suicidality. In particular, a high level of self-esteem has been associated with lowered risk for suicide and suicide attempt among young persons (Beautrais et al., 1999; McGee, Williams, & Nada-Raja, 2001). Measures of self-esteem assess the degree of self-worth or self-valuation held by the individual, characteristics that at elevated levels are intrinsically incompatible with

taking one's own life. Additionally, measured indicators of beliefs held by young persons regarding their ability to exert control over their environment (i.e., locus of control) or to cope effectively in the face of adversity (i.e., mastery) also have been linked to decreased risk for suicide-related behaviors (Beautrais et al., 1999; Evans, Owens, & Marsh, 2006; Lauer, de Man, Marques, & Ades, 2008). Such self-attributes develop over time and are based in part on cognitive and emotional growth; nonetheless, maturational deficits often found in at-risk youths may interfere with the development of these more positive facets of personality.

Therefore, in addition to impulsivity, we also examine key positive attributes reported to decrease risk for suicide attempt and other suicide behavior in young people. Items from shortened versions of the Self-Esteem Scale (Rosenberg, 1965) and the Mastery Scale (Pearlin and Schooler, 1978) were aggregated to form the Capability Scale, which centers on these beliefs. Owing to the salient role played by past experiences in shaping cognitive perceptions (Pearlin, Nguyen, Schieman, & Milkie, 2007; Sameroff, Seifer, & Bartko, 1997), such beliefs may change over time as a function of history of accomplishments and failures; yet even less is known regarding the impact of time-varying perceptions of capability on suicidal risk.

Increased understanding of patterns of development and change in facets of personality implicated in suicide susceptibility would inform intervention/preventive efforts targeting at-risk individuals in both community and clinical settings. In the current study, we investigated features of impulsivity and capability as related to suicide attempt with longitudinal data drawn from a large community sample of individuals followed in multiple waves from childhood into adulthood. First, change in impulsivity and capability from age 10 to age 25 was examined using hierarchical linear modeling (HLM): two separate trajectories were examined for each of these personality facets, one for individuals reported (by self or mothers) to have attempted suicide and one for all other individuals. Two basic questions were asked: (1) What is the average level of impulsivity and the average level of capability at age 17, the midpoint of the assessed age period and approximate age at which onset of suicide attempt peaks (Kessler, Borges, & Walters, 1999)? (2) What is the shape of the change function: linear (equal rates of change over age) or curvilinear (a pattern of accelerated or decelerated change)? Additionally, we examined the relationships between those trajectories and the trajectory of suicide attempt between ages 10 and 25 independent of other suicide-related risks.

## METHOD

### Sample

Data are based on the Children in the Community study, an ongoing longitudinal investigation of early risk for and long-term consequences of childhood psychopathology. First interviewed in 1983 (T1), a cohort of 776 youths (51% female; 91% European Caucasian, 8% African American Black) whose families were randomly selected from rural, suburban, and urban areas in two upstate New York counties for study participation were followed into adulthood. Comparisons with 1980 Census data indicated high demographic comparability to families with same-aged children living in the north-eastern United States (Cohen & Cohen, 1996). Reinterviews of mothers and youths took place nearly 3 years later (T2), with 776 families participating, and 10 years later (T3), with 717 families participating, resulting in a 92.4% retention rate over that period. There were no significant differences between those not interviewed at T3 and those interviewed at T3 on study variables assessed in prior waves (sex, history of abuse, suicide attempt, impulsivity, and capability). The current study is based on data from those three waves conducted at cohort mean ages 13.7 ( $SD = 2.6$ ) (T1), 16.1 ( $SD = 2.8$ ) (T2), and 22.0 ( $SD = 2.7$ ) (T3). The current

study sample is composed of 770 youths (six youths who had missing data pertaining to main study variables at more than one assessment point were eliminated from the analyses), of whom 715 were interviewed in all three waves and 55 were interviewed in two waves.

## Procedure

Mothers and youths were interviewed at home simultaneously but separately by pairs of trained lay interviewers on a wide range of individual and social factors central to child development and behavior. Study procedures followed appropriate institutional guidelines and were approved by the Columbia University Medical Center Institutional Review Board (IRB) and the New York State Psychiatric Institute IRB. Written informed consent or assent was obtained from all participants after interview procedures were fully explained. Data are protected by a National Institutes of Health Certificate of Confidentiality.

## Measures

Impulsivity was assessed at mean ages 13.7, 16.1, and 22.0, with seven self-administered questionnaire items. Five items had an item internal consistency (IIC: correlation between the specific item and the hypothesized scale, corrected for overlap) score  $\geq 0.4$  across the three assessments and two items had an IIC score  $\geq 0.4$  across two assessments; specific items and IIC scores are shown in Table 1. Exploratory factor analysis was performed on these seven impulsivity items using principal component factoring, which yielded a single eigenvalue  $>1.0$  across the three assessments: values equivalent to 2.85, 2.70, and 2.80 explained 41.0% of the scale variance at T1, 37.9% at T2, and 40.1% at T3, respectively. Resulting scales had adequate internal consistencies (Cronbach's alpha = 0.73, 0.72, and 0.75). Each item on the impulsivity scale was rated on a 4-point Likert scale (see Table 1 for response options); items were scored so that higher scores indicated greater self-reported impulsivity. Raw mean (*SD*) scaled scores were 15.7 (4.5), 15.3 (3.9), and 14.7 (3.8) at successive assessments.

The construct capability also was assessed at mean ages 13.7, 16.1, and 22.0 with seven self-administered questionnaire items on individual characteristics related to perceived mastery or coping (Pearlin & Schooler, 1978) and self-proclaimed worth (Rosenberg, 1965). Six items had an IIC score  $\geq 0.4$  across the three assessments and one item had an IIC score  $\geq 0.4$  across two assessments; specific items and IIC scores are shown in Table 1. Exploratory factor analysis was performed on the seven capability items using principal component factoring, which yielded one single eigenvalue  $>1.0$ : values equivalent to 2.80, 2.77, and 2.89 explained 40.2% of the scale variance at T1, 39.4% at T2, and 41.3% at T3, respectively. Resulting scales had adequate internal consistencies comparable to the impulsivity scale (Cronbach's alpha = 0.74, 0.72, and 0.76). Items on the capability scale were rated on one of two 4-point Likert scales (see Table 1 for response options); items were scored so that higher scores indicated greater self-reported capability. Raw mean (*SD*) scaled scores were 22.0 (2.9), 22.2 (3.0), and 22.2 (3.0) at successive assessments.

Mothers were assessed for lifetime major depressive disorder (MDD) at T3 by trained experienced interviewers using a structured interview covering *DSM-III-R* criteria and suicide attempts. Of the 657 mothers assessed, 102 (15.5%) reported lifetime MDD or attempted suicide (hereafter referred to as maternal risk). As recommended by Cohen, Cohen, West, and Aiken (2003), to maintain as large a sample as possible a missing flag variable was used to control for the potential effects of the 113 youths with missing data on maternal risk.

A measure of physical or sexual abuse of the youth before age 18 was derived from official reports or youth reports after age 18. Of the 677 individuals with information, 60 (8.9%) had

a history of physical or sexual abuse before age 18. A missing flag variable was used to control for the potential effects of the 93 youths with missing data on history of abuse.

Youths and mothers responded to parallel interview items about suicide attempts by the youth, with *attempt* defined as confirmation by either informant that the youth had tried to kill him or herself. The actual question asked at T1, T2, and T3 was “Did you (your child) ever try to kill yourself (him/herself)?”; 68 (8.8%) youths were reported to have made a suicide attempt. Information on age at which attempt(s) occurred also was obtained.

### Developmental Trajectories of Impulsivity and Capability

Hierarchical linear models using SAS PROC MIXED (SAS Institute, Inc., 2002) were used to estimate individual (level 1) trajectories and average (level 2) trajectories of impulsivity and capability between ages 10 and 25, including estimated values at age 17 (the average trajectory midpoint) and annual and potential curvilinear changes over the assessed period. To obtain those estimates, repeated measures of impulsivity and capability were employed as dependent variables in individual growth models (Chen & Cohen, 2006); residual diagnostics were used to assess the adequacy of the fitted models. Histograms of residuals did not indicate discernable skew, and normal quantile plots displayed no systematic departure from a straight line. Accordingly, the normal residual assumption is tenable in our data.

Basic models for trajectories of impulsivity and capability (Model 1) examined fixed average linear and quadratic age changes and were the basis for cumulative models examining associations between each trajectory and sex of youth, maternal risk, youth history of physical or sexual abuse (Model 2); and suicide attempt (Model 3). Suicide attempt, which was assessed concurrently with impulsivity and capability at T1, T2, and T3, also was treated as a time-varying variable. These analyses estimate both linear and nonlinear change in risk-related factors that may vary with age or over time; permit inclusion of persons not assessed at all time-points; tolerate unequal intervals between data points; and combine data from individuals assessed at different ages, allowing for fuller exploitation of longitudinal data relative to traditional regression. HLM has been used successfully in epidemiological (Cohen et al., 2005; Perrin, Chen, Sandberg, Malaspina, & Brown, 2007) and clinical (McArdle, Small, Bäckman, & Fratiglioni, 2005) studies when risk or protective factors measured repeatedly over time are hypothesized to influence concurrent or subsequent pathological features, thus capitalizing on multiple assessments of predictors.

## RESULTS

### Preliminary Analyses

Bivariate analyses using logistic regression conducted with SPSS 15.0 (SPSS, Inc., 2006) showed that the odds of making a suicide attempt over the assessed period increased significantly with maternal risk (OR = 2.91, 95% CI = 1.61–5.26) and history of abuse (OR = 5.00, 95% CI = 2.58–9.68), but did not change significantly with sex (OR = 0.81, 95% CI = 0.49–1.35).

### Developmental Trajectory Analyses by Suicidality Status

To facilitate interpretation of magnitudes of effect sizes, developmental trajectories of impulsivity and capability were standardized. The standardized estimates ( $\beta$ ) of fixed age effects on impulsivity and capability at age 17, and the annual linear and (if observed) quadratic changes for the 68 youths with a lifetime suicide attempt and nonattempters are

shown in Table 2. Because there was no quadratic change in either group for capability those estimates were not included in the table.

At age 17, level of impulsivity was about six times higher in suicide attempters compared to nonattempters (0.409 *SD* vs. 0.067 *SD*). Moreover, in nonattempters there was a significant annual decline in impulsivity of 0.02 *SD* that tapered off with age (quadratic effect), whereas decline in attempters over that same age period did not reach conventional levels of significance (Figure 1, top panel). At age 17, level of capability was 0.028 *SD* in nonattempters and rose significantly by 0.05 *SD* per year; thus, by age 22 capability increased to 0.278 *SD* (0.028 *SD* + [0.05 *SD* × 5 years]). In contrast, among suicide attempters, at age 17 capability was -0.475 *SD*, ½ *SD* lower than sameaged nonattempters, and increased at a comparatively slower and nonsignificant rate (0.033 *SD* per year); thus, by age 22, capability remained below mean level among attempters at -0.31 *SD* (-0.475 *SD* + [0.033 *SD* × 5 years]). Figure 1 (bottom panel) shows the widening disparity in capability with age between suicide attempters and nonattempters owing to the more rapid and significant increase among nonattempters.

### Multivariate Analyses

Standardized estimates ( $\beta$ ) of associations between impulsivity and suicide attempt (controlling for sex of youth) are shown in Table 3. Average level of impulsivity at age 17 was significantly higher than the overall mean level between ages 10 and 25 (overall mean level = 0 given standardization of the scale) ( $\beta = 0.096$ ,  $SE = 0.031$ ,  $p < .01$ ), but showed a significant annual decline ( $\beta = -0.020$ ,  $SE = 0.005$ ,  $p < .001$ ) that slowed with increasing age ( $\beta = -0.004$ ,  $SE = 0.001$ ,  $p < .001$ ) (Model 1). Considered simultaneously, maternal risk ( $\beta = 0.284$ ,  $SE = 0.085$ ,  $p < .001$ ) and youth history of physical or sexual abuse ( $\beta = 0.151$ ,  $SE = 0.075$ ,  $p < .05$ ) were independently related to a higher overall mean level of impulsivity between ages 10 and 25 (Model 2). The addition of fixed predictors maternal risk and youth history of physical or sexual abuse in Model 2 improved the fit to the data ( $\chi^2 = 38.8$ ,  $df = 2$ ,  $p < .001$ ). Independent of those risk effects, suicide attempt was significantly related to a higher overall mean level of impulsivity ( $\beta = 0.435$ ,  $SE = 0.105$ ,  $p < .001$ ), a relation that was stronger during the younger years of the assessed age range ( $\beta = -0.075$ ,  $SE = 0.025$ ,  $p < .01$ ) (Model 3). The addition of fixed predictors trajectory of suicide attempt and its interaction with age in Model 3 further improved the fit to the data relative to Model 2 ( $\chi^2 = 22.3$ ,  $df = 2$ ,  $p < .001$ ). Additionally, although the relation between impulsivity and maternal risk remained significant in Model 3, the relation between impulsivity and youth history of physical or sexual abuse was reduced to a marginal one.

Standardized estimates ( $\beta$ ) of associations between capability and suicide attempt (controlling for sex of youth) are shown in Table 4. Average level of capability at age 17 did not differ significantly from the overall mean level between ages 10 and 25 (overall mean level = 0 given the standardization the scale) ( $\beta = -0.013$ ,  $SE = 0.027$ ), and showed a significant annual increase ( $\beta = 0.050$ ,  $SE = 0.004$ ,  $p < .001$ ) (Model 1). Considered simultaneously, neither maternal risk ( $\beta = -0.018$ ,  $SE = 0.082$ ) nor youth history of physical or sexual abuse ( $\beta = 0.073$ ,  $SE = 0.073$ ) was related significantly to capability (Model 2); however, suicide attempt was significantly related to an overall lower mean level of capability between ages 10 and 25 ( $\beta = -0.533$ ,  $SE = 0.106$ ,  $p < .001$ ) (Model 3). The addition of fixed predictor trajectory of suicide attempt improved the fit to the data relative to Model 2 ( $\chi^2 = 39.2$ ;  $df = 2$ ;  $p < .001$ ).

## DISCUSSION

This longitudinal study used multilevel modeling to examine developmental trajectories of impulsivity and capability between ages 10 and 25, and their associations with suicide

attempt over that same period in a community sample of 770 youths. To our knowledge, this is the first study to investigate whether age-related changes in these individual facets of personality contribute to the trajectory of suicide attempt over an interval spanning childhood, adolescence, and young adulthood. Our findings support previous work that impulsive behaviors and beliefs about one's capability are related to suicide attempt, but also extend them by providing estimates of the degree to which age-related change in impulsivity and capability among suicide attempters deviates from the norm.

We found that it is normative for impulsivity to decline from childhood to adulthood and then to taper off, which is in concert with findings based on youths with impulsivity-related pathological features in both epidemiological (Johnson et al., 2000; Winograd, Cohen, & Chen, 2008) and clinical (Biederman, Mick, & Faraone, 2000; Zanarini et al., 2007) samples. Thus, albeit it is not uncommon for young children to act rashly on impulse, break rules, and exhibit socially maladaptive behavior, it appears that this form of impulsivity becomes increasingly less frequent as they mature, probably owing in part to more effective emotional regulation and to increasing external pressure for restraint. However, our results showed that youths who attempted suicide deviated significantly from these normative patterns of development, exhibiting a higher level of this form of impulsivity at age 17 and a slower decline with age, suggesting a delay in those developmental tasks. Such poor impulse control may reflect biologically based individual differences in temperament that affect the capacity to actively control attentional and emotional responses (Cloninger, 1987; Putnam, Ellis, & Rothbart, 2001). Evidence that adult suicide attempters demonstrated executive and arousal inhibitory deficits that may lead to perseveration of deliberate thoughts and actions to end one's life supports that theory (Legris & Van Reekum, 2006). The finding that youth suicide attempt and maternal MDD or suicide attempt were related independently to overall mean level of impulsivity between ages 10 and 25 (and to each other) supports others' findings of a familial link among these factors (e.g., Brent et al., 2002; Melhem et al., 2007), but also indicates that their effects may be additive.

At the same time, we found that it is normative for youths to report enhanced capability as they advance through the adolescent years into adulthood, the kind of capability that comes with increasing recognition of one's strengths, leading a progressively more useful and purposeful life, and becoming more adept at managing one's life circumstances. Such enhanced capability likely reflects cognitive growth, cumulative accomplishments, and increasing success in dealing with challenging experiences. Individuals' beliefs regarding the extent to which they are competent and able to effectively manage and adapt to significant change in their lives can be a critical resource for coping with adversity (Avison & Cairney, 2003). Here too, however, suicide attempters deviated significantly from normative patterns, showing a lower mean level of capability at age 17 and a slower increase with age: given the propensity for cognitive deficiencies and distortions reported among youthful suicide attempters, this finding suggests that positive personal attributes and accomplishments either go unrecognized or are perceived in a negative light by at-risk individuals. Perhaps the most notable outcome was the decreased risk for suicide attempt with a high overall mean level of capability between ages 10 and 25, a period over which suicide attempts grow increasingly more prevalent (Kessler et al., 1999).

These findings have implications regarding increased vulnerability for further suicidal behavior and for preventive/intervention efforts. The trajectory for impulsivity among nonattempters was to decline significantly and linearly with age; however, decline among suicide attempters was not significant, thus the risk presented by poor impulse control, quick provocation, and disregard of external constraints, features of impulsivity assessed in the current study, may continue to present a risk for future suicide attempt. Therefore, despite the focus on impulse control in younger children, it may be judicious to address such

impulsivity in intervention/prevention efforts even during the late adolescent years to forestall later risk. By the same token, the low mean level of capability in middle to late adolescence (i.e., at age 17) and the slower nonsignificant increase in capability between ages 10 and 25 among suicide attempters relative to nonattempters also suggests that intervention/prevention efforts may do well to shore up that personality facet to increase its protective strength. Such negative beliefs are amenable to increased opportunities that would build a sense of growing capability. History of suicide attempt is a key predictor of subsequent suicide attempt; thus, contexts that facilitate such prospects also may deter future attempts.

The following limitations should be noted when interpreting these findings. Because the participants in our sample are of primarily European Caucasian background, generalizability of the results to other racial or ethnic groups is limited. However, this sample is representative of a large segment of the U.S. population (Cohen & Cohen, 1996); therefore, results may be generalized to a substantial proportion of community-dwelling individuals in the same age range. Although we considered a number of known factors that could influence associations between impulsivity or capability and suicide attempt (sex of youths, maternal MDD or suicide attempt, and youths' histories of physical or sexual abuse), we did not address others (e.g., concurrent psychiatric disorders, parental history of abuse, disorders of the central nervous system [Mann, 2002]). Albeit measures of impulsivity and capability show adequate psychometric features with regard to their internal consistency and unidimensionality, they also are exclusive to our study; therefore, it is difficult to draw comparisons with others' findings. The measure of suicide attempt used relied only on the one self- or mother-reported item "Did you (your child) ever try to kill yourself (him/herself)?" Failure to consider lethality (i.e., the medical consequences of the act) or seriousness of intent (full intent to die vs. ambivalence) may have resulted in an oversimplification of this study construct. We also did not address the issue of whether the association between impulsivity and suicide attempt is at least partly explained by concurrent impulse-related disorders. However, study analyses adjusted for powerful suicide-related risks with links not only to suicide attempt and impulsivity but to Axis I and Axis II psychopathology in these youths (e.g., Johnson, Cohen, Chen, Kasen, & Brook, 2006; Kasen et al., 2001). Moreover, others who have examined this issue in clinical samples report evidence that relations between excessive impulsivity and suicide behaviors are not a consequence of disorder (Dumais et al., 2005; Fenton, 2000; Kim et al., 2003; Sinclair, Mullee, King, & Baldwin, 2004). Finally, information on maternal MDD and suicide attempt and youth history of physical or sexual abuse was missing for substantial proportions of the sample (15.5% and 8.9%, respectively), requiring the use of missing flag variables in the analyses.

Nonetheless, this study also has notable strengths. Findings are based on longitudinal data drawn from a randomly selected population-based sample of youths and their mothers followed longitudinally in multiple waves. Additionally, the current study sample had a very high rate of retention, thus minimizing potential bias owing to participant attrition. Finally, this repeated measures design allowed us to examine developmental trajectories of individual facets of personality implicated in suicidality (impulsivity and capability) and trajectory of suicide attempt over that same period. This analytic strategy has several advantages, a key one being minimized variance due to local or time-limited influences with the estimation of each person's trajectory mean at a fixed (constant) age and the average annual change (slope) prior and subsequent to that age.



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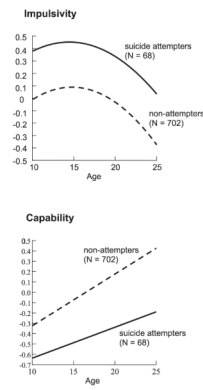
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**Figure 1.** Impulsivity and capability trajectories from age 10 to age 25 by suicide attempt over that same period in a population-based cohort of 770 individuals.

**TABLE 1**  
Item Internal Consistency (IIC) of the Seven-Item Impulsivity Scale and the Seven-Item Capability Scale

Individual items	T1	T2	T3
<b>Impulsivity scale</b>			
I often act without stopping to think (scoring reversed) <sup>a</sup>	0.38	0.40	0.41
I often lose my temper at people (scoring reversed) <sup>a</sup>	0.47	0.50	0.55
I often feel like swearing (scoring reversed) <sup>a</sup>	0.42	0.40	0.48
I often blurt out things without thinking (scoring reversed) <sup>a</sup>	0.40	0.36	0.41
When rules get in my way I ignore them (scoring reversed) <sup>a</sup>	0.51	0.45	0.45
I am often called hot-headed or bad-tempered (scoring reversed) <sup>a</sup>	0.48	0.44	0.47
I get into trouble at school or work (scoring reversed) <sup>a</sup>	0.47	0.45	0.48
<b>Capability scale</b>			
There is no way I can solve my problems <sup>b</sup>	0.40	0.40	0.51
I often feel helpless dealing with problems <sup>b</sup>	0.48	0.43	0.53
I can do whatever I set my mind to (scoring reversed) <sup>b</sup>	0.40	0.38	0.40
I don't have much to be proud of <sup>d</sup>	0.47	0.48	0.47
I feel that my life is very useful (scoring reversed) <sup>a</sup>	0.50	0.50	0.55
I am a useful person to have around (scoring reversed) <sup>a</sup>	0.42	0.40	0.44
I have a number of good qualities (scoring reversed) <sup>a</sup>	0.54	0.53	0.48

<sup>a</sup>Response options: 1 = *definitely true about me*; 2 = *mostly true but not completely true about me*; 3 = *mostly false but not completely false about me*; 4 = *definitely false about me*.

<sup>b</sup>Response options: 1 = *strongly agree*; 2 = *agree*; 3 = *disagree*; 4 = *strongly disagree*.

Developmental Trajectories of Impulsivity and Capability Between Ages 10 and 25 as Related to Trajectory of Suicide Attempt During that Period

TABLE 2

	Impulsivity		Capability	
	$\beta$ (SE)	p value	$\beta$ (SE)	p value
Suicide attempt ( <i>n</i> = 68)				
Level at age 17	0.409 (0.117)	<.001	-0.475 (0.103)	<.0001
Annual linear change	-0.028 (0.018)	=.115	0.033 (0.190)	=.082
Quadratic age change	<i>a</i>		<i>a</i>	
No suicide attempt ( <i>n</i> = 702)				
Level at age 17	0.067 (0.032)	=.037	0.028 (0.027)	=.307
Annual linear change	-0.020 (0.005)	<.0001	0.050 (0.004)	<.0001
Quadratic age change	-0.004 (0.001)	<.0001	<i>a</i>	

*a* No significant quadratic age effect was observed.

**TABLE 3**  
Developmental Changes in Impulsivity from Ages 10 to 25 in a Population-Based Cohort of 770 Individuals

Covariates	Model 1 β (SE)	Model 2 <sup>a</sup> β (SE)	Model 3 <sup>a</sup> β (SE)
Random effects			
Intercept (at age 17)	0.451 (0.033) ****	0.436 (0.032) ****	0.430 (0.032) ****
Linear slope	0.003 (0.001) **	0.003 (0.001) **	0.003 (0.001) **
Residual	0.468 (0.024) ****	0.472 (0.004) ****	0.468 (0.024) ****
Fixed effects			
Intercept (at age 17)	0.096 (0.031) **	0.059 (0.046)	0.043 (0.045)
Annual linear age change	-0.020 (0.005) ****	-0.019 (0.005) ****	-0.018 (0.005) ****
Quadratic age change	-0.004 (0.001) ****	-0.005 (0.001) ****	-0.004 (0.001) ****
Maternal risk <sup>b</sup>		0.284 (0.085) ****	0.276 (0.084) ****
Youth history of abuse <sup>c</sup>		0.151 (0.075) *	0.143 (0.074)
Suicide attempt			0.435 (0.105) ****
Suicide attempt × Age			-0.075 (0.025) **
Goodness of fit			
Parameters	6	8	10
-2 log likelihood	5911.5	5872.7	5850.4
Chi-square		38.8 ****	22.3 ****
Degrees of freedom		2	2

<sup>a</sup>Models controlled for sex.

<sup>b</sup>Maternal history of major depression or suicide attempt.

<sup>c</sup>Youth was physically or sexually abused before age 18.

\*  $p < .05$ ;

\*\*  $p < .01$ ;

\*\*\*\*  $p < .001$ .

**TABLE 4**  
Developmental Changes in Capability from Ages 10 to 25 in a Population-Based Cohort of 770 Individuals

Covariates	Model 1 $\beta$ (SE)	Model 2 <sup>a</sup> $\beta$ (SE)	Model 3 <sup>a</sup> $\beta$ (SE)
Random effects			
Intercept (at age 17)	0.380 (0.031)***	0.379 (0.031)***	0.364 (0.030)***
Linear slope	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)
Residual	0.558 (0.025)***	0.557 (0.027)***	0.554 (0.027)***
Fixed effects			
Intercept (at age 17)	-0.013 (0.027)	0.029 (0.042)	-0.010 (0.042)
Annual linear age change	0.050 (0.004)***	-0.050 (0.004)***	0.051 (0.004)***
Maternal risk <sup>b</sup>		-0.018 (0.082)	-0.001 (0.081)
History of abuse <sup>c</sup>		0.073 (0.073)	-0.064 (0.072)
Suicide attempt			-0.533 (0.106)***
Goodness of fit			
Parameters	5	7	9
-2 log likelihood	5994.9	5991.1	5951.9
Chi-square		3.8 ( $p > .05$ )	39.2***
Degrees of freedom		2	2

<sup>a</sup>Models controlled for sex.

<sup>b</sup>Maternal history of major depression or suicide attempt.

<sup>c</sup>Youth was physically or sexually abused before age 18.

\*\*\*  
 $p < .001$