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Leiden
The Netherlands

Dynamics of despair: examining suicidal ideation using real-time methodologies

Kivelä, L.M.M.

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Summary

Title: Dynamics of Despair – Examining Suicidal Ideation Using Real-Time Methodologies

This dissertation examines the temporal dynamics of suicidal ideation in daily life using real-time assessment methods, including actigraphy and ecological momentary assessment (EMA). Suicidal ideation can be highly variable, and increased insight into these fluctuations can aid us in understanding how an individual may transition into moments of heightened suicidal ideation in real-time. Further, it has been proposed that variability in itself may serve as a phenotypic marker for increased suicide risk. Hence, obtaining a better understanding of the correlates and predictors of this variability is important for improved risk detection.

Suicidal ideation is both a prevalent and a potentially persistent disturbance: up to 20% of the general population will experience suicidal thoughts at some point over their lifespan, and for approximately 30% of these individuals, suicidal ideation becomes a persistent experience for years and even decades. However, the severity of ideation can exhibit substantial variability over time; individuals can experience lengthy periods characterized by the absence of symptoms, but may also exhibit substantial increases and decreases in ideation levels merely within the span of hours and days.

Prediction of suicide risk is hindered not only by the variable nature of suicidal ideation, but also the heterogeneity of risk factors. Multiple interacting risk and protective factors are involved in the emergence and maintenance of suicidal ideation over time, with each individual risk factors explaining only a very small portion of suicide risk. Further, most of our current understanding of these risk factors is centered around chronic, long-term determinants (such as sociodemographic characteristics). Instead, we largely lack understanding of *warning signs of suicide*, referring to factors that indicate increase suicide risk in the short-term.

Newly developed real-time assessment methods may help increase our understanding of the phenomenology of suicidal ideation. Such methods include *Ecological Momentary Assessment (EMA)*, referring to short, repeated self-report assessments completed within individuals daily lives, utilizing mobile technologies, such as smartphones. EMA therefore enables researches to study individuals' symptoms in the natural environment, examining their contributing factors in real-time. Additional ambulatory assessments, such as those examining sleep and activity patterns using *actigraphy*, can help supplement these self-reports with objective data.

This dissertation reports on the longitudinal SAFE study (Suicidal ideation Assessment: Fluctuation monitoring with Ecological momentary assessment), which employed EMA and actigraphy to examine suicidal ideation in daily life. The study

included 82 individuals currently experiencing suicidal ideation. The study aimed to 1) describe how suicidal ideation fluctuates in real-time (within and between days), and which risk and protective factors are associated with these fluctuations, and 2) how these dynamics relate to suicide risk in the long-term (up to 1-year).

In **Chapter 1** of this dissertation, we give an introduction to the topic of suicidal ideation, review prominent theoretical models around it, and discuss our current understanding of the temporal dynamics of suicidal ideation; this includes both the long-term course of, as well as the short-term variability in, suicidal ideation. Further, we describe the relevant data collection methods (EMA and actigraphy) as well as introduce the SAFE study.

In **Chapter 2**, we present a systematic review of prior literature using the EMA method in suicide research to study the dynamics and predictors of real-time-suicidal ideation. The use of EMA for this purpose has seen an enormous increase in the past decade, and has already provided robust support for the notion that suicidal ideation may fluctuate greatly both between and within days, increasing and decreasing sharply merely within the span of hours. This finding highlights the need to better understand which risk factors may contribute to these fluctuations. However, while prior research has already identified a number of *correlates* of said fluctuations (that is, factors that increase and decrease in tandem with suicidal ideation, such as hopelessness and negative affect), research so far has been more limited in identifying corresponding *short-term predictors*. More research is therefore needed on this front. Further, research indicates that variability in suicidal ideation may be trait-like, and be associated with heightened suicide risk. However, prior research on this topic has been predominantly reliant on retrospective self-report, and prospective confirmatory studies are needed. Finally, while prior research supports the feasibility of using EMA among individuals with suicidal ideation, reporting on safety procedures and adverse events is inconsistent. Due to the focus on high-risk populations, these considerations also warrant further attention.

In **Chapter 3**, we report on the feasibility, acceptability and safety of EMA based on data from the SAFE study. Interpreting response and completion rates, we conclude that EMA appears highly feasible and well-tolerated among participants, including those experiencing high levels of suicidal ideation and/or other symptomatology (depression, anxiety). Our findings also generally supported the safety of EMA, as we did not observe systematic increases in real-time suicidal ideation over the study period. However, a minority of participants retrospectively reported (at the end of the study) that the EMA had sometimes triggered or worsened their ideation. As these reports are in opposition to the (lack of) pattern observed in the data, these effects do not appear to have impacted

the participants to a substantial degree. Regardless, we urge researchers to transparently inform participants in similar studies about the potential to such effects.

In **Chapter 4**, we employ statistical network modeling to examine the interconnectedness of suicidal ideation (passive ideation and active ideation, and *acquired capability* i.e., preparedness for suicidal acts) and its cognitive-affective predictors (positive and negative affect, anxiety, hopelessness, loneliness, burdensomeness, optimism) in real-time. We identified differential associations with different facets of suicidal ideation, with constructs central to the Interpersonal Psychological Theory of Suicide (IPTs), including hopelessness, loneliness, and burdensomeness, being uniquely associated with passive suicidal ideation. Further, we found shame to be uniquely associated with active suicidal ideation and acquired capability. These findings indicate that shame may represent an especially important target for suicide prevention, as it appears to specifically associate with the active desire to die, and preparedness for such suicidal acts.

In **Chapter 5**, we use both EMA and actigraphy to examine sleep characteristics, hopelessness, and their associations with next-day suicidal ideation. We found support for the notion that sleep disturbances, and specifically interrupted sleep during the night (including increased night-time awakenings), can have immediate, night-to-day effects on suicidal ideation. That is, ideation was heightened following nights with disturbed sleep. Importantly, we replicated these findings using both subjective and objective measures of sleep. We further observed that such interrupted sleep increased feelings of hopelessness the following morning, and that these hopeless thoughts were a significant explanatory factor in the association between sleep and suicidal ideation. While hopelessness is a well-established risk factor for suicidal ideation, within this specific context, it remains to be established whether such hopelessness is specific to despair about the effects of lack of sleep, or due to broader cognitive-affective disturbances resulting from sleep loss.

In **Chapter 6**, we used latent profile modeling to identify subtypes of suicidal ideation based on EMA data, and their associations with the prospective risk of suicide attempts over 1-year. We identified four subtypes of suicidal ideation, namely 1) high frequency, high intensity, moderate variability ideation (Phenotype 1), moderate/high frequency, moderate intensity, high variability ideation (Phenotype 2), and moderate frequency, low intensity, low variability ideation (Phenotype 3). Further, we found Phenotypes 1 and 2 to have increased odds of making a suicide attempt over the 1-year follow-up, with Phenotype 1 specifically being characterized by repeat suicidal behavior (i.e., multiple suicide attempts). Therefore, our findings did not produce straightforward support for the notion that suicidal ideation variability *per se* is associated with

heightened risk, but that such variability needs to be considered in the context of other suicidal ideation characteristics, such as frequency and (average) intensity. However, these preliminary findings need replication, due to a low sample size in our follow-up cohort.

In **Chapter 7**, we summarize and conclude on our findings from the previous chapters, and discuss the strengths and limitations of the SAFE study. We further integrate the study findings into the greater theoretical framework of suicidal ideation, and outline our suggestions for future research. Importantly, we support the value of EMA and other real-time data collection methods in suicide research, but urge researchers to consider newer statistical modeling techniques in analyzing their data, as the structure of EMA data sets additional demands on analysis methods. Further, we discuss the importance of improving our understanding of the temporal dynamics of not only suicidal ideation itself, but also its predictors, as such knowledge has important implications for study designs. Finally, we discuss the prospects of using real-time symptom measures in clinical practice; considering this implementation needs nuance, also in line with our findings that some individuals may perceive such increased attention to their symptoms as potentially triggering.

