The Trajectory of Suicidal Behavior Over Time

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Some empirical work on genetic and prenatal factors in suicidality is presented. These factors may represent enduring predispositions that comprise risk for initial as well as later suicidal behavior. The existence of enduring predispositions does not preclude the possibility, however, that initial suicidal behavior sets processes into motion that spur later suicidal behavior. Based on past conceptual and empirical work, I suggest two psychological processes—cognitive sensitization and opponent processes—that may partly explain the link between past and future suicidal behavior.

Some contributors to eventual death by suicide may be in place at the time of conception; others may occur prenatally. Still others occur throughout childhood, adolescent, and adult development. To complicate matters further, it is possible that past suicidal behavior itself is causally linked to future suicidal behavior. It should thus be no surprise that a truly complete understanding of suicide has not yet been obtained—it is an enormous and daunting undertaking that requires expertise ranging from the molecular to the cultural levels.

The purpose of this article is to summarize some work from my research team that touches on the molecular, prenatal, and psychological levels of analysis. A potentially useful starting point for this summary is depicted in Figure 1.

The figure’s prominent central arrow contains a simple truth: Past suicidal behavior is related to future suicidal behavior. Even this simple fact has nontrivial implications; for example, it is useful prognostically (those with a past history of suicidal behavior are at elevated risk relative to those with no past history; Joiner, Walker, Rudd, & Jobes, 1999), it is useful descriptively (e.g., in articulating the chronicity, episodicity, and general course of suicidal behavior), and it is useful in research design and analysis (i.e., studies on risk factors for future suicidal behavior would do well to covary or control for past suicidal behavior, to demonstrate that any risk occurs beyond the simple effects of past suicidality).

Behind the simple truth of the figure’s central arrow, however, lies several complexities, which can be summarized by two questions: (a) Is the relation of past to future

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suicidal behavior meaningful (i.e., nonspurious), or is it fully accounted for by a set of third variables, such as the enduring predispositions depicted at the top of the figure? and (b) if the relation of past to future suicidal behavior is nonspurious, then what are the processes and mechanisms that explain why past suicidality facilitates future suicidality?

The existence and influence of enduring predispositions are indisputable, and in the next two sections, my research team’s work on two possible enduring predispositions is summarized. What is more controversial is whether past suicidal behavior has causal influence on future suicidal behavior beyond the effects of enduring predispositions. In the article’s third section, I will argue that it does.

**ALLELIC VARIATIONS ON THE SEROTONIN TRANSPORTER GENE**

Smooth serotonergic neurotransmission is important for health and functioning generally, and mental health is no exception. There is growing evidence that central serotonergic functioning differs in suicidal people as compared to other people (e.g., Mann et al., 2000). An important aspect of serotonergic functioning is serotonin transport (i.e., the neuronal reuptake of serotonin from synapses). The serotonin transporter is actively involved in regulating serotonin's neurotransmission, is the initial site of action for serotonin reuptake inhibitor medicines, and may even be involved in the early development of brain regions related to emotions and emotional processing. It is encoded by a single gene on chromosome 17q11.2, and a polymorphism in the transcriptional control region (5HTTLPR) has been described (Lesch et al., 1996). Two forms of the 5HTTLPR have been identified, a 484-base pair denoted as short (s), and a 528-base pair denoted as long (l). For any given individual, then, only three genotypes are possible: short-form homozygosity (two short alleles), long-form homozygosity (two long alleles), and heterozygosity (one short allele and one long allele).

Some work has found the two genotypes involving a short allele to be significantly more frequent in suicide victims (e.g., Bellivier et al., 2000). Mann and colleagues (2000) assessed suicide victims and found a significant association between the s/l genotype and a history of depression, but no significant association with suicide (suicide victims did have more short alleles than others, but this difference did not reach statistical significance).

We conducted a study that, despite its modest scope, produced some striking re-
results. Allelic variations in the serotonin transporter gene and family history of severe suicidality were assessed in 47 nonclinical volunteers (Joiner, Johnson, & Soderstrom, in press). Results are displayed in Figure 2. As can be seen there, family history of completed suicide and of multiple suicide attempts were more common among participants with short-form homozygocity than among others.

In subsequent analyses of these data, we addressed the specificity of this finding, by determining whether short-form homozygocity related to family history of suicidality specifically or whether it related to family history of suicidality merely because it relates to family history of mood disorder in general. Intriguingly, we found evidence that short-form homozygocity related independently both to family history of suicidality and to family history of depression. Whatever risk short-form homozygocity may confer for suicidality may be distinct from the risk it confers for depression.

It is important to keep these types of results in perspective. Even within the serotonergic system, the serotonin transporter gene is a relatively small piece of the puzzle. When the scope is widened to include all factors in suicidality, ranging from the molecular to the cultural level, it is clear that the serotonin transporter gene is a small part of an enormously complicated phenomenon.

A POSSIBLE LINK BETWEEN SEASON OF BIRTH AND SUICIDAL SYMPTOMS IN ADULTHOOD

Prenatal exposure to factors like influenza infection (which peaks in certain seasons, of course) may increase risk for adult mental disorders (e.g., Barr, Mednick, & Munk-Jorgensen, 1990). The mechanism for this link may involve disruption of processes of basic neural organization (e.g., cell birth, cell migration, axonal and dendritic outgrowth, synaptic development, and pro-

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Figure 2. Percentage of volunteers with short-form homozygocity versus others reporting family members' completed suicides and multiple suicide attempts.
grammed cell death), which are occurring simultaneously, especially during the second trimester (Nowakowski & Hayes, 1999).

To my knowledge, the link between, on the one hand, season of birth or maternal influenza and, on the other hand, outcomes related to suicidality, has received no previous attention, although other psychopathology-related outcomes have been studied, with mixed results (e.g., see Clarke et al., 1998; Susser, Lin, Brown, & Lumey, 1994).

To address this issue regarding suicidality, my colleagues and I (Joiner, Pfaff, Acres, & Johnson, 2001) studied a large group of Australian adults and capitalized on a “natural experiment” afforded by immigration—although all of the participants in our study were currently living in Australia, and most had been born in Australia (or elsewhere in the Southern hemisphere), some were born in the Northern hemisphere. We predicted that those born in the Southern hemisphere between September and November (and who thus spent their second trimester in utero during Southern hemisphere flu peak) would show the highest suicidal symptoms, as would those born in the Northern hemisphere between March and May (who spent their second trimester in utero during Northern hemisphere flu peak), even though all were currently living in Australia.

We obtained evidence that supported our predictions. As depicted in Table 1, it was the case that those who spent their second trimester in utero in the Southern hemisphere during Southern hemisphere flu peak obtained higher suicidality scores than other participants; those who spent their second trimester in utero in the Northern hemisphere during Northern hemisphere flu peak also obtained higher suicidality scores than other participants.

Here again, it is important to keep such findings in perspective. If, as our study showed, there is a link between season of birth and suicidality (more work on the question is needed), then the link represents one small piece of a hugely complex phenomenon.

BEYOND ENDURING PREDISPOSITIONS: PSYCHOLOGICAL PROCESSES LINKING PAST TO FUTURE SUICIDALITY

Genetic and prenatal factors may represent enduring predispositions that comprise risk for initial as well as later suicidal behavior. The existence of enduring predispositions does not preclude the possibility, however, that initial suicidal behavior sets processes into motion that spur later suicidal behavior.

There are at least three lines of conceptual and empirical work that suggest that previous suicidality may have a nontrivial and causal relation to later suicidality. First, from the depression literature, Post and colleagues (e.g., Post et al., 1996) argued that earlier depressive episodes change the contours of later episodes of depression, in that episodes become more autonomous, more spontaneous, and less strongly linked to stressors. Second, from a cognitive viewpoint, Beck (1996) argued that suicidal episodes may operate similarly. Briefly, Beck theorized that previous suicidal experience sensitizes suicide-related thoughts and behaviors, such that they later become more accessible and active. The more accessible and active the schemas and modes become, the more easily they are triggered, and the more severe are the subsequent suicidal episodes.

Third, also regarding suicide, we (Rudd, Joiner, & Rajab, 1996) and others have found that multiple attempters, as compared with ideators and single attempters, represent a relatively distinct group with regard to personality, symptoms, and risk. Just as Post et al. (1996) argued that multiple episodes of depression take on a distinct quality with regard to stress reactivity, we (like Beck, 1996) argued that multiple episodes of suicidality imply distinct clinical and personality profiles. Taken together, these three lines of work are consistent with the view that past suicidality has a direct effect on subsequent suicidality.
TABLE 1
Suicidal Symptoms Among Those Whose Second Prenatal Trimester Occurred in Southern Hemisphere Flu Peak Versus Not and Among Those Whose Second Prenatal Trimester Occurred in Northern Hemisphere Flu Peak Versus Not

<table>
<thead>
<tr>
<th></th>
<th>Second Trimester in S. Hemisphere Flu Peak</th>
<th>Everyone Else</th>
<th>Suicidality Score</th>
<th>F (1, 2378) = 3.81, p &lt; .05</th>
</tr>
</thead>
<tbody>
<tr>
<td>Born in the Southern Hemisphere</td>
<td></td>
<td></td>
<td>1.17</td>
<td>0.75</td>
</tr>
<tr>
<td>Born in the Northern Hemisphere</td>
<td></td>
<td></td>
<td>1.92</td>
<td>0.81</td>
</tr>
</tbody>
</table>

Note. Suicidality measure ranges from 0 to 12, with sample-wide mean of 0.79 and standard deviation of 1.64.

I would like to suggest two psychological mechanisms by which past suicidal behavior may affect future suicidal behavior. One of these mechanisms, cognitive sensitization, is borrowed from Beck (1996) and implies that previous suicidal behavior increases the activity and accessibility of suicide-related cognitive structures, which in turn increase the chances of future suicidal behavior. The second mechanism borrows from opponent process theory (Solomon, 1980), which predicts that, with repetition, the effects of a provocative stimulus diminish (the “a” process), and the opposite effect, or opponent process, becomes amplified and strengthened. As applied to suicidal behavior, the painful and fear-inducing qualities of suicidality may diminish with repetition, whereas opponent processes (e.g., calming and pain-relieving effects) may intensify. Moreover, people may engage in more and more extreme behaviors to obtain the same effects. Just as a skydiver may try higher or more interesting dives to further amplify the exhilarating opponent process, someone who self-harms may engage in increasingly dangerous behavior.

If opponent processes and cognitive sensitization are engaged by previous suicidal behavior, what hypotheses could be inferred, and do they withstand empirical scrutiny? In the sections that follow, I derive several such hypotheses and discuss evidence relevant to them.

Not All Suicidal Symptoms Are Alike

If opponent processes and cognitive sensitization are at play, the nature of suicidal symptoms should change as experience with previous suicidal behavior accrues. That is, serious suicidal symptoms (as compared with “less serious” suicidal symptoms) should become more and more prominent with repeated suicidal experience. This begs a key question: What represents “serious” vs. “less serious” suicidal symptoms?

Happily, there is a relatively clear answer to this question. Like others before us (e.g., Beck, Kovacs, & Weissman, 1979), my colleagues and I showed that the factor space containing suicidal symptoms can be adequately explained by two factors, which, though of course correlated (approximate r = .50), were discernible and which we named “resolved plans & preparations” and “suicidal
desire & ideation” (Joiner, Rudd, & Rajab, 1997).

The “resolved plans & preparation” factor was made up of the following symptoms: a sense of courage to make an attempt, a sense of competence to make an attempt, availability of means to and opportunity for attempt, specificity of plan for attempt, preparations for attempt, duration of suicidal ideation, and intensity of suicidal ideation. The “suicidal desire & ideation” factor comprised the following symptoms: reasons for living, wish to die, frequency of ideation, wish not to live, passive attempt, desire for attempt, expectancy of attempt, lack of deterrents to attempt, and talk of death/suicide.

Although the presence of symptoms corresponding to either factor is of clinical concern, the symptoms of “resolved plans & preparation” are, relatively speaking, of more concern than the symptoms of “suicidal desire & ideation.” And crucial to the prediction that serious suicidal symptoms (as compared with “less serious” suicidal symptoms) should become more and more prominent with repeated suicidal experience, “resolved plans & preparation” was more related than “suicidal desire & ideation” to status as a multiple suicide attempter (Joiner et al., 1997).

“Courage about Suicide” as an Indicator of Severe Suicidality

An opponent process view of suicidality would suggest that with repeated exposure to suicidality, one habituates—the “taboo” and prohibited quality of suicidal behavior diminishes and so may the fear and pain associated with self-harm. Put differently, courage about suicide may accrue. In our recent book (Rudd, Joiner, & Rajab, 2001), we presented anecdotal evidence very consistent with this view. Specifically, consider two vignettes. The first is from someone who attempted suicide but survived:

After she broke up with me, I started thinking about suicide. That night, I drank 3 or 4 beers and then got together all my medication, and just counted out all the pills. I wrote a note to her and my parents. I took all the pills and just lay down on the couch. I got scared and called my mom [italics added]. I don’t remember anything after that and the next morning I woke up in the ER.

Lack of courage about suicide may have saved this person’s life.

The second vignette is from the journal of someone who died by suicide. In the first entry, this person recounted, “I bought a gun the other day. Didn’t buy ammo, but not too far off. Been obsessing about my gun.” In the second entry, this individual wrote, “I fired my gun today; five rounds. It’s really loud. Been thinking and dreaming about it [suicide].” In the third entry: “I really flipped out today; threw my ammo at someone in public; I know I have to do it now; there’s no hope for me.” This person died by self-inflicted gunshot wound 4 days after this last entry.

For this individual, courage about suicide seemed to escalate over time, culminating in completed suicide. In this light, it is perhaps not surprising that “courage about suicide” was one of the strongest indicators of the more pernicious dimension of suicidality (“resolved plans & preparations”) in the Joiner et al. (1997) study.

Interestingly, in a case-controlled study comparing accidental deaths to suicides, people who died by suicide were more likely to have tattoos (Dhossche, Snell, & Larder, 2000). There are many possible reasons for an association between tattooing and completed suicide (for example, Dhossche et al. mention that both tattooing and suicide may be associated with substance abuse). It is an intriguing if speculative interpretation, however, that eventual suicide victims have obtained courage regarding suicide partly via painful and provocative experiences, such as tattooing (nonlethal self-cutting and self-poisoning are other examples; Menninger, 1936, mentioned another possible example: compulsive submission to multiple surgeries).
Courage may also accrue ideationally. The ideational aspect of the “resolved plans & preparation” factor, which involved intense, vivid, and long-lasting ideation about one’s death by suicide, may represent a form of mental practice for suicide. To the extent that one engages in rehearsal for suicide, whether actually or mentally, suicide potential is increased. The concept of mental rehearsal for suicide may be helpful in understanding those who die by suicide on their first attempt (in a sense, without behavioral practice and accrual of courage about suicide; studies have found rates of first-attempt completed suicide as high as 50%; Isometsae & Loennqvist, 1998). Mental practice may subserve suicide completion among first-time attempters.

One last reason to worry about the accrual of courage about suicide relates to cognitive sensitization; that is, as suicidal experience accumulates, suicide-related cognitions and behaviors may become more accessible and active (Beck, 1996). The more accessible and active these thoughts and behaviors become, the more easily they are triggered (e.g., even in the absence of negative events) and the more severe are the subsequent suicidal episodes. My colleagues and I have documented that, in fact, as episodes of suicidality increase, their relation to external triggers decreases and their severity increases (Joiner & Rudd, 2000; Joiner, Rudd, Rouleau, & Wagner, 2000).

“Worst Point” Suicidality

According to opponent process and cognitive sensitization viewpoints, among currently suicidal people, those who have experienced severe episodes of suicidality in the past (particularly if the episode involved loss of fear and other “resolved plans & preparation” phenomena) may be most at risk to eventually die by suicide. My colleagues and I obtained results supportive of this possibility (Joiner et al., 2001).

Among several hundred current suicide ideators consecutively evaluated at the Center for Cognitive Therapy at the University of Pennsylvania between 1975 and 1995, we assessed both “worst point” and current suicidal symptoms. The worst point assessment strategy involves a retrospective report of suicidal symptoms at their most severe point. The retrospective worst point report includes the two dimensions of suicidality mentioned earlier—“resolved plans & preparations” (which includes “courage about suicide) and “desire for death” (the less serious dimension).

Deaths in the sample were ascertained by use of the National Death Index (NDI), a centralized computer database of death record information compiled from data submitted annually by individual states. Participants’ identifying information is checked against corresponding information in the database. When a match was made, a copy of the death certificate was obtained from the particular state in order to determine the cause of death. Of the 440 patients in the study, 8 had “suicide” listed as the cause of death on their death certificates.

In separate regression equations predicting death by suicide and past suicide attempt, we used four predictors: “worst point resolved plans & preparations,” “worst point suicidal desire,” “current resolved plans & preparations,” and “current suicidal desire.” Consistent with prediction, the “worst-point resolved plans & preparations” comprised the strongest predictor of past suicide attempt and the only significant predictor of the four suicidality dimensions of eventual death by suicide (conditional OR = 1.40; 95% CI = 1.05–1.86; likelihood of eventual suicide rose 40% for every point that “worst-point resolved plans & preparations” score increased).

CONCLUSION

The general perspective articulated here assigns importance to the effect of past suicidal experience on future suicidality and does not view the relation of past to future suicidality as spurious (e.g., accounted for enduring predispositions to suicidal behavior,
such as genetic and prenatal factors, though they appear important in their own right. However, Clark, Gibbons, Fawcett, and Scheftner (1989) evaluated two models of the relation of previous to subsequent suicide attempt among mood disordered patients. One model (the “trait” or “heterogeneity” model) viewed likelihood of suicide attempt as predetermined by enduring dispositions and as uninfluenced by intervening occurrences of suicidal behavior, whereas the other model (“crescendo” or “state dependence” model) assumed that each occurrence of suicidal behavior increases the subsequent likelihood of suicidal behavior. Data were more consistent with the trait model, supporting the influence of enduring predispositions on suicidal behavior.

**REFERENCES**


Significantly, the framework articulated in the present paper was not fully captured by either the crescendo or trait models tested by Clark et al. (1989). My view would be captured by an amended crescendo model, in which occurrences of suicidal behavior increase the likelihood of subsequent suicidal behavior only if the original behavior contains elements of the “worst-point resolved plans & preparations” factor and approaches or exceeds previous worst-point suicidality. When this happens, cognitive sensitization and opponent processes may be engaged. By contrast, relatively mild suicidality may not increase the subsequent likelihood of severe or escalated suicidality (incidentally, this may explain the empirical fact that women are more likely than men to experience mild suicidality, but less likely than men to escalate to completed suicide).


Joiner, T. E., Jr., Rudd, M. D., Rouleau, M., & Wagner, K. D. (2000). Parameters of suicidal crises vary as a function of previous sui-


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