The Role of Temperament in the Onset of Suicidal Ideation and Behaviors across Adolescence: Findings from a 10-year Longitudinal Study of Mexican-Origin Youth

Katherine M. Lawson[1], **John K. Kellerman**[2], **Evan M. Kleiman**[2], **Wiebke Bleidorn**[1], **Christopher J. Hopwood**[1], **Richard W. Robins**[1]

[1]University of California, Davis

[2]Rutgers University

Abstract

Suicide among young people is an increasingly prevalent and devastating public health crisis around the world. To reduce the rate of suicide, it is important to identify factors that can help us better predict suicidal ideation and behaviors. Adolescent temperament (Effortful Control, Negative Emotionality, Positive Emotionality) may be a source of risk and resilience for the onset of suicidal ideation, plans, and attempts. The present study uses longitudinal data from a large, community sample of Mexican-origin youth (*N*=674), assessed annually from age 12 to 21, to examine how temperament is associated with the onset of suicidal ideation and behaviors during adolescence and young adulthood. Results indicate that higher levels of Effortful Control (Activation Control, Inhibitory Control, Attention) are associated with *decreased* probability of experiencing the onset of suicidal ideation, plans, and attempts, whereas higher levels of Negative Emotionality (particularly Aggression, Frustration, and Depressed Mood) are associated with *increased* probability of experiencing the onset of suicidal ideation and behaviors. Positive Emotionality (Surgency, Affiliation) was not associated with the onset of suicidal ideation and behaviors. Supplemental analyses showed conceptually similar findings for the Big Five, with Conscientiousness associated with decreased risk, Neuroticism associated with increased risk, and the other three dimensions showing largely null results. The findings do not vary significantly for boys and girls or for youth born in the U.S. versus Mexico. Overall, these findings suggest that adolescent temperament serves as both a protective factor (via Effortful Control/Conscientiousness) and a risk factor (via Negative Emotionality/Neuroticism) for suicidal ideation and behaviors in Mexican-origin youth.

Keywords

Suicide is the second leading cause of death for Americans aged 10 to 24 and the prevalence of adolescent deaths by suicide has steadily increased during the past decade (Curtin &

Corresponding author: Katherine M. Lawson, Department of Psychology, University of California, Davis, One Shields Ave., Davis, CA 95616, kmlawson@ucdavis.edu.

Heron, 2019). Consequently, it is important to understand the risk and resilience factors associated with the onset of suicidal ideation and behaviors across adolescence (Franklin et al., 2017). In particular, risk factors can identify youth who need additional support, whereas resilience factors may be leveraged to delay the onset, or minimize the severity, of suicidal behavior. Previous research on risk and resilience factors for suicide has emphasized individual factors such as depression and other mood disorders, and relational factors such as bullying and relationship problems (Shain, 2016). However, almost no longitudinal work has examined how adolescent temperament, or relatively enduring individual differences in reactivity and self-regulation that are present from an early age, might influence the onset of suicide risk. Further, few studies have examined risk and protective factors for adolescent suicide in Latinx youth, despite the fact that Latinx youth are at especially high risk for suicidal ideation and behaviors (Price & Khubchandani, 2017; Silva & Van Orden, 2018). To address these gaps, the present study examined whether three domains of adolescent temperament (Effortful Control, Negative Emotionality, Positive Emotionality) and their facets serve as risk and/or resilience factors in the onset of suicidal ideation, plans, and attempts across adolescence. To examine this question, we used data from a large, community sample of Mexican-origin youth ($N = 674$) assessed nine times from age 12 to 21.

Adolescent Suicide

Suicide among young people is an increasingly prevalent and devastating public health crisis around the world. Suicide is now estimated to be the second leading cause of death among adolescents and young adults and the past two decades have seen steady increases in global adolescent suicide rates, with rates in the United States increasing 24% between 1999 and 2014 (CDC, 2017; WHO, 2014). Suicide attempts and deaths are relatively rare during childhood, but dramatically increase during the transition to adolescence before decreasing and stabilizing during the transition from adolescence to adulthood (Nock et al., 2008; Nock et al., 2013). Notably, adolescents experience elevated risk of transitioning from ideation of suicide to suicidal behavior, with risk for suicidal behavior peaking at age 16 and remaining elevated into the early 20s (Nock et al., 2008). Young adults who meet risk criteria in adolescence are also more likely to engage in suicidal behavior than those who did not meet risk criteria in adolescence. Therefore, for many individuals, adolescence is the most consequential developmental period for suicide risk, and researchers should work to understand risk and resilience trajectories throughout this period.

Suicide risk encompasses multiple components, including suicidal ideation, plans, and attempts. Data from a national survey of American adolescents indicate a prevalence rate of 12.1% for suicidal ideation across youth ages 13–18 (Nock et al., 2013). Suicide plans and suicide attempts have estimated prevalence rates of 4.0% and 4.1%, respectively, among the same population. Approximately one-third of adolescents who experience suicidal ideation go on to develop a suicide plan and make a suicide attempt during adolescence, although the factors driving this transition from thought to behavior are not yet understood (Glenn et al., 2017; Nock et al., 2013). Well-studied suicide risk factors (e.g., major depressive disorder) are more predictive of suicidal ideation than they are of the transition from ideation to plans and attempts, limiting the ability to predict which youth who ideate will experience

an escalation to suicidal behavior (Miranda, Ortin, Scott, & Shaffer, 2014; Nock et al., 2008). Therefore, understanding the factors underlying suicidal ideation, plans, *and* attempts is imperative to identify individuals at higher risk and to prevent suicide deaths among adolescents.

Latinx youth, and Mexican-origin youth in particular, are an understudied demographic group that are at elevated suicide risk. National statistics indicate that American adolescents who identify as Hispanic or Latinx report higher rates of suicidal ideation, plans, and attempts during adolescence than members of other ethnic groups (Carino & Roberts, 2001; Kann et al., 2014; Silva & Van Orden, 2018; Spirito & Esposito-Smythers, 2006). Further, suicide attempts among Latinx youth are generally more severe, as they are more likely to require medical attention. But, despite the increased severity of their suicidal behaviors, Latinx youth are generally less likely to receive needed mental health treatment (Goldston et al., 2008; Spirito & Esposito-Smythers, 2006). These higher rates may be due, in part, to various aspects of acculturative stress, including exposure to discrimination, greater family conflict, lower ethnic identity, and a lower sense of belonging (Fortuna et al., 2016; Gomez, Miranda, & Polanco, 2011; Silva & Van Orden, 2018). Disparities in the prevalence of suicidal ideation and and behaviors are primarily driven by Latina adolescents, who consistently report the highest rates of suicidal ideation and attempts of any gender and ethnic group (Kann et al., 2014; Price & Khubchandani, 2017). Among American high school students, Latina/Hispanic girls reported higher rates of suicidal ideation (21.1%) compared to White female students (17.8%), as well as a suicide attempt rate (14.0%) nearly double the rate reported by their White female classmates (7.7%; Eaton, Koti, Brener, Crosby, et al., 2011). Finally, studies examining differences among Latinx youth have found that Mexican-origin youth are at higher risk than their other Latinx counterparts (Duarté-Vélez & Bernal, 2007). Altogether, these findings highlight that Mexican-origin youth are a particularly important demographic in which to study risk and protective factors for suicide. However, the majority of suicide research conducted with adolescents has used data from predominantly White samples.

Personality and Suicide

Past research has shown that personality disorders, in particular, borderline personality disorder (Pompili, Girardi, Ruberto, & Tatarelli, 2005; Yen et al., 2003) and antisocial personality disorder (Verona et al., 2001), are associated with increased risk for suicidal ideation and behaviors. Studies of normal-range personality traits have shown that suicidal ideation, plans, and attempts are concurrently associated with *lower* levels of Extraversion (Baertschi, Costanza, Canuto, & Weber, 2018; Brezo et al., 2006a; Cramer et al., 2012; Fino et al., 2014; Frances et al., 1986; Kerby, 2003; Tucker et al., 2014), Agreeableness (Baertschi et al., 2018; Brezo et al., 2006b; Kerby, 2003), and Conscientiousness (Brezo et al., 2006b; Kerby, 2003; Velting 1999), as well as *higher* levels of Neuroticism (Baertschi et al., 2018; Brezo et al., 2006a; Chioqueta & Stiles, 2005; Cramer et al., 2012; Fino et al., 2014; Kerby, 2003; Lolas, Gomez, & Suarez, 1991; Nordström, Schalling, & Asberg, 1995; Tanji et al., 2015; Tucker et al., 2014). However, the vast majority of these studies use cross-sectional data from relatively small samples of college students, hospitalized patients, or individuals who are incarcerated, limiting generalizability to members of the broader

community. Additionally, the majority of participants from these studies are White, limiting generalizability to ethnic minority groups.

Thus, despite a plethora of concurrent associations, we have little insight into the longitudinal associations between personality traits and suicidal ideation and behaviors (Franklin et al., 2017). This is a common problem in the field of personality and psychopathology and makes it difficult to tease apart the directionality of associations between temperament and suicidal ideation and behaviors. Fortunately, longitudinal data provide an opportunity to examine evidence for various developmental models of temperament and psychopathology including the vulnerability, scar, pathoplasty, and spectrum models (Durbin & Hicks, 2014; Tackett, 2006). The vulnerability model suggests that underlying levels of temperament can increase risk for experiencing the onset of suicidal ideation and behaviors, whereas the scar model suggests that experiencing suicidal ideation and behaviors can lead to changes in temperament. Further, the pathoplasty model suggests that temperament could influence the manifestation of suicidal ideation and behaviors in terms of course, severity, presentation, or prognosis. Finally, the spectrum model suggests that temperament traits and suicidal ideation/behaviors lie on the same continuum. In the present study, we focus on the *vulnerability* model, which is especially relevant because temperament differences are present prior to the onset of suicidal ideation and behaviors and may help to identify youth who need additional support. Furthermore, only a handful of past studies have focused on adolescence, a critical, high-risk period for the onset of suicidal ideation and behaviors. Next, we review the limited cross-sectional research on adolescent temperament and suicide risk, and then turn to the small number of longitudinal studies of personality/temperament and suicidal ideation and behaviors.

Adolescent temperament.

Temperament refers to individual differences in reactivity and self-regulation that are present from an early age and relatively enduring (Rothbart, Ahadi, & Evans, 2000); Rothbart, 2007; Rothbart, 2011). Researchers describing individual differences in children and adolescents often label traits as either "temperament" or "personality", but there is no clear conceptual or empirical distinction between the two (Clark & Watson, 2008; Shiner & DeYoung, 2013). In this paper, we focus on the role of individual differences through the lens of temperament, though we also include complementary analyses and interpretations using a Big Five personality framework.

Research on youth temperament is often guided by Rothbart's highly influential temperament model (Rothbart et al., 2000), which posits three key constructs: Effortful Control (EC), Negative Emotionality (NE), and Positive Emotionality (PE). According to Rothbart's model, the EC domain involves one's capacity to plan and suppress inappropriate impulses (Inhibitory Control), perform an action or pursue goals when there are competing desires (Activation Control), and focus and shift attention when needed (Attention). The NE domain involves unpleasant affect derived from anticipating distress (Fear), negative affect related to ongoing tasks being interrupted (Frustration), and behavioral inhibition to social interaction (Shyness). In some cases, the NE domain is expanded to include hostile reactivity to negative stimuli including person- and object-directed violence (Aggression)

and unpleasant affect, lowered mood, and lack of enjoyment in activities (Depressed Mood). The PE domain involves pleasure derived from high intensity or novel activities (High Intensity Pleasure/Surgency; hereafter referred to as Surgency) and a desire for close, warm interpersonal connections (Affiliation). Whereas EC and NE represent broad cohesive domains, mounting theoretical and empirical evidence suggests that the PE facets do not form a cohesive domain (Lawson, Atherton, & Robins, 2020; Snyder et al., 2015). Because of this, we consider both domain and facet-level scores for EC and NE but we only consider facet-level scores (i.e., separate Surgency and Affiliation) for PE.

Rothbart's temperament domains, especially low EC and high NE, are associated with numerous mental health problems, including anxiety, depression, nonsuicidal self-injury, conduct disorder, and ADHD (Atherton, Lawson, Ferrer, & Robins, 2020; Baetens et al., 2011; Capaldi & Rothbart, 1992; De Pauw & Mervielde, 2010; Muris & Ollendick, 2005; Snyder et al., 2015). Consequently, these temperament domains may also be related to suicidal ideation and behaviors. It is well-documented, both conceptually and empirically, that EC is comparable to Conscientiousness, NE is analogous to Neuroticism, and PE is related to Extraversion (Shiner & DeYoung, 2013; Rothbart, 2007; Rothbart & Ahadi, 1994; Rothbart et al., 2000). Given these relations and previous research on Big Five traits and suicidal ideation and behaviors, we might expect to find that higher levels of EC and PE serve as protective factors whereas NE serves as a risk factor.

Indeed, three systematic reviews found that high levels of impulsivity (associated with low levels of the Inhibitory Control facet of EC), high levels of aggression and anxiety (associated with the Aggression and Fear facets of NE, respectively), and high levels of novelty-seeking (associated with the Surgency facet of PE) were consistently associated with increased suicidal ideation, plans, attempts, and deaths (Brezo, Paris, & Turecki, 2006a; Frances, Fyer, & Clarkin, 1986; Gvion & Apter, 2011). Two studies of Japanese (Tanabe et al., 2016) and Lebanese adults (Karam et al., 2015) found that suicide attempts were associated with anxious and irritable temperament scores on the TEMPS-A (Akiskal et al., 2005). Together, these studies highlight that the temperamental domains of EC and NE, and possibly PE, are related to suicidal ideation and behaviors. However, all of these studies use cross-sectional designs, which provide little insight into *developmental* relations between temperament and suicidal ideation and behaviors. Next, we describe the few extant longitudinal studies of temperament and suicidal ideation and behaviors.

Longitudinal associations.

Studies examining longitudinal relations between temperament and suicidal ideations and behaviors suggest that certain traits might predispose youth to experience later suicidal ideation and behaviors. One longitudinal study that followed American adolescents from age 10 to 25 found that individuals who attempted suicide scored six times higher in impulsivity than those who did not attempt at age 17, and showed smaller subsequent declines in impulsivity as they transitioned into young adulthood (Kasen, Cohen, & Chen, 2011). Another longitudinal study found that EC might mediate the influence of coping responses on suicide attempts, given that youth with higher levels of EC were able to cope more effectively and showed decreased likelihood of attempting suicide two years later

(Piquet & Wagner, 2003). Further, a more recent study found that impulsivity was positively associated with risk of suicide attempts during adolescence and declines in impulsivity map on to declines in suicide risk during the transition from adolescence to adulthood (Thompson & Swartout, 2018). With respect to NE, in a large, long-term longitudinal study, adolescent self-reported worry and irritability predicted making a suicide plan and attempting suicide 30 years later in middle adulthood, even after accounting for adult psychopathology and Neuroticism (Pickles et al., 2010). Finally, a large, longitudinal study of adolescents in New Zealand found that Neuroticism and novelty-seeking (related to PE) assessed at age 14 and 16, respectively, were associated with the onset of suicidal ideation and attempts from age 14 to 21 (Fergusson, Beautrais, & Horwood, 2003). Thus, there is evidence that certain aspects of EC, NE, and PE might predispose youth to be more vulnerable to experience later suicidal ideation and behavior. However, these associations are not likely to manifest in the same way for all adolescents and, in particular, they may be impacted by demographic differences in gender and nativity (i.e., country of birth).

Gender and nativity.

There are well-documented gender differences in the prevalence of suicidal ideation and behaviors across adolescence. In particular, adolescent boys and girls demonstrate differences in onset and trajectory of suicide risk, with girls experiencing higher overall rates of ideation compared to boys, in addition to earlier onset, peak, and decline of suicidal ideation (Kann et al., 2014; Nock et al., 2008; Reuter, Holm, McGeorge, & Conger, 2008). As previously outlined, this gender difference is exacerbated in Latinx youth, with Latinas being at especially high risk for suicidal ideation and behaviors (Price & Khubchandani, 2017). Data from the Youth Risk Behavior Surveillance study in 2013 showed that Latina high school students had the highest prevalence rates of any demographic group for suicidal ideation (26.0%), plans (20.1%), and attempts (15.6%) (Kann et al., 2014).

In addition to mean-level differences in the prevalence of suicidal ideation and behaviors, past research has documented gender differences in the association between individual-level risk and protective factors and suicidal ideation and behaviors (Edwards & Holden, 2001). This finding extends to gender differences in the relation between personality and suicide. A cross-sectional study of undergraduate students found that women higher in angry hostility and depression (i.e., NE) were more prone to suicidal ideation, whereas men with poor self-discipline (i.e., low EC) were more prone to suicidal ideation (Velting, 1999). Another cross-sectional study using a large sample of German adults found that men low in Extraversion and Conscientiousness were at increased risk for suicide, whereas women high in Neuroticism and Openness were at increased risk (Blüml et al., 2013). Together, these studies provide limited evidence that the relation between temperament and suicidal ideation and behaviors may differ for boys and girls, though much of this work has been done with adult men and women.

In addition to gender, nativity status (i.e., whether a child was born in Mexico vs. the U.S.) may moderate the relation between temperament and suicide ideation and behaviors in Mexican-origin youth. Duarté-Vélez and Bernal (2007) highlight evidence of "within-group diversity (such as national origin, generational status in the United States)" in suicide

behaviors, demonstrating the importance of studying individual differences among Mexican-origin youth (p. 439). Indeed, there is evidence that Latinx, and particularly Mexican-origin, immigrants born in the United States may be at higher risk for suicidal behavior than Mexican-origin adolescents who were born abroad and then immigrated during childhood (Carino & Roberts, 2001; Peña et al., 2008; Silva & Van Orden, 2018; Sorenson & Shen, 1996). These findings are consistent with the "immigrant paradox", which suggests that more recent immigrants have better outcomes than more established immigrants despite facing additional barriers to social integration (Garcia-Coll & Marks, 2012). Thus, given the evidence that nativity is associated with suicidal ideation and behaviors, it may also moderate the relation between temperament and the onset of suicidal ideation and behaviors in Mexican-origin youth. In particular, temperament may be more strongly associated with the onset of suicidal ideation and behaviors for youth born in the U.S. compared to youth born in Mexico.

The Present Study

The present study examines the role of temperament in the onset of suicidal ideation and behaviors from early adolescence (age 12) to young adulthood (age 21). This research is exploratory, although prior research suggests that suicide risk will be related to higher levels of NE and lower levels of EC. Relations between PE and suicide risk are much less clear. Our primary research question concerns how temperament (i.e., EC, NE, PE) is associated with the onset of suicidal ideation, plans, and attempts from early adolescence to young adulthood. In addition, we will test whether these associations vary by gender (boys vs. girls) and nativity (born in the U.S. vs. Mexico).

The present study extends past research in several ways. First, we use long-term, longitudinal data with nine waves of data spanning ten years from early adolescence to young adulthood. This builds on previous cross-sectional work and provides a more comprehensive, fine-grained depiction of the development of suicide risk than previous longitudinal studies, which typically only included a few waves of data. Given that the onset of suicidal ideation and behaviors most frequently occurs during adolescence (Nock et al., 2008), we are likely to capture onset for the majority of participants who will experience lifetime suicidal behaviors. Second, we examined suicidal ideation and behaviors among Mexican-origin youth, a population that is historically understudied in psychological research in general and research on suicide in particular. This knowledge gap is even more striking given that Mexican-origin youth are at particularly high risk for suicidal behavior (Price & Khubchandani, 2017). These first two strengths directly address past appeals that "more within-group studies are needed, and particularly with Latino/a older adolescents" (Duarté-Vélez & Bernal, 2007, p. 445). Third, we assess multiple types of suicidal thoughts and behaviors including ideation, plans, and attempts. Though suicidal ideation, plans, and attempts have similar correlates, assessing all three provides a more nuanced depiction of the onset of suicide risk and extends past research which focuses on ideation and attempts, but less on plans (Franklin et al., 2107). Fourth, we assess both risk and protective factors, which is unique as most studies of correlates of suicidal ideation and behaviors exclusively focus on risk factors (Franklin et al., 2017). Fifth, we use multi-method temperament data including both self-reports and mother reports of adolescent temperament, which reduces

problems associated with exclusive reliance on self-reports, a concern in many studies of personality and psychopathology (Durbin & Hicks, 2014). Finally, given conceptual and empirical relations between temperament and personality (Shiner & DeYoung, 2013), we also examine the role of Big Five personality traits in the onset of suicidal ideation, plans, and attempts to complement the temperament analyses.

Methods

Participants

This study uses data from the California Families Project, a longitudinal study of Mexican-origin youth and their parents (N=674).[1] Children were drawn at random from rosters of students from the Sacramento and Woodland, CA school districts. The focal child had to be in the 5th grade, of Mexican origin, and living with his or her biological mother in order to participate in the study. Approximately 72.6% of the eligible families agreed to participate in the California Families Project, which was granted approval by the University of California, Davis Institutional Review Board (Protocol # 217484–21). The children (50% female) were assessed annually from 5th grade to three years post-high school. The present study uses data from Waves 3–11 (collected in 2006–18), when the children were in 7th grade (M_{age} = 12.81, SD = 0.49) to three years post-high school (M_{age} = 21.74, SD =0.73). Retention rates compared to the original sample are as follows: 86% (Wave 3), 88% (Wave 4), 90% (Wave 5), 88% (Wave 6), 89% (Wave 7), 89% (Wave 8), 87% (Wave 9), 87% (Wave 10), and 80% (Wave 11).

Participants were interviewed in their homes in Spanish or English, depending on their preference. Interviewers were all bilingual and most were of Mexican heritage. Sixty-three percent of mothers and 65% of fathers had less than a high school education (median = 9th grade for both mothers and fathers); median total household income was between $30,000 and $35,000 (overall range of income = < $5,000 to > $95,000). With regard to generational status, 83.6% of mothers and 89.4% of fathers were 1st generation, and 16.4% of mothers and 10.6% of fathers were either 2nd or 3rd generation. One hundred and twenty-four of the families were single-parent households (mothers only), and 549 of the families were two-parent households. In the present study, we used data for all available participants (i.e., no exclusions were applied), and we have reported all analyses conducted to address our research questions.

Measures

Suicidal ideation and behaviors.—We used two measures to assess suicidal ideation and behaviors.[2] First, adolescents responded to three questions adapted from the Youth

---

[1]Ten published articles have used data from the California Families Project (CFP) to examine temperament measured via the EATQ-R (Atherton, Lawson, Ferrer, & Robins, 2020; Atherton, Lawson, & Robins, 2020; Atherton et al., 2017; Atherton et al., 2019; Clark et al., 2015; Clark et al., 2018; Lawson et al., in press; Robins et al., 2010; Taylor et al., 2018). No previous CFP publications have examined suicidal ideation, plans, or attempts. For a complete list of California Families Project publications, see: https://osf.io/ky7cw/.

[2]All materials, scripts, and output files for this project are available on the Open Science Framework (OSF): https://osf.io/j7vfb/. We are not legally or ethically allowed to publicly post data for this project because the participants in the study have not given informed consent to have their personal data publicly shared, and we do not have IRB approval to post data publicly. Researchers interested in replicating findings can contact the corresponding author to gain access to individual-level data.

Risk Behavior Survey annually from age 12 to 19 and at age 21 (YRBS; Brener et al., 2004). In particular, youth were asked about their experiences in the past year with suicidal ideation (i.e., "Have you thought about committing suicide?"), planning (i.e., "Have you made a plan for committing suicide?"), and attempts (i.e., "Have you attempted suicide?"). To ensure discretion and given the sensitive nature of these questions, youth completed this scale without the help of the interviewers (i.e., youth reported their responses directly on a computer that was turned away from interviewers). Additionally, youth were asked about their own ideation, plans, and attempts only *after* being asked about whether their friends had ideated, planned, or attempted (e.g., "Have your friends thought about committing suicide?"). Responses were recorded as 1 = *never*, 2 = *once*, 3 = *twice*, and 4 = *3 or more times*.

Second, adolescents responded to two items about suicide from the depression module of the NIMH Diagnostic Interview Schedule for Children-IV annually from age 12 to 18 (*DISC-IV*). The *DISC-IV* is a comprehensive, psychiatric interview that assesses mental health problems for children and adolescents using DSM-IV criteria; it is the most widely-used mental health interview that has been tested in both clinical and community populations and validated in both English and Spanish (Costello, Edelbrock, & Costello, 1985; Schwab-Stone et al., 1996; translated into Spanish by Bravo, Woodbury-Farina, Canino, & Rubio-Stipec, 1993). The two relevant depression items asked about suicidal ideation (i.e., "Was there a time when you thought seriously about killing yourself?") and suicide attempts (i.e., "During the last year, have you tried to kill yourself?") in the past year. Responses to these items were recorded dichotomously (0 = *no*, 1 = *yes*) as the symptom being present or not in the past year.

To create the most comprehensive suicide variables across assessments, we created a binary (0 = *no*, 1 = *yes*) score for each participant at each year, separately for ideation, plans, and attempts. From ages 12 to 18, the binary ideation and attempt variables included two items – one from the YRBS and one from the DISC-IV – such that participants who endorsed at least one of these items received a *yes* score. At ages 19 and 21, the suicidal ideation and attempt variables include only YRBS data. At all ages, the binary plan variable included only the item from the YRBS because there were no corresponding DISC-IV data for suicide plans.[3] Table 2 reports prevalence rates at each age and across the entire study period from age 12 to 21, separately for ideation, plans, and attempts.

Temperament.—Adolescent temperament was measured via self-reports and mother-reports when the adolescents were 12, 14, and 16 years old using a short form of the *Early Adolescent Temperament Questionnaire – Revised* (EATQ-R; Ellis & Rothbart, 2001). In particular, adolescents and their mothers completed the EATQ-R, which measures three domains of temperament – Effortful Control (EC), Negative Emotionality (NE), and Positive Emotionality (PE). Ratings were made on a 4-point scale ranging from 1 (*not at all true*

[3]Beginning at age 18, skip logic was used to assess suicidal ideation and behaviors. Specifically, participants were first asked the YRBS item about ideation and were only presented with the subsequent YRBS planning item if they endorsed ideation. Similarly, participants were only presented with the YRBS attempt item if they endorsed planning. Therefore, the data might *underestimate* planning and attempts at ages 18 through 21 because youth sometimes report planning or attempting suicide without endorsing ideation.

of you/your child) to 4 (*very true of you/your child*). Given variability in the way the EATQ-R temperament domains are scored (e.g., Lawson et al., 2020, Snyder et al., 2015), we present all findings separately for each individual facet scale, as well as for the broad temperament domains. For each domain and facet, we computed latent variables using both self- and mother-reports of adolescent temperament. We used parcels as indicators because parcels produce more reliable latent variables than individual items (Little et al., 2002). In particular, for the EC and NE domains, we created four parcels by randomly assigning items from *all* facets onto *each* parcel. For all facets, we created three parcels by randomly assigning items into each parcel. Additionally, to examine whether type of informant (i.e., self or mother) impacts the findings, we ran additional analyses separately for self- and mother-ratings of temperament. For all temperament data (i.e. self-and mother ratings, adolescent self-ratings, and mother-ratings), we saved factor scores of the latent variables and used these as predictors in the survival models. Descriptive statistics for the temperament domains are shown in Table 1.

Effortful control.: The EC scale (16 items) assesses the ability to anticipate and suppress inappropriate responses, as well as the ability to perform an action despite the inclination not to do so. This scale has three facets: Activation Control (5 items), Attention (6 items), and Inhibitory Control (5 items). Activation Control assesses the ability to perform an action or pursue goals when there are competing desires. Attention assesses the ability to focus and shift attention when needed. Inhibitory Control assesses the ability to plan and suppress inappropriate impulses. Sample EC items include "It is easy for [you/your child] to really concentrate on homework problems" and "[You/your child] puts off working on projects until right before they are due."

Negative emotionality.: The NE scale (17 items) assesses the propensity to experience negative emotions. This scale has three central facets: Fear (6 items), Frustration (7 items), and Shyness (4 items). Fear assesses unpleasant affect derived from anticipating distress. Frustration assesses negative affect related to ongoing tasks being interrupted. Shyness assesses behavioral avoidance of novelty and social challenges. The Aggression and Depressed Mood scales are also conceptually related to NE. In particular, Aggression (6 items) assesses hostile reactivity to negative stimuli including person- and object-directed violence and Depressed Mood (6 items) assesses unpleasant affect, lowered mood, and lack of enjoyment in activities. Sample NE items include, "[You/your child] feel scared when entering a darkened room at home" and "It frustrates [you/your child] if people interrupt when you're talking."

Scoring of the NE domain varies widely across studies, sometimes including items from the Fear, Frustration, and Shyness subscales and other times including items from these scales plus the Aggression and Depressed Mood subscales (e.g., Snyder et al., 2015). In order to examine multiple conceptualizations of NE, we ran all analyses with both a narrow NE score (i.e., Fear, Frustration, and Shyness subscales) and a broad NE score (i.e., Fear, Frustration, Shyness, Aggression, and Depressed Mood subscales).

Positive emotionality.: As detailed above, the PE scale includes two largely separate facets – Surgency and Affiliation.[4] The Surgency subscale (14 items) is the core of PE and

assesses the tendency to seek out rewarding or sociable experiences. This scale includes the 6 Surgency items from the short version of the EATQ-R as well as an additional 8 items from the full-length version of the EATQ-R, which were added to improve the reliability of the Surgency scale. A sample item is, "[You/your child] enjoy[s] going places where there are big crowds and lots of excitement". The Affiliation subscale (5 items), assesses desire for warmth and closeness with others. A sample item is, "It is important to [you/your child] to have close relationships with other people."

Gender.—Adolescents reported on their gender (1 = girl, 2 = boy).

Nativity.—Participants were categorized as 1st generation if their birth country was Mexico (29%); as 2nd generation if their birth country was the U.S., and only one of their parents was reported as being born in the U.S. (62%); and as 3rd generation if their birth country and both parents were born in the U.S. (9%). Because of the low percentage of 3rd generation youth, we created a dichotomous nativity status variable comparing 1st generation (born in Mexico; 29%) to 2nd+ generation (born in U.S.; 71%) youth in all analyses.

Procedures for the Statistical Analyses

All data cleaning was conducted in R (R Core Team, 2019) via RStudio Version 1.2.1335. All analyses were conducted in Mplus Version 8 (Muthén & Muthén, 1998–2017) using robust maximum likelihood estimation (MLR) and full information maximum likelihood (FIML) to address missing data (Allison, 2003; Schafer & Graham, 2002).[5] Chi square analyses were conducted to examine significant gender and nativity differences in suicidal ideation, plans, and attempts.

Measurement Invariance.—We examined evidence for longitudinal measurement invariance of the temperament domain and facets. In particular, we compared four measurement models: (a) freely estimating the factor loadings for the latent factors at each age of assessment (i.e., configural invariance); (b) constraining the respective factor loadings to be equal at each of assessment (i.e., weak invariance); (c) constraining the factor loadings and intercepts to be equal at each age of assessment (i.e., strong invariance); and (d) constraining the factor loadings, intercepts, and residual variances to be equal at each age of assessment (i.e., strict invariance). If the more constrained models did not fit worse than the lesser constrained models, then we concluded that the structure of the latent constructs is the same over time. We assessed adequate model fit via changes in chi-square and degrees of freedom and comparative fit index (CFI) less than or equal to .01 (Cheung & Rensvold, 2002; Meade et al., 2006). We also note values of root-mean-square error of approximation (RMSEA), for which adequate fit is indicated by values less than or equal to .06. We found

---

[4]Rothbart's EATQ-R measure also includes a Perceptual Sensitivity scale (assessing awareness of low-intensity stimulation in the environment) and a Pleasure Sensitivity scale (assessing pleasure related to activities or stimuli involving low intensity), which are conceptually related to Affiliation (Snyder et al., 2015). When the present study was launched in 2006, the Perceptual Sensitivity and Pleasure Sensitivity subscales were not considered relevant to the study aims and were therefore not included at any assessment.
[5]We believe that the data are missing at random (MAR) because the propensity for missing suicidal ideation, plans, and/or attempts data can be explained by other variables in the dataset – namely temperament (adolescents with missing temperament data at all waves were not included in the survival analyses).

evidence for strict longitudinal measurement invariance for all of the temperament domains and facets except Inhibitory Control, Depressed Mood, and Surgency, for which we found evidence for weak invariance (see Table S2 for model comparisons). We used the retained models to create factor scores, which were then included in the models.

We also examined evidence for measurement invariance across gender (i.e., girl vs. boy) and nativity (i.e., born in Mexico vs. born in U.S.) to facilitate multiple-groups analyses. Using the retained models from the longitudinal measurement invariance analyses, we tested four measurement models – configural, weak, strong, and strict invariance – for each of the temperament domains by constraining the relevant parameters across groups in each model. We found evidence for strict measurement invariance across gender and nativity for all temperament domains (see Tables S3–S4 for model comparisons).

Discrete-Time Survival Models.—We used discrete-time survival analyses to examine the probability of the onset of suicidal ideation and behaviors from age 12 to 21, and how the probability of first experiencing suicidal ideation, plans, and attempts varied as a function of temperament (Múthen & Masyn, 2005; Singer & Willett, 2003). Survival analysis is a commonly used method for studying age at first suicidal ideation (e.g., Bolger et al., 1989) and *discrete-time* survival models are most appropriate for data collected at discrete-time intervals (e.g., annually) rather than on a more continuous-time interval (e.g., hourly, daily; Masyn, 2003; Singer & Willett, 2003).

Discrete-time survival analyses convey the probability of "whether, and if so, when" an adolescent will experience a non-repeatable event (i.e., the onset of suicidal ideation, plans, or attempts), given that they have not endorsed ideating, planning, or attempting suicide previously (Singer & Willett, 2003, p. 306). Once a participant experiences an event (e.g., a suicidal thought, plan, or attempt), they are no longer "at risk" for that event and are excluded from future waves aimed at predicting the age of onset. These models accommodate data that are right-censored, that is, data from participants who do not experience the event over the course of the observation period and it is unknown whether they experience suicidal ideation or behaviors after the course of the study. Further, using a logit link, these analyses produce odds ratios, which depict the percentage of increased or decreased risk for first experiencing suicidal ideation, plans, or attempts that is associated with a one-unit change in a given predictor (Sharaf & Tsokos, 2014; Xie et al., 2003). For the present study, we examined both time-varying predictors (i.e., temperament) and time-invariant covariates (i.e., gender, nativity). For temperament domains and facets, suicidal ideation, plans, and attempts at each age were regressed on their respective age-matched measure. Each model was specified so that there was a proportional effect on the onset of suicidal ideation and behaviors at each age, given the estimated baseline thresholds. For gender and nativity, we conducted multiple group analyses, which test whether the effects differed significantly between boys versus girls or between adolescents born in Mexico versus the U.S. To determine differences across groups, we used a Wald test to examine whether the odds ratios for each temperament domain and facet differed significantly across groups (Koode & Palm, 1986) and we also compared values of Akaike information criteria (AIC) and Bayesian information criteria (BIC) from models where the parameters were freely estimated versus constrained across groups.

Results

Mean-level Changes in Prevalence Rates from Age 12 to 21

Table 2 shows the percentage of adolescents who endorsed suicidal ideation, plans, and attempts from age 12 to 21. On average, youth tended to report increases in suicidal ideation from age 12 to 14 and then plateaued until age 21, except for a dip at age 18. Suicide plans and attempts both showed similar patterns of mean-level increases from age 12 to 14 and then a fairly stable leveling-off, except for a dip at age 18.[6] Unlike suicidal ideation, the average level of suicide plans and attempts at ages 19–21 did not reach the levels reported before the dip at age 18.

In addition to mean-level changes in suicide variables, we also examined the number of unique participants who endorsed suicidal ideation, plans, and attempts at any point across the 10 years of the study. We found that 32.0% of the participants endorsed suicidal ideation at some point from age 12 to 21; 14.4% of participants endorsed making a suicide plan; and, 11.9% of participants endorsed attempting suicide at some point (see Figure 1). Given the presence of a non-trivial number of unique participants endorsing suicidal ideation, plans, and attempts across adolescence, we next examined predictors of the onset of suicidal ideation and behaviors across adolescence.

Temperamental Associations with the Onset of Suicide Ideation and Behaviors

Table 3 shows the odds ratios (OR) and 95% confidence intervals (CI) for each of our temperament predictors on the likelihood of initiating suicidal ideation, plans, or attempts across adolescence. To assess statistical significance, we applied a Bonferroni correction to account for multiple comparisons resulting in $\alpha = .005$.[7] An OR of exactly 1.00 would imply that the covariate was not associated with the onset of the behavior, whereas an OR below 1.00 would indicate a decreased propensity to initiate and an OR above 1.00 would indicate an increased propensity to initiate. Given that temperament is a continuous predictor, odds ratios correspond to a one-unit increase in the predictor (e.g., at each age, the estimated odds of initiating suicidal ideation are about 50% lower for youth whose Effortful Control factor scores were one unit higher).[8] Notably, the temperament variables all have standard deviations around 1, so a one unit increase is approximately the same as a one standard deviation increase.

In particular, we found that youth who had EC scores that were one unit *higher* were 45% *less* likely to experience the onset of suicidal ideation, 45% *less* likely to experience the

---

[6]Given the slight dip in sample size at age 18 and the drop in ideations, plans, and attempts at this age, we examined whether the participants who expressed suicidal ideation, plans, and attempts at age 17 were more likely to have missing data at age 18. We found that, of the 65 participants who expressed suicidal ideation at age 17, only 1 participant was missing suicide data at age 18. We found the same results (i.e., 1 participant missing suicide data at age 18) for the 27 participants who expressed making a suicide plan at age 17 and the 21 participants who endorsed making a suicide attempt at age 17. Thus, this drop does not appear to be due to selective attrition.

[7]To gauge robustness of the results, we also bootstrapped the confidence intervals of all significant results to see if the results remained largely unchanged. Using maximum likelihood estimation and bootstrapping 10,000 iterations, we found no meaningful differences in the point estimates or upper/lower limits of the confidence intervals (differences were all less than or equal to .03).

[8]For comparison, we also present odds ratios for the observed variables in Table S5. Results are the same between observed and latent variables with respect to significance, but the odds ratios are substantially larger for observed variables, which is due to the fact that the observed and latent variables are on different scales (see Tables 1 and S1 to compare).

onset of suicide plans, and 40% *less* likely to experience the onset of suicide attempts (all $ps < .001$). Further, youth who had NE scores that were one unit higher (assessed via Fear, Frustration, and Shyness facets) were 60% more likely to experience the onset of suicidal ideation ($p < .001$). However, there was no significant association between this narrow NE domain and suicide plans or attempts. Using a broader NE conceptualization including Aggression and Depressed Mood resulted in larger OR's of suicidal ideation and plans. In particular, youth who had NE scores (assessed via Fear, Frustration, Shyness, Aggression, and Depressed Mood facets) that were one unit higher were more than twice as likely to experience the onset of suicidal ideation ($p < .001$). Further, youth one unit higher on this broad conceptualization of NE were almost twice as likely to experience the onset of suicide plans ($p < .001$) and about 70% more likely to experience the onset of suicide attempts ($p = .001$). Positive emotionality, assessed via both the Surgency and Affiliation facets, was not significantly associated with the onset of suicidal ideation, plans, or attempts.[9]

Together, these results suggest that EC and NE are particularly consequential in the onset of suicidal ideation, plans, and attempts across adolescence. We also examined the facet-level results to determine which facets were driving these associations (Table 3). Facet results indicated that all three facets of EC (Activation Control, Inhibitory Control, and Attention) were associated with decreased probability of experiencing the onset of suicidal ideation, plans, and attempts (only for Attention) across adolescence. For the NE domain, the results show that that Frustration, Aggression, and Depressed Mood were all significantly associated with suicidal ideations, plans, and attempts, whereas Fear and Shyness were unrelated to suicidal ideation and behaviors. Noticeably, Depressed Mood had the largest association with suicidal ideation and behaviors. A one unit increase in Depressed Mood was associated with being almost three times as likely to experience the onset of suicidal ideation ($p < .001$), two and a half times as likely to experience the onset of planning ($p < .001$), and over two times as likely to experience the onset of attempting ($p < .001$).

Role of Informant.—To examine the role of informants on the association between temperament and the onset of suicidal ideation, plans, and attempts, we also ran discrete-time survival analyses separately for self- and mother-reported temperament. Results from the analyses using adolescent self-report ratings of temperament parallel the results from analyses using both self- and mother-ratings. Indeed, with one exception (Frustration no longer significantly predicted suicide attempts; OR = 1.48, $p = .021$), all findings remained significant and had similar effect sizes when only using adolescent self-reported temperament (Table S6). Using only mother-ratings of adolescent temperament, we replicated 9 out of 23 (36%) of the effects that were significant using both self- and mother-reported temperament (Table S7 using $p < .005$), though the vast majority of effects (87%) were in the expected direction and 61% were replicated using $p < .05$. To contextualize these

---

[9]To examine the potential confounding impact of gender, we ran models where both gender and temperament domains/facets were included as predictors in the models. We found that 35 out of the 39 (90%) results remained the same. For the results that changed, two significant associations became nonsignificant and two nonsignificant associations became significant. In particular, the relation between suicide attempts and Activation Control became significant (OR = 0.60, $p < .001$), which also happened with suicide attempts and Inhibitory Control (OR = 0.67, $p = .001$). On the other hand, the association between suicide attempts and the broad NE domain became nonsignificant (OR = 1.52, $p = .009$), which also happened with suicide attempts and the Frustration facet (OR = 1.44, $p = .021$).

findings, we believe that the best measure of temperament is the composite measure of self- and mother-reports, so we believe that the findings in Table 3 are the best representation of the relation between temperament and the onset of suicidal ideation and behaviors.

Temperament and Personality.—To complement our analyses of temperament, we also examined the role of Big Five personality traits in the onset of suicidal ideation, plans, and attempts (see Table S8 for descriptive statistics).[10] Using self-reported Big Five personality traits at ages 14 and 16 and suicide data from age 14 to 21, our results generally mirrored those from the temperament analyses (see Table S9). In particular, we found that, similar to EC, Conscientiousness was associated with decreased propensity to initiate suicidal ideation, plans, and attempts across adolescence. Similar to NE, Neuroticism was associated with increased propensity to initiate suicidal ideation, plans, and attempts across adolescence. Similar to PE, Extraversion, Agreeableness, and Openness were not associated with the onset of suicidal ideation, plans, and attempts (except that Extraversion was associated with a decreased propensity toward suicidal ideation and Agreeableness was associated with an increased propensity toward suicidal ideation).

Moderating Effects of Gender and Nativity

Given that there was evidence of several significant associations between temperament and the onset of suicidal ideation, plans, and attempts, we next examined whether gender or nativity moderated these associations. Before doing so, however, we first examined whether the prevalence of adolescent suicidal ideation and behaviors varied by gender and nativity. Tables S10 and S12 show the percentage of youth exhibiting suicidal ideation, plans, and attempts separately for boys and girls and for youth born in Mexico versus the U.S. Across adolescence, girls were three to four times more likely to ideate about suicide than boys (e.g., at age 15, 13.5% of girls reported ideation compared to only 4.2% of boys). These average gender differences were similar for plans (e.g., at age 15, 4.9% of girls reported planning in the past year compared to only 1.5% of boys) and attempts (e.g., at age 15, 6.8% of girls reported attempting in the past year compared to only 1.5% of boys). Further, these gender differences bore out in the number of unique individuals who ideated, planned, and attempted across the 10 years of the study. In particular, 44.0% of the females reported suicidal ideation at some point during the study, whereas 19.9% of the males reported ideating at least once from age 12 to 21 ($\chi^2 = 42.46$, $p < .001$). Furthermore, 21.7% of females made suicide plans at some point during the study, compared to 7.1% of males ($\chi^2 = 27.28$, $p < .001$). Finally, 18.3% of the females reported having attempted suicide at some point during the study, compared to 5.5% of males ($\chi^2 = 24.33$, $p < .001$).

For nativity status, we did not find any consistent trends for the average levels of ideation, plans, or attempts for youth born in the U.S. versus Mexico. Additionally, we did not find significant nativity differences in the number of participants who ideated, planned, and attempted. In particular, 28.3% of the youth born in Mexico ideated at some point from age 12 to 21, whereas 33.7% of the youth born in the United States ideated during this period

---

[10] Adolescent self-reported Big Five traits (i.e., Extraversion, Agreeableness, Conscientiousness, Neuroticism, and Openness) were measured using the 44-item Big Five Inventory (BFI; John et al., 1991; John et al., 2008) at ages 14 and 16. Given that we do not have Big Five data at age 12, we began these survival analyses at age 14 (versus age 12, as was the case for the temperament analyses).

($\chi^2 = 1.47$, $p = .225$). Further, 12.8% of youth born in Mexico reported making suicide plans, compared to 15.2% of youth born in the U.S ($\chi^2 = 0.45$, $p = .503$). Finally, 10.0% of the youth born in Mexico reporting attempting suicide at some point during the study, compared to 12.9% of youth born in the U.S ($\chi^2 = 0.76$, $p = .384$).

After examining differences in the prevalence of suicidal ideation and behaviors by gender and nativity, we then conducted multiple group analyses to examine whether gender and nativity moderated the individual effects of temperament on the onset of suicidal ideation and behaviors by testing whether equality constraints on the estimated thresholds were significantly different across groups. We found no evidence that gender or nativity significantly moderated any associations (see Tables S11 and S13).

Discussion

The present study examined the role of temperament in the onset of suicidal ideation, plans, and attempts across ten years, from age 12 to 21, in a large, community sample of Mexican-origin youth ($N = 674$). We used discrete-time survival analyses to assess whether three central domains of youth temperament – EC, NE, and PE – served as risk or protective factors for suicidal ideation and behaviors. Our results suggested that EC was associated with *decreased* probability of experiencing the onset of suicidal ideation and behaviors, thus serving as a protective factor, whereas NE was associated with an *increased* probability of experiencing the onset of suicidal ideation and behaviors, thus serving as a risk factor. We found no evidence suggesting that PE was related to the onset of suicidal ideation and behaviors across adolescence.

Adolescent Suicidal Ideation and Behaviors

Data on the prevalence of suicidal ideation, plans, and attempts from the present study indicate that there were relatively high levels of suicidal ideation and behaviors in this sample of Mexican-origin youth. In particular, we found that, at some point from age 12 to age 21, 32.0% of youth experienced suicidal ideation, 14.4% made a suicide plan, and 11.9% attempted suicide. These prevalence rates are approximately three times higher than the rates from a nationally representative survey of American adolescents aged 13–18, which found prevalence of 12.1%, 4.0%, and 4.1% for ideation, plans, and attempts, respectively (Nock et al., 2013).

However, the prevalence rates in the present study are comparable to those found in previous studies examining Latinx youth. In particular, the prevalence rates for plans and attempts (14.4% and 11.9%, respectively) are very similar to those found in a large sample of Latinx high school students in the Youth Risk Behavior Surveillance (YRBS) study (15.7% and 11.3%, respectively; Kann et al., 2013). We did find a higher rate of ideating in the present study (32.0%) than in the YRBS study (18.9%), but this could reflect the different ages captured by each study (i.e., age 12 to 21 years in the present study vs. 9th to 12th grade in the YRBS). When we limited the timeframe of the present study to high school, the rate of ideation (22.4%) was much closer to the 18.9% in the YRBS study. Additionally, we might be seeing slightly higher rates in the present study because our participants have been part of the California Families Project for many years and have

grown comfortable reporting emotional problems and learned to trust that their responses will remain confidential, whereas participants in large national surveys are unlikely to have the same personal connection with the project.

With respect to gender, we found that girls were two to three times more likely to experience suicidal ideation, plans, and attempts than boys. This gender disparity is consistent with past research that found that suicidal ideation and behaviors are approximately three times more prevalent among girls compared to boys (Nock et al., 2013). We also found differences in the onset and trajectory of suicide risk by gender that is consistent with past research (Reuter, Holm, McGeorge, & Conger, 2008). In particular, we found that girls experienced earlier onset, such that, at age 12, 8.8% of girls ideated at age 12 versus 2.9% of boys. Additionally, we found gender differences in peak prevalence, such that ideation for girls peaked at age 14 with 17.2% of female participants endorsing suicidal ideation and it peaked for boys at age 17 with 6.9% endorsing ideation. Similar patterns were observed for gender differences in plans and attempts.

The strikingly high prevalence of suicidal ideation (44%), plans (22%), and attempts (18%) among girls in our sample corresponds to the well-documented finding that Latina adolescents consistently report the highest suicide ideation and attempt rates of any gender and ethnic group (Eaton et al., 2011; Price & Khubchandani, 2017). Indeed, when we consider the differences between the studies noted above – capturing a long period of time and having participants who are especially comfortable with interviewers – our rates are comparable with data from the YRBS study, which showed that Latina high school students had the highest prevalence rates of any demographic group for suicidal ideation (26.0%), plans (20.1%), and attempts (15.6%) (Kann et al., 2014).

For nativity, we found no evidence of a significant difference between suicidal ideation, plans, or attempts for youth born in Mexico versus those born in the United States. These results are not consistent with past research showing that youth born in Mexico were *less* likely to experience suicidal ideation and behaviors than youth born in the United States (Carino & Roberts, 2001; Silva & Van Orden, 2018; Sorenson & Shen, 1996) and that Latinx youth born in the U.S. were two to three times *more* likely to attempt suicide than youth born outside of the U.S. (Peña et al., 2008). Thus, our results are not consistent with the "immigrant paradox," which posits that U.S.-born ethnic minority youth have more emotional and behavioral problems than 1st generation ethnic minority youth who were born in another country and immigrated to the U.S. (García Coll & Marks, 2012; Marks, Ejesi, & García Coll, 2014).

Temperament and Suicidal Ideation and Behaviors

Supporting the vulnerability model of personality and psychopathology, we found evidence that multiple temperament domains (and their facets) were associated with the onset of suicidal ideation and behavior across adolescence in our sample of Mexican-origin youth. In almost all cases, the associations with temperament replicated across suicidal ideation, plans, and attempts, suggesting that the importance of temperament in identifying youth at higher or lower risk for suicidal ideation and behaviors is not limited to any particular aspect

of suicide risk. Below, we detail the specific relations between EC, NE, and PE and the onset of suicidal ideation and behaviors.

Effortful Control.—We found that youth who were higher in EC had a substantially *decreased* risk of experiencing the onset of suicidal ideation, plans, and attempts. This finding is consistent with past longitudinal work showing that impulsivity (which is related to low EC) is associated with increased suicide risk later in life (Kasen et al., 2011; Piquet & Wagner, 2003). Notably, the association between EC and suicidal ideation and behaviors replicated across all EC facets, suggesting that not only is there an association between suicidal ideation/behaviors and Inhibitory Control (i.e., low impulsivity), but also a relation between ideation/behaviors and Activation Control and Attention. This finding is also consistent with previous claims that Conscientiousness (closely related to EC) is particularly relevant in the development of psychopathology (Tackett, 2006). Indeed, in the present study, we found that higher levels of Conscientiousness were associated with decreased propensity to experience the onset of suicidal ideation, plans, and attempts.

Negative Emotionality.—We found that youth who were higher in NE, particularly the Frustration, Aggression, and Depressed Mood facets, had a substantially *increased* risk of experiencing the onset of suicidal ideation, plans, and attempts. These findings are consistent with past longitudinal work suggesting that high levels of NE are associated with later suicidal ideation and behavior (Enns et al., 2003; Fergusson et al., 2003; Pickles et al., 2010). Additionally, results suggesting a large association between Depressed Mood and suicidal ideation and behaviors are consistent with the substantial literature on relations between clinical (rather than temperament) measures of depression and suicidal ideation/behaviors (Minkoff, Bergman, Beck, & Beck, 1973). These results are especially interesting given the content captured by the Depressed Mood subscale of the EATQ-R. In particular, most EATQ-R Depressed Mood items relate to sad mood ("You get sad more than other people realize", "You get sad when a lot of things are going wrong", "You feel sad even when you should be enjoying yourself, like at Christmas or on a trip", "Your friends seem to enjoy themselves more than you do") which is the most common symptom captured on depression inventories (Fried, 2017). The other items capture crying ("It often takes very little to make you feel like crying") and feeling happy ("You feel pretty happy most of the day" – reverse scored), which are both less commonly included depression symptoms. Notably, the EATQ-R does not include any of the other types of depression symptoms described by Fried (2017), including none of the somatic symptoms nor symptoms relating to suicidal ideation. This bolsters the importance of the *temperament* construct of Depressed Mood in the development of suicidal ideation and behaviors, and highlights the distinction between this scale and our measures of suicidal ideation, plans, and attempts. Further, the importance of NE also bolsters claims that Neuroticism (analogous to NE) is particularly relevant in the development of later psychopathology (Tackett, 2006). Indeed, the present study found that higher levels of Neuroticism were associated with increased propensity to experience the onset of suicidal ideation, plans, and attempts across adolescence.

Positive Emotionality.—We did not find evidence that either the Surgency facet or the Affiliation facet of PE was associated with suicidal ideation and behaviors. These

findings are not consistent with previous research showing that Extraversion is associated with reduced risk, and novelty seeking with higher risk, of suicidal ideation and behaviors (Fergusson et al, 2003). The Big Five analyses in the present study also failed to support an important role of Extraversion. In particular, Extraversion was not associated with suicidal plans or attempts, although it was associated with a decreased propensity toward suicidal ideation.

Although we believe the best measure of adolescent temperament is the composite of both the adolescent and mother perspectives, we also examined whether the findings differed when using only self-report or mother report of the adolescent's temperament. We found identical results for the adolescent self-reports that we found with the composite measure. For the mother-reports of adolescent temperament, we also saw similar patterns of effects, but they were not always significant.

Finally, we did not find evidence that gender or nativity moderated the association between temperament and suicidal ideation and behaviors. These results suggest that EC and NE have similar associations with suicide risk for boys and girls and for youth born in the U.S. and Mexico. With respect to gender, this finding is inconsistent with past research that documented gender differences in the association between individual-level risk and protective factors and suicidal ideation and behaviors (Edwards & Holden, 2001). In particular, we did not replicate the finding from a cross-sectional study of undergraduate students that women high in angry hostility and depression (i.e., NE) were more prone to suicidal ideation, whereas men with poor self-discipline (i.e., low EC) were more prone to suicidal ideation (Velting, 1999). Additionally, we did not replicate findings from a cross-sectional study of German adults that found men low in Extraversion and Conscientiousness were at increased risk for suicide, whereas women high in Neuroticism were at increased risk (Blüml et al., 2013).

Limitations

The present study has several limitations. First, our suicide risk measures were single-item assessments of suicide ideation, plans, and attempts that did not provide participants with definitions of what each of these meant, which might have impacted youth's responses to those items (Franklin et al., 2017) and could be prone to misclassification compared to multiple-item measures (Millner, Lee, & Nock, 2015). Second, we only assessed suicidal ideation and behaviors until age 21. Although this is the developmental period when most people first exhibit suicidal ideation and behaviors, some individuals exhibit these later in young adulthood and beyond. Because of this, we may not have captured all of the participants who went on to experience suicidal ideation or behaviors during their lifetimes. Third, our use of survival analyses meant that we did not examine severity or duration of suicidal ideation and behaviors. Although survival analyses have been used with data on the onset of suicidal ideation and behaviors (e.g., Bolger et al., 1989), future studies should examine these other aspects of suicide risk. Relatedly, in order to run the survival analyses, we assumed that the censoring was noninformative, though it is possible that some cases of censoring were informative (i.e., youth stopped participating in the study because they experienced the onset of suicidal ideation but they had yet to be documented as having

experienced it; Singer & Willett, 2003). This is especially relevant given that our data were "group-timed" (Allison, 1982); that is, the onset of suicidal ideation, plans, or attempts occurred at some point in the previous 12 months but we were only able to document the event occurrence happening at our annual assessment. Fourth, although we reference prevalence rates from other studies to contextualize our results, we cannot draw conclusions about whether the prevalence of suicidal ideation, plans, and attempts of Mexican-origin youth are high compared to other ethnic groups, given that we do not have a matched comparison sample. Fifth, although we found that temperament was associated with the onset of suicidal ideation and behaviors across adolescence and into young adulthood, we still have a limited understanding of the mechanisms through which temperament serves as a risk or protective factor, or the family and social-contextual processes that might moderate the influence of temperament on suicide risk. Relatedly, although our prospective longitudinal design is a strength in testing whether temperament is associated with suicidal ideation/behaviors, more evidence is needed for strong causal inferences; in particular, researchers could make use of genetically-informed designs (Durbin & Hicks, 2014).

Future Directions

In the future, researchers should aim to replicate these findings in other samples, including samples with different demographic makeups. In particular, researchers should compare Mexican-origin youth to other (especially other Latinx) subsamples. Once replicated, researchers should seek to understand possible mediators of this connection; in particular, which factors might be part of a developmental sequence, or cascade, that leads from temperament to suicidal ideation, plans, and attempts (Dumais et al., 2005; Pickles et al., 2010). Additionally, researchers should explore whether mental healthcare providers at schools and community centers could use measures of adolescent temperament to identify adolescents likely to experience suicidal ideation and behaviors before the onset actually occurs. Indeed, this is one of the most beneficial outcomes of personality and psychopathology research; that is, to use early assessments of temperament to identify individuals who are particularly at risk for suicidal ideation and behaviors (Frick, 2004). Researchers should also explore socio-cultural factors that may underlie the gender disparity documented in past studies and replicated in the present study, where Latinas are at a substantially higher risk than Latinos for experiencing the onset of suicidal ideation, plans, and attempts across adolescence. In addition, there may be endogenous biological factors that undergird gender differences in suicidal ideation and behavior; in particular, there is evidence from research on complex trait genetics that suggests pleiotropic effects on suicidal behavior and MDD, both of which tend to be higher in females compared to males (Levey et al., 2019). Finally, researchers should examine evidence for other developmental models of temperament and suicidal ideation and behaviors, including the scar, pathoplasty, and spectrum models (Durbin & Hicks, 2014; Tackett, 2006).

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgements

References

Allison PD (1982). Discrete-Time Methods for the Analysis of Event Histories. Sociological Methodology, 13, 61. 10.2307/270718

Allison PD (2003). Missing data techniques for structural equation modeling. Journal of Abnormal Psychology, 112(4), 545–557. 10.1037/0021-843X.112.4.545 [PubMed: 14674868]

Akiskal HS, Mendlowicz MV, Jean-Louis G, Rapaport MH, Kelsoe JR, Gillin JC, & Smith TL (2005). TEMPS-A: Validation of a short version of a self-rated instrument designed to measure variations in temperament. Journal of Affective Disorders, 85(1–2), 45–52. 10.1016/j.jad.2003.10.012 [PubMed: 15780675]

Atherton OE, Lawson KM, Ferrer E, & Robins RW (2019). The role of effortful control in the development of ADHD, ODD, and CD symptoms. Journal of Personality and Social Psychology.

Atherton OE, Lawson KM, & Robins RW (in press). The development of effortful from late childhood to young adulthood. Journal of Personality and Social Psychology.

Atherton OE, Schofield TJ, Sitka A, Conger RD, & Robins RW (2016). Unsupervised self-care predicts conduct problems: The moderating roles of hostile aggression and gender. Journal of Adolescence, 48, 1–10. 10.1016/j.adolescence.2016.01.001 [PubMed: 26820648]

Atherton OE, Tackett JL, Ferrer E, & Robins RW (2017). Bidirectional pathways between relational aggression and temperament from late childhood to adolescence. Journal of Research in Personality, 67, 75–84. 10.1016/j.jrp.2016.04.005 [PubMed: 28943676]

Atherton OE, Zheng LR, Bleidorn W, & Robins RW (2019). The co-development of effortful control and school behavioral problems. Journal of Personality and Social Psychology, 117, 659–673. [PubMed: 30035568]

Baertschi M, Costanza A, Canuto A, & Weber K (2018). The function of personality in suicidal ideation from the perspective of the interpersonal-psychological theory of suicide. International Journal of Environmental Research and Public Health, 15(4), 636. 10.3390/ijerph15040636

Baetens I, Claes L, Willem L, Muehlenkamp J, & Bijttebier P (2011). The relationship between non-suicidal self-injury and temperament in male and female adolescents based on child- and parent-report. Personality and Individual Differences, 50(4), 527–530. 10.1016/j.paid.2010.11.015

Blüml V, Kapusta ND, Doering S, Brähler E, Wagner B, & Kersting A (2013). Personality factors and suicide risk in a representative sample of the German general population. PLoS ONE, 8(10), e76646. 10.1371/journal.pone.0076646 [PubMed: 24124582]

Bolger N, Downey G, Walker E, & Steininger P (1989). The onset of suicidal ideation in childhood and adolescence. Journal of Youth and Adolescence, 18(2), 175–190. 10.1007/BF02138799 [PubMed: 24271685]

Bravo M, Woodbury-Farina M, Canino GJ, & Rubio-Stipec M (1993). The Spanish translation and cultural adaptation of the Diagnostic Interview Schedule for Children (DISC) in Puerto Rico. Culture, Medicine, & Psychiatry, 17, 329–344.

Brener ND, Kann L, Kinchen SA, Grunbaum JA, Whalen L, Eaton D, Hawkins J, & Ross JG (2004). Methodology of the youth risk behavior surveillance system. 53, 1–13.

Brezo J, Paris J, Tremblay R, Vitaro F, Zoccolillo M, Hébert M, & Turecki G (2006a). Personality traits as correlates of suicide attempts and suicidal ideation in young adults. Psychological Medicine, 36(2), 191–202. 10.1017/S0033291705006719 [PubMed: 16332283]

Brezo J, Paris J, & Turecki G (2006b). Personality traits as correlates of suicidal ideation, suicide attempts, and suicide completions: A systematic review. Acta Psychiatrica Scandinavica, 113(3), 180–206. 10.1111/j.1600-0447.2005.00702.x [PubMed: 16466403]

Canino G, & Roberts RE (2001). Suicidal behavior among Latino youth. Suicide and Life-Threatening Behavior, 31, 122–131. [PubMed: 11326756]

Capaldi DM, & Rothbart MK (1992). Development and validation of an early adolescent temperament measure. Journal of Early Adolescence, 12(2), 153–173.

Centers for Disease Control and Prevention (CDC). (2017). Web-based injury statistics query and reporting system (WISQARS). Available from: https://www.cdc.gov/injury/wisqars/fatal.html

Cheung GW, & Rensvold RB (2002). Evaluating goodness-of-fit indexes for testing measurement invariance. Structural Equation Modeling: A Multidisciplinary Journal, 9(2), 233–255. 10.1207/S15328007SEM0902_5

Chioqueta AP, & Stiles TC (2005). Personality traits and the development of depression, hopelessness, and suicide ideation. Personality and Individual Differences, 38(6), 1283–1291. 10.1016/j.paid.2004.08.010

Clark LA, & Watson D (2008). Temperament: An organizing paradigm for trait psychology. In John OP, Robins RW, & Pervin LA (Eds.), Handbook of personality: Theory and research (pp. 265–286). The Guilford Press.

Clark DA, Donnellan MB, Robins RW, & Conger RD (2015). Early adolescent temperament, parental monitoring, and substance use in Mexican-origin adolescents. Journal of Adolescence, 41, 121–130. 10.1016/j.adolescence.2015.02.010 [PubMed: 25841175]

Clark DA, Donnellan MB, & Robins RW (2018). Personality traits and parent–adolescent interactions: An observational study of Mexican origin families. Journal of Family Psychology, 32(4), 544–551. 10.1037/fam0000408 [PubMed: 29878814]

Costello EJ, Edelbrock CS, & Costello AJ (1985). Validity of the NIMH diagnostic interview schedule for children: A comparison between psychiatric and pediatric referrals. Journal of Abnormal Child Psychology, 13, 579–595. 10.1007/BF00923143 [PubMed: 4078188]

Cramer RJ, Garza MJ, Henderson CE, Ribeiro JD, Silva C, Smith AR, Joiner TE, & White J (2012). A trait-interpersonal perspective on suicide risk in criminal offenders. Archives of Suicide Research, 16(4), 334–347. 10.1080/13811118.2013.722057 [PubMed: 23137223]

Curtin SC, & Heron M (2019). Death rates due to suicide and homicide among persons aged 10–24: United States, 2000–2017. National Center for Health Statistics (NCHS) Data Brief No. 352.

De Pauw SSW. & Mervielde I. (2010). Temperament, personality and developmental psychopathology: A review based on the conceptual dimensions underlying childhood traits. Child Psychiatry and Human Development, 41, 313–329. [PubMed: 20238477]

Duarté-Vélez Y, & Bernal G (2007). Suicide behavior among Latino and Latina adolescents: Conceptual and methodological issues. Death Studies, 31:5, 435–455, DOI: 10.1080/07481180701244579 [PubMed: 17554838]

Dumais A, Lesage AD, Alda M, Rouleau G, Dumont M, Chawky N, Roy M, Mann JJ, Benkelfat C, & Turecki G (2005). Risk factors for suicide completion in major depression: A case-control study of impulsive and aggressive behaviors in men. American Journal of Psychiatry, 162(11), 2116–2124. 10.1176/appi.ajp.162.11.2116

Durbin CE, & Hicks BM (2014). Personality and psychopathology: A stagnant field in need of development. European Journal of Personality, 28(4), 362–386. 10.1002/per.1962 [PubMed: 25544802]

Eaton DK, Foti KE, Brener ND, Crosby AE, Flores G, & Kann L (2011). Associations between risk behaviors and suicidal ideation and suicide attempts: Do racial/ethnic variations in associations account for increased risk of suicidal behaviors among Hispanic/Latina 9th- to 12th-grade female students? Archives of suicide research: official journal of the International Academy for Suicide Research, 15(2), 113–26. [PubMed: 21541858]

Edwards MJ, & Holden RR (2001). Coping, meaning in life, and suicidal manifestations: Examining gender differences. Journal of Clinical Psychology, 57(12), 1517–1534. 10.1002/jclp.1114 [PubMed: 11745593]

Ellis LK, & Rothbart MK (2001). Revision of the Early Adolescent Temperament Questionnaire. Poster presented at the 2001 Biennial Meeting of the Society for Research in Child Development, Minneapolis, Minnesota

Enns MW, Cox BJ, & Inayatulla M (2003). Personality predictors of outcome for adolescents hospitalized for suicidal ideation. Journal of the American Academy of Child & Adolescent Psychiatry, 42(6), 720–727. 10.1097/01.CHI.0000046847.56865.B0 [PubMed: 12921480]

Fergusson DM, Beautrais AL, & Horwood LJ (2003). Vulnerability and resiliency to suicidal behaviours in young people. Psychological Medicine, 33(1), 61–73. 10.1017/S0033291702006748 [PubMed: 12537037]

Fino E, Iliceto P, Sabatello U, Petrucci F, & Candilera G (2014). Self/other perception mediates between personality and suicidal ideation in young adults. European Journal of Psychiatry, 28, 102–113.

Fortuna LR, Álvarez K, Ramos Ortiz Z, Wang Y, Mozo Alegría X, Cook BL, & Alegría M (2016). Mental health, migration stressors and suicidal ideation among Latino immigrants in Spain and the United States. European Psychiatry, 36, 15–22. 10.1016/j.eurpsy.2016.03.001 [PubMed: 27311103]

Frances A, Fyer M, & Clarkin J (1986). Personality and suicide. Annals New York Academy of Sciences, 487, 281–293.

Franklin JC, Ribeiro JD, Fox KR, Bentley KH, Kleiman EM, Huang X, Musacchio KM, Jaroszewski AC, Chang BP, & Nock MK (2017). Risk factors for suicidal thoughts and behaviors: A meta-analysis of 50 years of research. Psychological Bulletin, 143(2), 187–232. 10.1037/bul0000084 [PubMed: 27841450]

Frick PJ (2004). Integrating research on temperament and childhood psychopathology: Its pitfalls and promise. Journal of Clinical Child & Adolescent Psychology, 33(1), 2–7. 10.1207/S15374424JCCP3301_1 [PubMed: 15028536]

Fried EI (2017). The 52 symptoms of major depression: Lack of content overlap among seven common depression scales. Journal of Affective Disorders, 208, 191–197. 10.1016/j.jad.2016.10.019 [PubMed: 27792962]

García Coll CE, & Marks AKE (2012). The immigrant paradox in children and adolescents: Is becoming American a developmental risk? (pp. xiv–328). American Psychological Association.

Glenn CR, Lanzillo EC, Esposito EC, Santee AC, Nock MK, & Auerbach RP (2017). Examining the course of suicidal and nonsuicidal self-injurious thoughts and behaviors in outpatient and inpatient adolescents. Journal of abnormal child psychology, 45(5), 971–983. doi:10.1007/s10802-016-0214-0 [PubMed: 27761783]

Goldston DB, Molock SD, Whitbeck LB, Murakami JL, Zayas LH, & Hall GC (2008). Cultural considerations in adolescent suicide prevention and psychosocial treatment. The American psychologist, 63(1), 14–31. doi:10.1037/0003-066X.63.1.14 [PubMed: 18193978]

Gomez J, Miranda R, & Polanco L (2011). Acculturative stress, perceived discrimination, and vulnerability to suicide attempts among emerging adults. Journal of Youth and Adolescence, 40(11), 1465–1476. 10.1007/s10964-011-9688-9 [PubMed: 21717234]

Gvion Y, & Apter A (2011). Aggression, Impulsivity, and Suicide Behavior: A Review of the Literature. Archives of Suicide Research, 15(2), 93–112. 10.1080/13811118.2011.565265 [PubMed: 21541857]

Hooven C, Snedker KA, & Thompson EA (2012). Suicide risk at young adulthood: Continuities and discontinuities from adolescence. Youth & society, 44(4), 524–547. [PubMed: 23129876]

John OP, Donahue EM, & Kentle RL (1991). Big five inventory. Journal of Personality and Social Psychology.

John OP, Naumann LP & Soto CJ (2008). Paradigm shift to the integrative big five trait taxonomy. Handbook of Personality: Theory and Research, 3, 114–158.

Kann L, Kinchen S, Shanklin SL, Flint KH, Hawkins J, Harris WA, et al. (2014). Youth Risk Behavior Surveillance - United States, 2015. MMWR Surveillance Summary 63(SS04):1–168. Retrieved from: https://www.cdc.gov/mmwr/preview/mmwrhtml/ss6304a1.htm

Karam EG, Itani L, Fayyad J, Hantouche E, Karam A, Mneimneh Z, Akiskal H, & Rihmer Z (2015). Temperament and suicide: A national study. Journal of Affective Disorders, 184, 123–128. [PubMed: 26080077]

Kasen S, Cohen P, & Chen H (2011). Developmental course of impulsivity and capability from age 10 to age 25 as related to trajectory of suicide attempt in a community cohort. Suicide & tional Psychiatry, 9(1), 22. 10.1038/s41398-0-278X.2011.00017.x

Kerby DS (2003). CART analysis with unit-weighted regression to predict suicidal ideation from Big Five traits. Personality and Individual Differences, 35(2), 249–261. 10.1016/S0191-8869(02)00174-5

Koode DA, & Palm FC (1986). Wald criteria for jointly testing equality and inequality restrictions. Econometrica, 54(5), 1243–1248.

Lawson KM, Atherton OE, & Robins RW (2020). The structure of adolescent temperament and associations with psychological functioning: A replication and extension of Snyder et al. (2015). [Manuscript submitted for publication.] Psychology Department, University of California, Davis.

Levey DF, Polimanti R, Cheng Z, Zhou H, Nuñez YZ, Jain S, He F, Sun X, Ursano RJ, Kessler RC, Smoller JW, Stein MB, Kranzler HR, & Gelernter J (2019). Genetic associations with suicide attempt severity and genetic overlap with major depression. Translational Psychiatry, 9(1), 22. 10.1038/s41398-018-0340-2 [PubMed: 30655502]

Little TD, Cunningham WA, Shahar G, & Widaman KF (2002). To parcel or not to parcel: Exploring the question, weighing the merits. Structural Equation Modeling: A Multidisciplinary Journal, 9(2), 151–173. 10.1207/S15328007SEM0902_1

Lolas F, Gomez A, & Suarez L (1991). EPQ-R and suicide attempt: The relevance of psychoticism. Personality and Individual Differences, 12(9), 899–902. 10.1016/0191-8869(91)90178-E

Marks AK, Ejesi K, & García Coll C (2014). Understanding the U.S. immigrant paradox in childhood and adolescence. Child Development Perspectives, 8(2), 59–64. 10.1111/cdep.12071

Masyn KE (2003). Discrete-time survival mixture analysis for single and recurrent events using latent variables. [Unpublished doctoral dissertation]. University of California, Los Angeles.

Meade AW, Johnson EC, & Braddy PW (2006). The utility of alternative fit indices in tests of measurement invariance. Academy of Management Proceedings, 2006(1), B1–B6. 10.5465/ambpp.2006.27182124

Millner AJ, Lee MD, & Nock MK (2015). Single-item measurement of suicidal behaviors: Validity and consequences of misclassification. PLOS ONE, 10(10), e0141606. 10.1371/journal.pone.0141606 [PubMed: 26496707]

Minkoff K, Bergman E, Beck AT, & Beck R (1973). Hopelessness, depression, and attempted suicide. American Journal of Psychiatry, 130(4), 455–459.

Miranda R, Ortin A, Scott M, & Shaffer D (2014). Characteristics of suicidal ideation that predict the transition to future suicide attempts in adolescents. Journal of child psychology and psychiatry, and allied disciplines, 55(11), 1288–1296.

Muris P, & Ollendick TH (2005). The role of temperament in the etiology of child psychopathology. Clinical Child and Family Psychology Review, 8, 271–287. [PubMed: 16362256]

Muthén B, & Masyn K (2005). Discrete-time survival mixture analysis. Journal of Educational and Behavioral Statistics, 30(1), 27–58. 10.3102/10769986030001027

Muthén LK, & Muthén BO (1998–2017). Mplus user's guide (8th ed.). Los Angeles, CA: Muthén & Muthén.

Nock MK, Borges G, Bromet EJ, Cha CB, Kessler RC, & Lee S (2008). Suicide and suicidal behavior. Epidemiologic Reviews, 30, 133–154. [PubMed: 18653727]

Nock MK, Green JG, Hwang I, McLaughlin KA, Sampson NA, Zaslavsky AM, & Kessler RC (2013). Prevalence, correlates, and treatment of lifetime suicidal behavior among adolescents: Results from the National Comorbidity Survey Replication Adolescent Supplement. JAMA Psychiatry, 70, 300–310. [PubMed: 23303463]

Nordström P, Schalling D, & Asberg M (1995). Temperamental vulnerability in attempted suicide. Acta Psychiatrica Scandinavica, 92(2), 155–160. 10.1111/j.1600-0447.1995.tb09560.x [PubMed: 7572263]

Peña JB, Wyman PA, Brown CH, Matthieu MM, Olivares TE, Hartel D, Zayas LH (2008). Immigration generation status and its association with suicide attempts, substance use, and depressive symptoms among Latino adolescents in the USA. Prevention Science, 9, 299–310. [PubMed: 18855139]

Pickles A, Aglan A, Collishaw S, Messer J, Rutter M, & Maughan B (2010). Predictors of suicidality across the life span: The Isle of Wight study. Psychological Medicine, 40(9), 1453–1466. 10.1017/S0033291709991905 [PubMed: 19939326]

Piquet ML, & Wagner BM (2003). Coping Responses of Adolescent Suicide Attempters and Their Relation to Suicidal Ideation Across a 2-Year Follow-up: A Preliminary Study. Suicide and Life-Threatening Behavior, 33(3), 288–301. 10.1521/suli.33.3.288.23212 [PubMed: 14582839]

Pompili M, Girardi P, Ruberto A, & Tatarelli R (2005). Suicide in borderline personality disorder: A meta-analysis. Nordic Journal of Psychiatry, 59(5), 319–324. 10.1080/08039480500320025 [PubMed: 16757458]

Price JH, & Khubchandani J (2017). Latina adolescents' health risk behaviors and suicidal ideation and suicide attempts: Results from the National Youth Risk Behavior Survey 2001–2013. Journal of Immigrant and Minority Health, 19(3), 533–542. [PubMed: 27286882]

R Core Team (2019). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL https://www.R-project.org/.

Robins RW, Donnellan MB, Widaman KF, & Conger RD (2010). Evaluating the link between self-esteem and temperament in Mexican origin early adolescents. Journal of Adolescence, 33(3), 403–410. 10.1016/j.adolescence.2009.07.009 [PubMed: 19740537]

Rothbart MK, & Ahadi SA (1994). Temperament and the development of personality. Journal of Abnormal Psychology, 103(1), 55–66. 10.1037/0021-843X.103.1.55 [PubMed: 8040481]

Rothbart MK (2007). Temperament, development, and personality. Current Directions in Psychological Science, 16, 207–212. 10.1111/j.1467-8721.2007.00505.x

Rothbart MK (2011). Becoming who we are: Temperament and personality in development. New York, NY: Guilford Press.

Rothbart MK, Ahadi SA, & Evans DE (2000). Temperament and personality: Origins and outcomes. Journal of Personality and Social Psychology, 78(1), 122–135. 10.1037/0022-3514.78.1.122 [PubMed: 10653510]

Rueter MA, Holm KE, McGeorge CR, & Conger RD (2008). Adolescent suicidal ideation subgroups and their association with suicidal plans and attempts in young adulthood. Suicide and Life-Threatening Behavior, 38, 564–575. [PubMed: 19014308]

Schafer JL, & Graham JW (2002). Missing data: Our view of the state of the art. Psychological Methods, 7(2), 147–177. 10.1037//1082-989X.7.2.147 [PubMed: 12090408]

Schwab-Stone M, Shaffer D, Dulcan M, Jensen P, Fisher P, Bird H, …Rubio-Stipec, & Rae D (1996). Criterion validity of the NIMH Diagnostic Interview Schedule for Children Version 2.3 (DISC 2.3). Journal of the American Academy of Child & Adolescent Psychiatry, 35, 878–888. 10.1097/00004583-199607000-00013 [PubMed: 8768347]

Shain B and AAP Committee on Adolescence. (2016). Suicide and suicide attempts in adolescents. Pediatrics,138:e20161420. [PubMed: 27354459]

Sharaf T, & Tsokos CP (2014). Predicting Survival Time of Localized Melanoma Patients Using Discrete Survival Time Method. Journal of Modern Applied Statistical Methods, 13(1), 140–156. 10.22237/jmasm/1398917280

Shiner RL, & DeYoung CG (2013). The structure of temperament and personality traits: A developmental perspective. In Zelazo PD (Eds.), The Oxford Handbook of Developmental Psychology (pp. 113–141). Oxford University Press.

Singer JD & Willett JB (2003). Applied longitudinal data analysis: Modeling change and event occurrence. Oxford University Press.

Silva C, & Van Orden KA (2018). Suicide among Hispanics in the United States. Current Opinion in Psychology, 22, 44–49. [PubMed: 30122277]

Snyder HR, Gulley LD, Bijttebier P, Hartman CA, Oldehinkel AJ, Mezulis A, Young JF, & Hankin BL (2015). Adolescent emotionality and effortful control: Core latent constructs and links to

psychopathology and functioning. Journal of Personality and Social Psychology, 109(6), 1132–1149. 10.1037/pspp0000047 [PubMed: 26011660]

Sorenson SB, & Shen H (1996). Youth suicide trends in California: An examination of immigrant and ethnic group risk. Suicide and Life-Threatening Behavior, 26(2).

Spirito A, Esposito-Smythers C (2006). Attempted and completed suicide in adolescence. Annual Review of Clinical Psychology, 2, 237–266.

Tackett JL (2006). Evaluating models of the personality–psychopathology relationship in children and adolescents. Clinical Psychology Review, 26(5), 584–599. 10.1016/j.cpr.2006.04.003 [PubMed: 16820251]

Tanji F, Kakizaki M, Sugawara Y, Watanabe I, Nakaya N, Minami Y, Fukao A, & Tsuji I (2015). Personality and suicide risk: The impact of economic crisis in Japan. Psychological Medicine, 45(3), 559–573. 10.1017/S0033291714001688 [PubMed: 25036366]

Tanabe S, Terao T, Shiotsuki I, Kanehisa M, Ishii K, Shigemitsu O, Fujiki M, Hoaki N (2016). Anxious temperament as a risk factor of suicide attempt. Comprehensive Psychiatry, 68, 72–77. [PubMed: 27234186]

Taylor ZE, Widaman KF, & Robins RW (2018). Longitudinal relations of economic hardship and effortful control to active coping in Latino youth. Journal of Research on Adolescence, 28, 396–411. 10.1111/jora.12338 [PubMed: 28851024]

Thompson MP, & Swartout KM (2018). Epidemiology of suicide attempts among youth transitioning to adulthood. Journal of Youth and Adolescence, 47, 807–817. [PubMed: 28421391]

Tucker RP, O'Keefe VM, Cole AB, Rhoades-Kerswill S, Hollingsworth DW, Helle AC, DeShong HL, Mullins-Sweatt SN, & Wingate LR (2014). Mindfulness tempers the impact of personality on suicidal ideation. Personality and Individual Differences, 68, 229–233. 10.1016/j.paid.2014.05.001

Velting DM (1999). Suicidal ideation and the five-factor model of personality. Personality and Individual Differences, 27, 943–952.

Verona E, Patrick CJ, & Joiner TE (2001). Psychopathy, antisocial personality, and suicide risk. Journal of Abnormal Psychology, 110(3), 462–470. 10.1037/0021-843X.110.3.462 [PubMed: 11502089]

World Health Organization (WHO) (2014). Preventing suicide: A global imperative. Geneva, Switzerland: World Health Organization.

Xie H, McHugo G, Drake R, & Sengupta A (2002). Using discrete-time survival analysis to examine patterns of remission from substance use disorder among persons with severe mental illness. Mental Health Services Research, 10.

Yen S, Shea T, Pagano M, Sanislow CA, Grilo CM, McGlashan TH, Skodol AE, Bender DS, Zanarini MC, Gunderson JG, & Morey LC (2003). Axis I and Axis II disorders as predictors of prospective suicide attempts: Findings from the Collaborative Longitudinal Personality Disorders Study. Journal of Abnormal Psychology, 112(3), 375–381. 10.1037/0021-843X.112.3.375 [PubMed: 12943016]
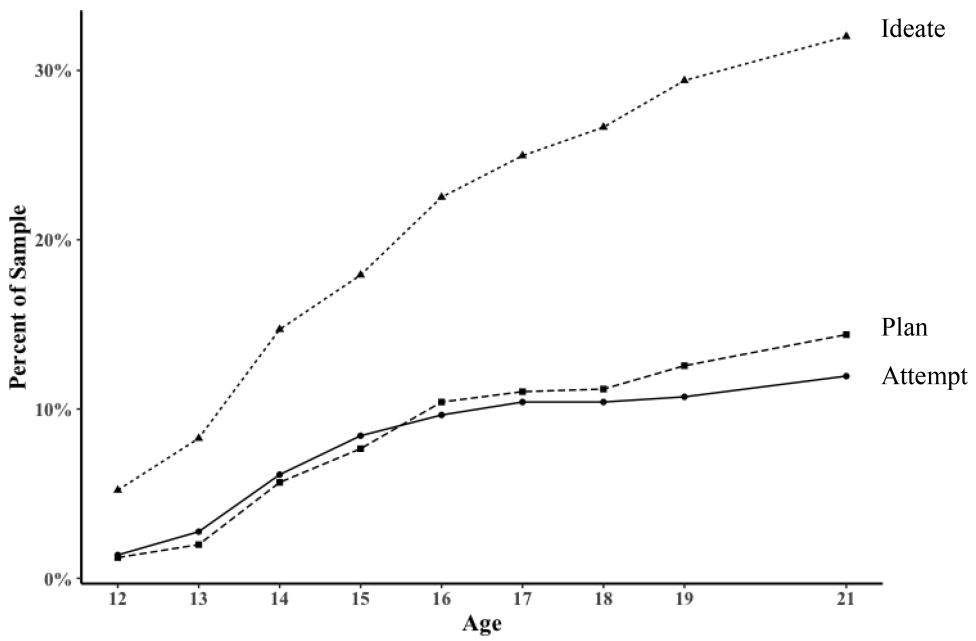
Figure 1.
Percent of sample who experienced suicide risk factors at any point from age 12 to 21, separately for ideation, plans, and attempts

Table 1

Descriptive statistics for temperament domains.

	Age 12		Age 14		Age 16	
	M (SD)	*α / ω*	*M (SD*	*α / ω*	*M (SD)*	*α / ω*
Effortful control	0 (0.92)	.82 / .84	−0.21 (0.97)	.84 / .86	−0.20 (0.88)	.82 / .84
Negative emotionality	0 (0.92)	.85 / .87	−0.30 (1.03)	.86 / .88	−0.47 (1.00)	.83 / .86
Negative emotionality (without aggression and depressed mood)	0 (0.91)	.75 / .80	−0.43 (0.91)	.71 / .77	−0.61 (0.91)	.76 / .81
Positive emotionality	0 (0.81)	.76 / .79	1.00 (0.94)	.77 / .81	1.07 (1.00)	.81 / .84

Note. M = mean, SD = standard deviation, α = alpha reliability, ω = omega reliability. Descriptive statistics for effortful control and negative emotionality reflect the results for the broader domains, whereas the statistics for positive emotionality (PE) reflect only the results from Surgency, the core of PE. Mean and SD are provided for the saved factor scores from the latent variables. Descriptive statistics for the observed variables are shown in Table S1.

Table 2

Average prevalence of suicidal ideation, plans, and attempts.

	Ideation		Plans		Attempts		N
	No	Yes	No	Yes	No	Yes	
Age 12	94.1%	5.9%	98.6%	1.4%	98.4%	1.6%	577
Age 13	93.9%	6.1%	99.0%	1.0%	97.8%	2.2%	591
Age 14	88.9%	11.1%	95.0%	5.0%	95.4%	4.6%	605
Age 15	90.7%	9.3%	96.3%	3.7%	95.4%	4.6%	590
Age 16	88.0%	12.0%	94.2%	5.8%	95.8%	4.2%	600
Age 17	89.2%	10.8%	95.5%	4.5%	96.5%	3.5%	600
Age 18	93.7%	6.3%	98.1%	1.9%	98.8%	1.2%	587
Age 19	89.0%	11.0%	96.7%	3.3%	97.7%	2.3%	584
Age 21	89.7%	10.3%	96.8%	3.2%	97.2%	2.8%	542
Overall	68.0%	32.0%	85.6%	14.4%	88.1%	11.9%	653

Note. Percentages are rounded, so they may not add up to exactly 100%. "Overall" row includes the percentages of youth who reported ideating, planning or attempting at *any point* from age 12 to 21.

Table 3

Odds ratio results from survival analyses with latent time-varying covariates

	Effortful Control		
	Ideation Odds Ratio [95% CI]	Plans Odds Ratio [95% CI]	Attempts Odds Ratio [95% CI]
Effortful control	0.55*[0.44, 0.67]	0.55*[0.40, 0.74]	0.60*[0.43, 0.83]
Activation Control	0.59*[0.46, 0.74]	0.59*[0.41, 0.85]	0.67 [0.47, 0.97]
Inhibitory Control	0.66*[0.53, 0.83]	0.65*[0.49, 0.86]	0.71 [0.52, 0.97]
Attention	0.52*[0.42, 0.64]	0.53*[0.39, 0.73]	0.60*[0.43, 0.84]
	Negative Emotionality		
	Ideation Odds Ratio [95% CI]	Plans Odds Ratio [95% CI]	Attempts Odds Ratio [95% CI]
Negative emotionality	2.10*[1.76, 2.51]	1.95*[1.55, 2.44]	1.67*[1.32, 2.12]
Negative emotionality (without Depressed Mood & Aggression)	1.61*[1.32, 1.96]	1.51 [1.14, 1.99]	1.27 [0.94, 1.72]
Fear	1.13 [0.87, 1.46]	1.10 [0.74, 1.62]	0.87 [0.57, 1.34]
Frustration	1.86*[1.57, 2.21]	1.74*[1.37, 2.20]	1.59*[1.23, 2.05]
Shyness	1.23 [0.97, 1.54]	1.14 [0.81, 1.60]	1.09 [0.76, 1.56]
Aggression	1.68*[1.42, 1.99]	1.56*[1.24, 1.95]	1.47*[1.18, 1.84]
Depressed Mood	2.85*[2.35, 3.46]	2.61*[2.17, 3.14]	2.27*[1.76, 2.93]
	Positive Emotionality		
	Ideation Odds Ratio [95% CI]	Plans Odds Ratio [95% CI]	Attempts Odds Ratio [95% CI]
Surgency	1.10 [0.88, 1.37]	1.13 [0.84, 1.53]	1.09 [0.78, 1.53]
Affiliation	1.03 [0.82, 1.30]	1.10 [0.82, 1.49]	1.03 [0.73, 1.44]

Note.

*$p < .005$.

ORs whose 95% CI's do not include 1 are significant at $p < .05$.