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# The Emerging Science of Suicide Prevention

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T he decisions leading up to a person's death by suicide are made under conditions unlike almost any other. Although we may spend weeks or even months considering whether to purchase a home, change jobs, or get married, the decision to attempt suicide is often made in the spur of the moment amid a crush of emotions, according to Brian W. Bauer and Daniel W. Capron (University of Southern Mississippi). A person may live with suicidal thoughts for years, yet anywhere from 25% to 40% of suicide attempts may take place less than 5 minutes after the individual decides to take their life, Bauer and Capron wrote in a 2020 *Perspectives on Psychological Science* article.

These circumstances make people experiencing suicidal ideation uniquely vulnerable to common cognitive biases that can result in irrational decision-making, causing them to act against their own self-interest. We are particularly bad at predicting how our emotional state may change in the future and tend to value short-term relief over long-term outcomes, Bauer and Capron noted. Both of these tendencies can contribute to the decision to end severe psychological pain through suicide despite the strong possibility that those feelings will change given time.

Nudges could offer some hope to people in crisis. Based in behavioral economics, these microinterventions are designed to push people toward making choices that align with their own self-interest, such as conserving energy or getting vaccinated, by providing easily digestible information about the benefits of those choices (e.g., stickers on washing machines reading "Fuller laundry loads save water") or even removing barriers to making those choices (e.g., offering walk-in vaccinations instead of requiring appointments).

Nudges have been used in mental health contexts to help people cut back on their drinking and enroll in treatment programs. In the case of suicide prevention, pre-crisis interventions can occur at several levels, Bauer said in an interview with the *Observer.*

Public safety campaigns, for example, might advise gun owners to store their firearms and ammunition separately, creating a barrier to impulsive self-harm, and encourage them to save the number for a local crisis hotline in their phone. In clinical care settings, reframing education on coping skills as a way to assist peers, rather than oneself, may increase patients' willingness to complete safety plans and participate in suicide prevention workshops. And for individual patients, smartphones may offer an avenue for effective "just-in-time" interventions.

Unfortunately, no nudge is a one-size-fits-all solution, Bauer said.

"One thing that is important for this area of research is to keep in mind that people have different needs," he noted. "For some, what would be most helpful are reminders about skills to use during a crisis, whereas others may benefit more from caring messages from family members, and yet for others each of these may increase emotional distress. This is because nudges likely work differently from person to person, so figuring out what nudges will work best for each person will be critical for optimizing just-in-time nudges."

The potential for each of these nudges to save lives may seem small, but it is important to remember that most survivors, according to self-reports, regret attempting suicide almost immediately, Bauer and Capron stressed in *Perspectives.*

"If people can make it to the other side of suicidal crises, they are likely to escape the fog of cognitive biases and go on living."

Numerous studies, the researchers added, have found that 75% of people who survive a suicide attempt don't make another attempt in their lifetime, and 90% of survivors do not go on to die by suicide.

This suggests that if people can make it to the other side of suicidal crises, they are likely to escape the fog of cognitive biases and go on living. To that end, psychological scientists are uncovering new methods for identifying people in need of a helping hand.

## Networking interpersonal needs

There is a serious need to apply more complex methods to suicide prevention, according to Sarah L. Brown (Texas Tech University) and colleagues, writing in *Clinical Psychological Science* in 2021.

The World Health Organization (WHO) estimates that more than 700,000 people globally died by suicide in 2019, making it a more common cause of death than malaria, HIV/AIDS, or breast cancer.

Stifling socioeconomic conditions and experiences of violence and discrimination, particularly among people who are LGBTQ or of indigenous descent, can significantly increase suicide risk, the WHO noted. Among the most affected countries are Kiribati, Micronesia, and South Korea, with people in lower-income countries experiencing the highest rates of suicide.

The loss of loved ones and livelihoods throughout the COVID-19 pandemic has also carried with it a heavy emotional toll for many people throughout the world. Through a study of 21 countries in *The Lancet Psychiatry*, Jane Pirkis (University of Melbourne) and colleagues found that, despite increases in depression, anxiety, and other mental health conditions, the number of deaths by suicide remained in line with, or even fell below, pre-pandemic projections during April to July of 2020. This could be due in part to steps many governments took to increase access to mental health services and financial support at the beginning of the pandemic, Pirkis and colleagues wrote. Some individuals might also have benefitted from spending more time at home with loved ones or the sense of social connection derived from the idea that "we're all in this together."

It's important to remain vigilant for the potential long-term effects of COVID-19-related distress on suicide risk, however, which may be more fully felt as governments begin to withdraw pandemic support services, Pirkis and colleagues added.

Given these and other complex and conflicting factors, it can be difficult to know who may be in need of suicide risk intervention.

"Many known suicide risk factors, which have been frequently tested in isolation or within relatively simple models, fail to predict suicide ideation and suicidal behaviors better than chance," Brown and

colleagues wrote.

Network analysis could help untangle the web of relationships between these factors, Brown and colleagues continued, allowing researchers and clinicians to better understand the constellation of symptoms and experiences associated with suicide, and therefore to design more effective screening and interventions.

Toward this end, Brown and colleagues analyzed three preexisting data sets from a total of 402 adult psychiatric patients in the United States, where the number of known deaths by suicide was 45,855 in 2020, down slightly from 47,511 in 2019, according to the Centers for Disease Control and Prevention. As part of each study, participants completed both the 15-item Interpersonal Needs Questionnaire (INQ) and the 21-item Beck Scale for Suicide Ideation, developed by APS James McKeen Cattell Fellow Aaron Beck, who died in 2021.

The INQ measures two factors considered central to the interpersonal theory of suicide: thwarted belonging, which includes feelings of isolation from other people, and perceived burdensomeness, which can contribute to the false belief that other people would be better off without the individual in their lives. Suicidal ideation and behavior can occur when these perceptions are paired with a sense of hopelessness about the future, Brown and colleagues explained.

In line with this theory, Brown and colleagues' item-level analysis found that scores on two INQ items uniquely predicted suicidal ideation and behavior: low scores on "I feel like I belong" and high scores on "I think I am a burden on society."

## The Burden of Inflexible Interpretations

Another cognitive bias that may contribute significantly to experiences of suicidal ideation is interpretation inflexibility, wrote Jonas Everaert (Ghent University) and colleagues in a 2021 article in *Clinical Psychological Science*.

"Beliefs highlighted in prominent theories of suicide might be distorted by biases in information processing, such as the bias against revising interpretations in response to evidence
against them," Everaert and colleagues explained.

This suggests that limiting the number of items used in suicide risk assessments could help improve their reliability while streamlining the clinical process, the researchers wrote. Including items that are not uniquely predictive of suicidal ideation and behavior can dilute results, obscuring individuals' actual risk for suicide. For example, scores on "I think the people in my life wish they could be rid of me," were not consistently associated with suicidal ideation or behavior. Keeping such items in an assessment could cause someone at risk for suicide to be incorrectly assessed as being at low risk despite their responses to more predictive items.

"Our results would suggest that directly assessing whether people feel like a burden on society or feel as if they belong may provide the

According to the interpersonal theory of suicide, suicidal ideation is driven primarily by perceptions of thwarted belongingness and burdensomeness. More often than not, the researchers wrote, these perceptions have been found to be inaccurate.

Everaert's study of 207 participants suggests that individuals with suicidal ideation can be more susceptible to these misperceptions because of a cognitive bias against updating interpretations of social situations. That bias may lead individuals to resist revising negative self-perceptions, even if contradictory information becomes available.

As part of the study, participants responded to a series of initially ambiguous social scenarios, known as Bias Against Disconfirmatory Evidence tasks, during which they were presented with two increasingly positive additional details and asked to report how their perception of the situation may have changed.

In a birthday scenario, for example, participants were told that they had received just a few Facebook messages wishing them a happy birthday, at which point they were asked to rate the plausibility of several statements: (1) Most of their friends didn't care that it was their birthday, (2) most of their friends had forgotten it was their birthday, and (3) their friends were planning a surprise birthday message.

Participants then received the additional information that they had one unopened voicemail and, finally, that the voicemail was

most insight into risk for both passive and active suicide ideation," Brown and colleagues concluded.

## Measuring the unspoken

Accurately assessing patients' suicidal thoughts can be challenging given people's tendency to conceal or deny these feelings, even in clinical settings, wrote Nina Tello (Université de Poitiers) and colleagues in *Psychological Science*. Fortunately, their research, published in 2020, suggests that the Suicide–Implicit Association Test (S–IAT) can be used to accurately predict patients' risk of attempting suicide.

In a direct replication of previous research by Matthew K. Nock (Harvard University) and colleagues, which followed 157 patients in the United States, Tello administered the S–IAT to 165 French patients who had been hospitalized for mental health treatment. Similar to the original Implicit Association Test, which was designed to detect social bias, the S–IAT presents participants with a series of simple stimuli in order to determine whether they associate thoughts of themselves with thoughts of death.

This involves using a keyboard to sort terms into a series of categories as quickly as possible —in this case "me," "not me," "life," and "death." A participant might be asked to sort the term "alive," for example, into the "me" or "not me" category or to sort "me" into the "lifeless" or "survive" category. An individual who associates terms related to death, as opposed to life, with the self more quickly would receive a higher score, indicating a strong implicit association between themself and death.

of all their friends singing happy birthday. At each of these points, participants were asked to reevaluate their perception of the above possibilities.

Individuals who maintained a more negative perception of social scenarios in the face of increasingly positive additional information were more likely to report perceiving themselves as a burden to others, which was in turn related to increased suicidal ideation.

> **"Limiting the number of items used in suicide risk assessments could help improve their reliability while streamlining the clinical process."**

Even when negative perceptions are initially plausible, Everaert and colleagues wrote, interpretation inflexibility may prolong the impact of adverse experiences such as discrimination, financial hardship, and trauma by preventing people from updating their self-perceptions as conditions improve. Incorporating existing practices for cognitive-bias modification into clinical treatment for suicidal ideation could help address inflexible perceptions, the researchers added.

## Managing Assessment in Foster Care

Unlike the authors of the original study, Tello and colleagues found that the S–IAT could not distinguish between patients who had just been admitted to the hospital for a suicide attempt versus those who had been admitted for other reasons. When the researchers reached out to participants 6 months later, however, their S–IAT scores were found to predict post-study suicide attempts with 85% accuracy.

"The S–IAT prospectively predicts one of the most important decisions an individual can make, the decision to take one's life, as attested by official medical records," Tello and colleagues wrote. "A straightforward implication for suicide prevention is that implicit identification with death or suicide should be assessed early, and patients with an implicit bias toward suicide should be given special attention and care."

## Computing states of mind

Computational linguistics offers another avenue for analyzing the risk factors that may contribute to suicide attempts, wrote Yaakov Ophir (Technion-Israel Institute of Technology) and colleagues in a 2021 *Clinical Psychological Science* article.

"To overcome these inherent obstacles in suicide prevention and break through the prediction ceiling in the current state of the literature, more and more scholars are recommending to integrate research methodologies from the field of machine learning," Ophir and colleagues wrote.

More traditional studies restrict researchers to examining just a few predefined variables, the researchers explained. Computational linguistics, on the other hand, allows

Youth in foster care are among the populations most at risk of suicide, said Lily A. Brown (University of Pennsylvania) in an interview with the *Observer*. Ideally, every child in foster care would be able to receive therapy from a clinician trained in assessing suicide risk, but this isn't the case in most parts of the United States.

"One thing that we commonly hear from stakeholders is that the system is enormously stressed in terms of the amount of amazing things that foster care organizations are able to accomplish on a limited budget," Brown said. "We often hear people saying that 'there are not enough resources to prioritize this; we need to focus on making sure these kids have a safe place to stay tonight and food in their bellies today.'"

Training case managers, who oversee children in foster care, to conduct suicide risk assessments could help meet this need in a relatively low-cost manner, Brown suggested in a 2020 *Perspectives on Psychological Science* article.

Funding is only one part of the equation, however: Even in highly resourced settings, staff may avoid asking about suicide simply because they don't know how. Preparing case managers to ask these questions, and to know how to respond if a child indicates they are experiencing suicidal thoughts, could be a crucial step in the right direction, Brown said.

psychological scientists to identify patterns in large data sets, including text, images, and even emojis. Deep neural networks that specialize in language encoding can also identify relationships between text order and proximity at the level of words, sentences, and paragraphs, providing researchers with a unique window into participants' state of mind.

A version of these methods has been available since as early as the 1950s, but it's not until recently that both sufficient computer processing power and large enough data sets have become common enough to apply computational linguistics to a problem as complex as suicide. In the past, Ophir and colleagues noted, written communication was comparatively formal, even in letters between friends, but social media platforms like Facebook and Twitter offer a more casual, if still curated, window into people's day-to-day lives.

This could allow computational linguistics programs not only to flag discussions explicitly related to suicide, Ophir and colleagues wrote, but to identify language patterns used by at-risk individuals who may not be comfortable discussing their mental health openly, or may even deny experiencing suicidal thoughts when asked.

"Not only can [computational linguistics] tools improve the accuracy of suicide prediction models and increase the accessibility to individuals at risk who lack psychosocial support, but they can also contribute to efforts to monitor the risk in real time," Ophir and colleagues explained. "Future application of such tools among large populations may therefore expand early suicide-detection efforts in the community, encourage at-risk individuals to seek help, and hopefully contribute to a significant reduction in suicide rates around the world."

Applying this technology to such a sensitive topic requires researchers to strike the right ethical balance between privacy, autonomy, security, and well-being, Ophir and colleagues acknowledged.

Although social media posts are public, that doesn't necessarily mean that individuals would consent to having them used in research, or even for platform-wide suicide-risk monitoring, which Facebook began doing several years ago. Additionally, computational linguistics research often requires offline validation, such as medical records, to meaningfully investigate how online content relates to individuals' experiences of suicidal ideation and behavior.

Instead, the researchers suggested, practitioners in clinical settings could ask patients to share existing diary entries, social media posts, and other personal texts for computational linguistics assessment as part of their treatment, the researchers suggested.

Securing this data for research purposes could require new guidelines around data sharing, such as storing anonymized data in online portals where it can't be exported, Ophir and colleagues continued. No system is perfect, though, and there is always the risk of information being leaked for nonscientific purposes.

Using computational linguistics programs to monitor suicide risk in more public settings such as social media also raises the question of what to do if a person is identified as being at high risk for suicide. Individuals could be directed to local suicide prevention resources or online intervention platforms, but, in theory, a program could go as far as automatically contacting local social services for a wellness check, a level of surveillance that may make some people uncomfortable, no matter how well intended.

Ophir and colleagues argue that real-world applications of computational linguistics should be subject to the same ethical norms that limit data collection in research settings. This means that programs should be transparent about what information they are collecting, require written consent to begin data collection, and allow individuals to opt out at any time.

"Developers and clinicians should prioritize lifesaving while trying their best to minimize the violation of users' privacy and/or autonomy," the researchers wrote. "We have a unique responsibility to convey a message of hope to our patients/research participants, insist that other and better solutions exist to any life crisis, and encourage them to seek further professional help."

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