Using Passive Data Monitoring and Machine LearningAlgorithms to Examine Negative Affect and Coping Behaviors Among College Students Experiencing Suicidal Ideation

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Suicide is the second leading cause of death in the United States among youth ages 12-19 (Murphy, Xu, Kochanek, & Arias, 2018). Despite the high prevalence, relatively little is known about the short-term predictors of suicidal crises (Davidson, Anestis, & Gutierrez, 2017). The few studies that have looked at short-term risk factors have found negative affect to be associated with suicidal thoughts and behaviors (Kleiman & Nock, 2018). One prominent limitation of these small studies has been the reliance on self-report methods for data collection. The present study looks at both active self-report and passive phone data to examine associations of negative affect and coping behaviors among a relatively large sample of college students who experience varying dimensions of suicidal ideation (SI).

Data is drawn from a 10-week long longitudinal study using both active self-report measures as well as passive data monitoring applications. Participants (n=209) were college students (mean age =18.37; 62% female) who answered a battery of baseline measures as well as daily, weekly, and biweekly EMA measures. A mobile phone application was installed on participants' phones that recorded global position system, bluetooth, incoming and outgoing communications, and accelerometer features. We used negative affect and coping items from EMA self-reports and examined differences between participants who experienced SI against students whom did not report SI at the beginning of the study. We then used passive phone data to see if we could use this data to detect changes in negative affect and coping patterns among individuals with varying trajectories of SI.

45 out of the 209 (21.5%) participants reported SI at baseline. Of these 45, 22 (48.9%) participants remitted from SI between the pre-quarter and the mid-quarter assessment points, while 20 (44.4%) participants maintained SI between these two time points. 10 participants developed SI over the course of the 5 week follow up. At the end of the 10-week quarter, 15 students continued to experience SI, 13 students remitted from SI between mid-quarter and post-quarter assessment periods, and 13 students had developed SI from mid-quarter to post-quarter assessment. Based on cross-sectional analyses, reappraisal emotion regulation strategies and loneliness were significantly associated with SI. We then used a machine learning algorithm to predict varying categories of SI status (remitted at midpoint of study, chronic SI, SI onset etc.).

This study uses cross-sectional and intensive longitudinal data to examine varying dimensions of SI. We also use passive data collection procedures to determine features collected via smart phones that predict different dimensions of SI. These features may be one way to detect individuals who are experiencing suicidal ideation without relying on self-report and could help inform intervention efforts; however, the study relied exclusively on a single-item of SI assessed at 3 different time points. Future studies should incorporate more frequent assessment of SI and include different dimensions of suicidality (e.g., planning, intent, etc.)