

ORIGINAL ARTICLE

Life events: a complex role in the timing of suicidal behavior among depressed patients

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Suicidal behavior is often conceptualized as a response to overwhelming stress. Our model posits that given a propensity for acting on suicidal urges, stressors such as life events or major depressive episodes (MDEs) determine the timing of suicidal acts. Depressed patients ($n = 415$) were assessed prospectively for suicide attempts and suicide, life events and MDE over 2 years. Longitudinal data were divided into 1-month intervals characterized by MDE (yes/no), suicidal behavior (yes/no) and life event scores. Marginal logistic regression models were fit, with suicidal behavior as the response variable and MDE and life event score in either the same or previous month, respectively, as time-varying covariates. Among 7843 person-months, 33% had MDE and 73% had life events. MDE increased the risk for suicidal behavior (odds ratio (OR) = 4.83, $P \leq 0.0001$). Life event scores were unrelated to the timing of suicidal behavior (OR = 1.06 per 100 point increase, $P = 0.32$), even during a MDE (OR = 1.12, $P = 0.15$). However, among those without borderline personality disorder (BPD), both health- and work-related life events were key precipitants, as was recurrent MDE, with a 13-fold effect. The relationship of life events to suicidal behavior among those with BPD was more complex. Recurrent MDE was a robust precipitant for suicidal behavior, regardless of BPD comorbidity. The specific nature of life events is key to understanding the timing of suicidal behavior. Given unanticipated results regarding the role of BPD and study limitations, these findings require replication. Of note, that MDE, a treatable risk factor, strongly predicts suicidal behaviors is cause for hope.

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INTRODUCTION

Suicidal behavior has been conceptualized as a response to stress, often of catastrophic proportions; however, methodological drawbacks hamper most studies addressing this hypothesis. Retrospective studies to identify predictors are subject to bias from several sources, with recall bias being particularly problematic, as suicide attempters or relatives interviewed in psychological autopsy studies after a suicide may preferentially recall 'precipitating' life events in an effort to reduce cognitive dissonance. Prospective studies are best suited to studying the relationship between life events and suicidal behavior.¹ Nonetheless, we could find only nine prospective studies in English, resulting in 12 publications addressing life events and suicidal behavior, not all focused on adults.^{2–13} Five^{2,3,8,9,11} of 12 studies^{4–7,10,12,13} reported no association, some based on the same sample.^{3,4,12} Limitations include the lack of contemporaneous assessments of life events and suicidal behavior,^{2,6–8,10,11} and life events measures that are not comprehensive.^{7,8,11} One prospective study examined life events' effect on suicidal behavior in major depression—the condition most commonly associated with it.²

In the stress diathesis model of suicidal behavior, suicidal behavior occurs when an individual with the diathesis is exposed to stress, which determines the behavior's timing.¹⁴ The diathesis includes 'pessimism' and aggression/hostility, which increase suicidal behavior risk among depressed individuals followed for 2 years.¹⁴ Stress can take the form of life events or illness exacerbation such as recurrence of major depressive episode (MDE), which increase risk for suicidal behavior.^{2,15–18} To test this stress diathesis model, we hypothesized that, in major mood disorders,

the probability and timing of suicidal behavior would be related to the presence of MDE, life events or both during a 2-year period, independently from diathesis predictors: aggression/hostility factors and cognitive factors such as pessimism, female sex and younger age.¹⁴ Given the close relationship of borderline personality disorder (BPD) to suicidal behavior that we^{19,20} and others^{21,22} have shown, *post-hoc* analyses examined the hypothesis separately in depressed patients with and without comorbid BPD.

MATERIALS AND METHODS

Subjects

Depressed patients ($n = 415$, Table 1 contains descriptive characteristics) recruited in New York and Pittsburgh provided written informed consent approved by the Institutional Review Board. About 57% of patients screened in person participated. Retention at 1 year was 84%. Patients had physical examinations and routine blood tests, including urine toxicology. Exclusion criteria were current substance or alcohol abuse or dependence and active medical conditions.

Baseline assessments

Raters were at least Master's level psychologists or psychiatric nurses. Axis I and II disorders were assessed using Structured Clinical Interviews for DSM-IV,²³ International Personality Disorder Examinations²⁴ and Structured Clinical Interviews for DSM-IV Axis II Disorders.²⁵ Other assessments included the following: Hamilton Depression Rating Scale,²⁶ Beck Depression Inventory,²⁷ Beck Hopelessness Scale,²⁸ Brown–Goodwin Lifetime Aggression History,²⁹ Buss–Durkee Hostility Index,³⁰ Barratt Impulsivity Scale,³¹ Reasons For Living Inventory³² and Scale for Suicidal

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Table 1. Baseline descriptive statistics ($n = 415$)

| Variables | n | Percent |
|---|---------|------------------|
| % Female | 240/415 | 57.8% |
| Childhood abuse (%) | 177/384 | 46.1% |
| Currently employed (%) | 148/415 | 35.7% |
| Childhood separation under 15 (%) | 145/411 | 35.3% |
| Comorbid past substance abuse (%) | 171/415 | 41.2% |
| Cigarette smoking (%) | 141/413 | 34.1% |
| Borderline personality disorder | 113/414 | 27.3% |
| MDD versus bipolar disorder | 294/415 | 70.8% |
| | | Mean \pm s.d. |
| Age (year) | 415 | 38.1 \pm 11.8 |
| Number of MDE | 395 | 12.0 \pm 24.6 |
| Hamilton Depression Rating Scale | 414 | 19.7 \pm 5.7 |
| St Paul Ramsey Questionnaire | 405 | 1.9 \pm 0.76 |
| <i>Aggression/impulsivity</i> | | |
| Brown–Goodwin History of Aggression | 404 | 18.8 \pm 5.6 |
| Buss–Durkee Hostility Inventory | 367 | 36.0 \pm 11.9 |
| Barratt Impulsivity Scale | 357 | 52.8 \pm 16.5 |
| <i>Depressive and suicidal cognitions</i> | | |
| Beck Depression Inventory | 413 | 27.1 \pm 11.2 |
| Hopelessness Scale | 410 | 12.0 \pm 5.8 |
| Scale for Suicidal Ideation | 379 | 12.2 \pm 10.4 |
| Reasons for Living Scale | 372 | 155.0 \pm 45.3 |

Ideation.³³ Childhood physical or sexual abuse were rated as present or absent. Life events were recorded using the Recent Life Changes Questionnaire (RLCQ)^{34,35} and the St Paul Ramsey Questionnaire,³⁶ which cover the previous 24 and 6 months, respectively.

Suicidal behavior, including suicide and suicide attempt, was defined as a self-destructive act with some intent to end one's life^{37,38} and recorded on the Columbia Suicide History Form (inter-rater reliability coefficient: 0.97).³⁹ This form uses the Columbia-Classification Algorithm for Suicide Attempts,⁴⁰ based on O'Carroll et al.³⁷ and endorsed by the Institute of Medicine.³⁸ The same definition is used in the Columbia-Suicide Severity Rating Scale,⁴¹ with excellent validity compared with expert evaluation board determinations (>95% sensitivity and specificity).⁴¹

Prospective assessments

Patients received open treatment and assessments at 3, 12 and 24 months. Interviews documented suicidal behavior, presence of MDE in monthly blocks using a SCID I-based check list and life events in 3-month blocks (RLCQ). The RLCQ, a well-validated, reliable instrument,³⁴ documented life events in: (1) Health; (2) Work; (3) Home/Family; (4) Personal/Social; and (5) Financial Domains (Table 2 has domains, life event items and weights). Positive life events include 'promotion at work' or 'birth of a child.' Negative life events include 'trouble with a boss' or 'minor injury or illness.' Weights (in Life Change Units or LCU) for each item were as per the scale's author. For example, 'death of spouse' has the highest weight, 119 LCU, and 'retirement' has a weight of 52 LCU.³⁴ Domain scores are computed by adding weighted scores of domain items measured in LCU. Total life event scores in LCU for each period are the sum of domain-specific scores. Of note, events are not necessarily new events. Participants rated ongoing events during all pertinent time blocks.

Statistical methods

To reduce baseline data dimensionality, two Principal Component Analyses generated 'aggression/hostility' factors and factors originally named 'pessimism' factors, found to increase risk for suicidal behavior in our prior work.¹⁴ Aggression/hostility factors were derived from the Barratt Impulsivity Scale, Buss–Durkee Hostility Inventory and Brown–Goodwin Aggression History Scale. Two factors explained 83% of the variance and were retained for further analysis. 'Pessimism factors'¹⁴ were calculated by first performing individual linear regressions of the Beck Depression Inventory, Beck Hopelessness Scale, Reasons for Living Inventory and Scale for Suicidal Ideation scores onto Hamilton Depression Rating Scale-17

scores. Residuals were entered into a Principal Component Analysis. Two factors, explaining 75% of the variance, were retained for further analysis. The first factor, based mostly on the Beck Depression Inventory and Hopelessness Scales, was renamed 'depressive cognitions.' The Scale for Suicidal Ideation and Reasons for Living Inventory (negatively scaled) loaded mostly onto the second factor, renamed 'suicide cognitions.'

Prediction of suicidal behavior. Each subject's follow-up period was divided into months designated by clinical state as having met MDE criteria: yes/no, and RLCQ total weighted score. Two models tested whether MDE or RLCQ score in the current or the prior month, respectively, predicted suicidal behavior in the current month. Analyses were controlled for diathesis variables (sex, age, 2 aggression/hostility factors, and depressive and suicide cognition factors) and variables entered into a marginal logistic regression model fit by proc glimmix from SAS 9.2, with suicidal behavior as the response variable and AR(1) correlation structure for the residuals. Results were verified using the Andersen–Gill extension to the Cox proportional hazards regression model,⁴² appropriate for analyzing multiple events per person, time-varying covariates constant over time intervals of different lengths and censored times in study. Given the potential effects of BPD on suicide risk, these models were re-run separately for patients with and without BPD. Both those with and without BPD may have had other PDs. As the total RLCQ variable had outliers, analyses were repeated with scores censored at 500 LCU.

In five exploratory models per subsample (with and without BPD), RLCQ scores for each one of five life event domains and presence/absence of MDE during follow-up, along with diathesis variables were tested as predictors of suicidal behavior, adjusted for multiple testing using Bonferroni's method. We also tested whether any of the 76 individual RLCQ items determined the timing of suicidal behavior, controlling for the presence of MDE during follow-up and diathesis variables, adjusted for multiple testing using the Benjamini–Hochberg procedure. This method controls the False Discovery Rate (ratio of false hypotheses to all null hypotheses that are rejected), appropriate when the goal is discovery, rather than confirmation.

Two final analyses were conducted based on data from depressed subjects with BPD. One included only 'negative' items from the RLCQ scale, the other only independent life event items (unrelated to participants' behavior and outside their control—for example, death of a friend) versus dependent life events (which are possibly influenced by participants' characteristics—for example, interpersonal conflicts).⁴³

RESULTS

Prospective data from 18 months per subject on average yielded 7843 person-months—the number of months observed for all study participants (Table 2). Life events in all five domains were common. Time in study was independent of baseline depression scores, attempt history or clinical severity. Married patients were retained about 2 months longer than others ($t = 2.57, df = 413, P = 0.0106$).

Suicidal behaviors occurred in 70/7843 (0.9%) person-months. Forty (9.6%) subjects manifested suicidal behavior during follow-up: 25 subjects had one behavior, 7 had 2 behaviors and 8 had 3 or more, for a total of 70 suicidal behaviors. Three died by suicide. All but seven subjects with suicidal behavior during follow-up were also baseline attempters. Most subjects (70.4%) had some months with MDE during follow-up. Patients with comorbid BPD were more likely to make suicide attempts and report life events (more health, personal/social life events and trend in work-related, and home and family life events) but were not more likely to experience MDEs during follow-up (Table 3).

In the entire sample of depressed patients, MDE was associated with a nearly five-fold increased odds of suicidal behavior during the same month and 2.5-fold increased odds of suicidal behavior in the following month. The baseline suicide cognition factor and female sex also predicted suicidal behavior (Table 4). Contrary to expectations, RLCQ scores during the concomitant or preceding month did not predict suicidal behavior either in the full model controlling for diathesis variables (Table 4) or in an unadjusted model (odds ratio (OR) = 1.06 per 100 point increase, 95%

Table 2. Relative weights of life events and frequencies of person-months with a given life event in the recent life changes questionnaire listed by domain

| Item number | Life event | Weight (LCU) ^a | Number of person-months with life event (N = 7843) | % Of subjects with life event |
|---|--|---------------------------|--|-------------------------------|
| <i>Health</i> | | | | |
| 1A ^{b,c} | An injury or illness which: Kept you in bed a week or more, or sent you to the hospital | 74 | 667 | 28 |
| 1B | Was less serious than above | 44 | 600 | 41 |
| 2 | Major change in eating habits | 26 | 884 | 42 |
| 3 ^b | Major change in sleeping habits | 27 | 873 | 41 |
| 1A ^{b,c} | Major change in your usual type and/or amount of recreation | 26 | 857 | 18 |
| 5 | Major dental work | 28 | 364 | 28 |
| <i>Work</i> | | | | |
| 6 | Change to a new type of work | 51 | 851 | 41 |
| 7 | Change in your work hours or conditions | 35 | 827 | 39 |
| Change in your responsibilities at work: | | | | |
| 8A | More responsibilities | 29 | 531 | 27 |
| 8B ^b | Fewer responsibilities | 21 | 199 | 11 |
| 8C ^b | Promotion | 31 | 113 | 7 |
| 8D ^b | demotion | 42 | 71 | 4 |
| 8E | Transfer | 32 | 16 | 1 |
| Troubles at work: | | | | |
| 9A ^b | With your boss | 29 | 415 | 18 |
| 9B ^b | With coworkers | 35 | 298 | 15 |
| 9C ^b | With persons under your supervision | 35 | 92 | 5 |
| 9D ^b | Other work troubles | 28 | 376 | 18 |
| 10 | Major business adjustment | 60 | 143 | 9 |
| 11 | Retirement | 52 | 32 | 2 |
| Loss of job: | | | | |
| 12A | Laid off from work | 68 | 184 | 9 |
| 12B | Fired from work | 79 | 135 | 9 |
| 13 | Correspondence course to help you in your work | 18 | 178 | 9 |
| <i>Home and family</i> | | | | |
| Change in residence: | | | | |
| 14A | Move within the same town or city | 25 | 496 | 25 |
| 14B | Move to a different town, city, or state | 47 | 364 | 18 |
| 15 | Change in family get-togethers | 25 | 412 | 23 |
| 16 | Major change in health or behavior of family member | 55 | 653 | 32 |
| 17 | Major change in living conditions | 42 | 381 | 23 |
| 18 | Death of spouse | 119 | 26 | 2 |
| Death of other family member: | | | | |
| 19A | Child | 123 | 13 | 1 |
| 19B | Brother or sister | 102 | 32 | 2 |
| 19C | Parent | 100 | 72 | 5 |
| 19D | Other close family member | 100 | 239 | 14 |
| 20 ^b | Death of a close friend | 70 | 164 | 11 |
| Change in the marital status of your parents: | | | | |
| 21A | Divorce | 59 | 43 | 3 |
| 21B | Remarriage | 50 | 39 | 3 |
| 22 | Marriage | 50 | 41 | 3 |
| 23 | Change in arguments with spouse | 50 | 243 | 14 |
| 24 | In-law problems | 38 | 93 | 5 |
| Separation from spouse: | | | | |
| 25A | Due to work | 53 | 47 | 3 |
| 25B ^c | Due to marital problems | 76 | 136 | 7 |
| 26 | Reconciliation with a spouse | 45 | 63 | 4 |
| 27 | Divorce | 96 | 85 | 4 |
| Gain of a new family member: | | | | |
| 28A | Birth of a child | 66 | 61 | 4 |
| 28B | Adoption of a child | 65 | 15 | 1 |
| 28C | A relative moving in with you | 59 | 76 | 4 |
| 29 | Spouse beginning or ending work | 46 | 63 | 4 |
| 30 | Pregnancy | 67 | 26 | 2 |
| Child leaving home: | | | | |
| 31A | To attend college | 41 | 27 | 2 |
| 31B | Due to marriage | 41 | 28 | 2 |
| 31C | For other reasons | 45 | 66 | 4 |
| 32 ^b | Miscarriage or abortion | 65 | 23 | 2 |
| 33 | Birth of grandchild | 43 | 58 | 4 |
| <i>Personal and social</i> | | | | |
| 34 | Major personal achievement | 36 | 559 | 31 |
| 35 | Change in personal habits | 26 | 695 | 34 |
| 36 | Sexual difficulties | 44 | 746 | 29 |
| 37 | Beginning or ending school or college | 38 | 357 | 20 |
| 38 | Change of school or college | 35 | 108 | 6 |
| 39 | Vacation | 24 | 550 | 28 |
| 40 | Change in religious beliefs | 29 | 147 | 8 |
| 41 | Change in social activities | 27 | 671 | 33 |
| 42 ^b | Minor violation of the law | 20 | 200 | 12 |
| 43 | Being held in jail | 75 | 46 | 3 |
| 44 ^b | Change in political beliefs | 24 | 86 | 5 |
| 45 | New, close, personal relationship | 37 | 514 | 28 |
| 46 | Engagement to marry | 45 | 66 | 5 |

Table 2. (Continued)

| Item number | Life event | Weight (LCU) ^a | Number of person-months with life event (N = 7843) | % Of subjects with life event |
|------------------|--|---------------------------|--|-------------------------------|
| 47 | Falling out of a close personal relationship | 47 | 632 | 32 |
| 48 | Girlfriend or boyfriend problems | 39 | 602 | 24 |
| 49 | Loss or damage to personal property | 43 | 196 | 11 |
| 50 | An accident | 48 | 157 | 9 |
| 51 | Major decision regarding your immediate future | 51 | 657 | 32 |
| <i>Financial</i> | | | | |
| 52 | Moderate purchase | 20 | 497 | 27 |
| 53 | Major purchase | 37 | 147 | 9 |
| 54 | Foreclosure on a mortgage or loan | 58 | 30 | 2 |
| | Major change in finances: | | | |
| 55A | Increased income | 38 | 356 | 19 |
| 55B | Decreased income | 60 | 916 | 41 |
| 55C | Investment and/or credit difficulties | 56 | 380 | 18 |

^aLCU = life change units.^bSignificantly associated with suicide attempt risk in depressed patients without BPD.^cSignificantly associated with suicide attempt risk in depressed patients with BPD.**Table 3.** Frequency of life events assessed with the recent life changes questionnaire, major depressive episode and suicide or suicide attempt during 2-year follow-up period ($n = 415$ subjects, $n = 7843$ person-months)

| Life events | % Subjects with life event during 2-year follow-up | | % Person-months with life events | | | |
|--------------------------|--|-----|----------------------------------|-----|------------------|-----------------|
| | No BPD | BPD | No BPD | BPD | T^a (df = 411) | P-value |
| Health | 75 | 84 | 29 | 37 | 2.65 | 0.0084 |
| Work-related | 64 | 70 | 24 | 29 | 1.94 | 0.0527 |
| Home and family | 73 | 84 | 29 | 34 | 1.88 | 0.0608 |
| Personal/social | 85 | 84 | 39 | 48 | 2.59 | 0.0098 |
| Financial | 66 | 62 | 25 | 22 | -1.10 | 0.2723 |
| Any kind of event | 97 | 100 | 68 | 75 | 2.69 | 0.0075 |
| MDE | 69 | 74 | 30 | 33 | 1.23 | 0.2201 |
| Suicidal behavior | 7 | 18 | 0.6 | 1.8 | 4.52 | < 0.0001 |

Abbreviations: BPD, borderline personality disorder; MDE, major depressive episode.

^aComparisons by BPD diagnosis were tested with marginal logistic regression models.

Values in bold are statistically significant.

confidence interval (CI): 0.94–1.18, $P = 0.33$) containing only RLCQ scores as predictors. Life events in the context of MDE did not have an effect either. Of note, life events did not predict MDE recurrence (data not shown). Censoring RLCQ scores at 500 LCU did not change results.

Among patients without BPD (Table 4), presence of MDE increased the odds of suicidal behavior 13-fold during the same month and nine-fold in the following month. The effect of life events was more moderate, with ORs for suicidal behavior of 1.33 and 1.06 per 100 RLCQ life change units during the same or the following month, respectively. The baseline suicide cognition factor and female sex predicted suicidal behavior, as well.

When RLCQ scores were explored by the domain among those with no BPD, the health-related and work-related life event scores were risk factors for suicidal behavior, adjusting for MDE and diathesis variables (Table 5), after correction for multiple comparisons. Health life events include items that are also MDE symptoms (for example, change in sleep), but were not higher in months with MDE (average difference in life event score, $P = 0.9568$).

Among 76 individual life event items tested, five were associated with suicidal behavior in the same month and three predicted behavior in the next month, in patients without BPD after multiple testing adjustment. A further six events were associated with suicidal behavior in the same month and 10 were predictive in the next month ($P < 0.05$, uncorrected). Most of these were work- or health-related (see Table 2). For 28 additional items,

the life event did not occur in the same month as suicidal behavior, and the model did not converge and therefore did not generate results (available upon request).

For patients with BPD, MDE increased the risk of suicidal behavior threefold in the same month but had no effect in the following month. Surprisingly, life events in the prior month were protective against suicidal behavior and same month life events tended to be so too. Restricting life event scores to negative items or to items representing independent or dependent life events did not change results (data not shown). Of note, for patients with BPD, no life event domain was statistically significant after correction for multiple comparisons. However, two individual life event items were associated with suicidal behavior in the same month ($P < 0.05$, uncorrected): 'an illness or injury that kept you in bed a week or more or hospitalization' and 'separation from spouse because of marital problems'; however, no item predicted suicidal behavior the following month. Indeed, having comorbid BPD moderated the effect of life events on risk for suicidal behavior, rendering them less 'effective' in precipitating suicidal acts (BPD*RLCQ interaction in the model that included stress and diathesis variables: interaction $b = -0.006$, s.e. = 0.002, $df = 7407$, $t = -3.07$, $P = 0.0021$).

DISCUSSION

In depressed patients without BPD, the effect of recurrent MDE on risk for suicidal behavior was marked, as reported previously.^{2,15–17}

Table 4. Predictors of suicides and suicide attempts during a 2-year follow-up period

| Predictor variables | Current month predictors ^a | | | Prior month predictors ^a | | | | |
|------------------------------------|---------------------------------------|-------------------------|---------|-------------------------------------|-------------------------|---------|-------|---------------|
| | OR | 95% Confidence interval | P-value | OR | 95% Confidence interval | P-value | | |
| <i>Total sample</i> | | | | | | | | |
| MDE | 4.83 ^a | 2.84 | 8.23 | 0.0001 | 2.40 ^a | 1.46 | 3.94 | 0.0006 |
| RLCQ ^b | 1.06 ^a | 0.94 | 1.20 | 0.3191 | 1.01 ^a | 0.87 | 1.18 | 0.8914 |
| Aggression/hostility 1 | 1.19 | 0.93 | 1.53 | 0.1744 | 1.25 | 0.97 | 1.61 | 0.0802 |
| Aggression/hostility 2 | 1.09 | 0.85 | 1.39 | 0.5145 | 1.11 | 0.87 | 1.43 | 0.4052 |
| Depressive cognitions | 1.21 | 0.92 | 1.59 | 0.1838 | 1.23 | 0.92 | 1.62 | 0.1692 |
| Suicide cognitions | 1.49 | 1.11 | 2.00 | 0.0083 | 1.51 | 1.12 | 2.02 | 0.0071 |
| Age | 0.98 | 0.95 | 1.00 | 0.0820 | 0.98 | 0.95 | 1.00 | 0.1114 |
| Female | 2.40 | 1.28 | 4.51 | 0.0067 | 2.47 | 1.31 | 4.66 | 0.0055 |
| Number of months ^c | 1.01 | 0.98 | 1.04 | 0.5355 | 1.01 | 0.98 | 1.04 | 0.6445 |
| <i>Depressed patients, no BPD</i> | | | | | | | | |
| MDE | 13.19 ^a | 4.52 | 38.51 | 0.0001 | 9.39 ^a | 3.60 | 24.52 | 0.0001 |
| RLCQ ^b | 1.33 ^a | 1.03 | 1.72 | 0.026 | 1.21 ^a | 1.06 | 1.38 | 0.005 |
| Aggression/hostility 1 | 1.15 | 0.77 | 1.74 | 0.493 | 1.31 | 0.88 | 1.96 | 0.182 |
| Aggression/hostility 2 | 0.93 | 0.64 | 1.35 | 0.711 | 0.97 | 0.68 | 1.40 | 0.889 |
| Depressive cognitions | 1.20 | 0.80 | 1.78 | 0.380 | 1.23 | 0.82 | 1.84 | 0.315 |
| Suicide cognitions | 1.90 | 1.20 | 3.02 | 0.006 | 1.84 | 1.17 | 2.91 | 0.009 |
| Age | 0.99 | 0.95 | 1.02 | 0.505 | 0.98 | 0.95 | 1.02 | 0.394 |
| Female | 3.00 | 1.22 | 7.69 | 0.0178 | 2.86 | 1.18 | 7.14 | 0.0211 |
| Number of months ^c | 1.01 | 0.96 | 1.06 | 0.720 | 1.01 | 0.96 | 1.06 | 0.694 |
| <i>Depressed patients with BPD</i> | | | | | | | | |
| MDE | 3.03 ^a | 1.46 | 6.30 | 0.004 | 1.04 ^a | 0.49 | 2.22 | 0.916 |
| RLCQ total ^b | 0.76 ^a | 0.55 | 1.06 | 0.109 | 0.66 ^a | 0.46 | 0.97 | 0.035 |
| Aggression/hostility 1 | 0.95 | 0.64 | 1.42 | 0.808 | 0.99 | 0.68 | 1.46 | 0.977 |
| Aggression/hostility 2 | 1.08 | 0.74 | 1.58 | 0.682 | 1.10 | 0.76 | 1.60 | 0.606 |
| Depressive cognitions | 1.16 | 0.75 | 1.80 | 0.515 | 1.16 | 0.74 | 1.82 | 0.525 |
| Suicide cognitions | 1.06 | 0.70 | 1.60 | 0.793 | 1.16 | 0.76 | 1.76 | 0.480 |
| Age | 0.99 | 0.95 | 1.03 | 0.482 | 1.00 | 0.96 | 1.04 | 0.859 |
| Female | 1.02 | 0.38 | 2.70 | 0.9759 | 1.18 | 0.44 | 3.23 | 0.747 |
| Number of months ^c | 1.00 | 0.98 | 1.05 | 0.933 | 1.00 | 0.95 | 1.05 | 0.968 |

Abbreviations: MDE, major depressive episode, OR, odds ratio; RLCQ, Recent Life Changes Questionnaire (weighted score in life change units).

^aTime-varying predictors only: MDE and RLCQ.

^bOR was reported for 100 life change units increase of the total score.

^cVariable accounts for the passage of time.

Values in bold are statistically significant.

Life events, specifically, work-and health-related ones, also determined the timing of suicidal behavior, albeit with a more modest effect. That stressors (life events or MDE) and baseline diathesis features (female sex and 'suicide cognitions') determined the timing and risk of future suicidal behavior is consistent with our stress diathesis model.^{14,20}

In contrast, in depressed patients with BPD, the role of MDE in precipitating suicidal behaviors was more modest. Moreover, depressed patients with BPD were not susceptible to life events as measured by the RLCQ. This is concordant with the notion that BPD patients report frequent intrapsychic pain, often unrelated to the salience of external events.^{44,45} Perhaps, life events have a lesser role in precipitating suicidal behavior among those with severe mental illness.⁴⁶ An alternative conceptualization is that given a strong diathesis such as MDE comorbid with BPD, daily hassles that do not qualify as a significant life event—not measured in this study—can precipitate suicidal behaviors.¹³ Few studies have focused on this but suggest that daily hassles relate to suicidal ideation among adolescents^{47,48} and older populations.⁴⁹ Life events were generally protective against suicidal behavior among BPD patients. One interpretation is that the RLCQ includes both positive and negative events. However, there was no effect when including only negative life events. Whether patients with BPD facing observable life events receive more psychosocial support, which may buffer against suicide attempts,^{50,51} is an open question that our data do not address. Alternatively, patients with comorbid BPD may 'organize' around a

life event and paradoxically cope better (B Stanley, personal communication). Nonetheless, consistent with a prospective study in personality disorders¹³ noting that negative love/marriage and crime/legal life events were risk factors for suicidal behavior and with clinical experience, our data suggest that marital problems are the key in those with BPD, indicating that the nature of the life event matters.^{13,52}

When the entire sample was examined, recurrent MDEs,¹⁵ female sex¹⁴ and high 'suicide cognitions' factor scores (previously termed 'pessimism')¹⁴ predicted suicidal behavior. Contrary to our hypothesis, but consistent with several studies,^{2,3,8,9,11} life events did not appear to precipitate suicidal behavior in depressed patients because of the striking opposing effects observed for life events among those with and without BPD. Curiously, in a prospective epidemiologic survey,⁴ negative events predicted first-onset suicidal behaviors over 3 years. However, in a depressed subsample from the same survey, not assessed for BPD, life events did not predict suicidal behaviors over 2 years, after controlling for demographic and clinical factors,³ underscoring the importance of examining diagnostic subsamples. Whether MDE affects appraisal of life events was not studied directly. However, the likelihood of suicidal behavior when patients were exposed to stress but not depressed did not differ from the likelihood when patients were both depressed and stressed (interaction of MDE and life events was not significant). This suggests that a more negative appraisal of life events is not at work, at least in terms of increasing suicide risk.

Table 5. Effect of health and work life event domain score (recent life changes questionnaire) as risk factors for suicide and suicide attempt adjusted for other predictors

| Predictor variables | Current month predictors ^a | | | Prior month predictors ^a | | | | |
|--------------------------------|---------------------------------------|--------|---------|-------------------------------------|--------|---------|-------|---------------|
| | OR | 95% CI | P-value | OR | 95% CI | P-value | | |
| MDE | 12.80 | 4.16 | 39.32 | < 0.0001 | 8.68 | 3.54 | 21.25 | 0.0001 |
| Health RLCQ score ^b | 2.78 | 1.39 | 5.57 | 0.0039 | 2.60 | 1.38 | 4.89 | 0.0031 |
| Aggression/hostility 1 | 1.18 | 0.76 | 1.83 | 0.4643 | 1.31 | 0.89 | 1.93 | 0.1677 |
| Aggression/hostility 2 | 0.96 | 0.66 | 1.41 | 0.8382 | 0.97 | 0.69 | 1.36 | 0.8496 |
| Depressive cognitions | 1.20 | 0.79 | 1.84 | 0.3897 | 1.22 | 0.84 | 1.78 | 0.2973 |
| Suicidal cognitions | 1.91 | 1.17 | 3.12 | 0.0099 | 1.81 | 1.17 | 2.78 | 0.0077 |
| Age | 0.99 | 0.95 | 1.03 | 0.4846 | 0.98 | 0.95 | 1.02 | 0.3274 |
| Female | 3.00 | 1.14 | 8.33 | 0.0268 | 2.94 | 1.27 | 7.14 | 0.0133 |
| Number of months ^c | 1.01 | 0.96 | 1.06 | 0.6846 | 1.01 | 0.97 | 1.06 | 0.5845 |
| MDE | 13.85 | 4.40 | 43.67 | < 0.0001 | 9.46 | 3.52 | 25.41 | 0.0001 |
| Work RLCQ score ^b | 2.14 | 1.36 | 3.35 | 0.0010 | 2.11 | 1.38 | 3.23 | 0.0006 |
| Aggression/hostility 1 | 1.20 | 0.78 | 1.85 | 0.4165 | 1.33 | 0.88 | 2.00 | 0.1782 |
| Aggression/hostility 2 | 0.94 | 0.64 | 1.38 | 0.7699 | 0.95 | 0.66 | 1.37 | 0.7912 |
| Depressive cognitions | 1.19 | 0.78 | 1.81 | 0.4303 | 1.20 | 0.80 | 1.80 | 0.3856 |
| Suicidal cognitions | 2.08 | 1.24 | 3.50 | 0.0060 | 1.98 | 1.21 | 3.24 | 0.0072 |
| Age | 0.99 | 0.95 | 1.03 | 0.5815 | 0.99 | 0.95 | 1.02 | 0.4529 |
| Female | 3.00 | 1.10 | 8.33 | 0.0322 | 2.94 | 1.15 | 7.69 | 0.0257 |
| Number of months ^c | 1.00 | 0.95 | 1.06 | 0.9118 | 1.01 | 0.96 | 1.06 | 0.8174 |

Abbreviations: CI, confidence interval; MDE, major depressive episode; OR, odds ratio; RLCQ = Recent Life Changes Questionnaire sub-score in life change units or item presence (yes/no). Model restricted to patients without borderline personality disorder.

^aTime-varying variables only: MDE and RLCQ.

^bOR and 95% CI computed for 100 points increase in life event change units.

^cVariable accounts for the passage of time.

Values in bold are statistically significant.

For depressed patients with BPD, recurrent MDE predicted suicidal behavior in the same month, but not in the following one, indicating a short latency to suicidal behavior, which may reflect higher impulsivity—a core BPD trait.²² In depressed patients with BPD, suicide cognitions and other baseline diathesis factors did not predict suicidal behavior. However, BPD encompasses many clinical features related to the diathesis for suicidal behavior.¹⁴ Borderline patients are more pessimistic,⁵³ impulsive/aggressive,²² and report more history of trauma.⁵⁴ Thus, among those with BPD, stressors such as MDE and perhaps very specific life events determine the timing of suicidal behavior, also consistent with a stress diathesis model.

Health domain life events precipitated suicidal behavior in those without BPD, and one item about hospitalization or staying in bed ill for a week did so in those with BPD, comporting with increased risk for suicide death observed after a cancer diagnosis⁵⁵ and World Mental Health Surveys⁵⁶ findings, wherein prior physical conditions increased risk for suicidal behavior, even adjusting for mental disorders. That MDE was a stronger predictor of suicidal behavior than life events is in agreement with Lewinsohn *et al.*,⁸ who noted that health life events no longer predicted suicidal behaviors after controlling for depression, although they did not examine the effect of comorbid BPD. We found that health life event scores were not higher during months with MDE, and thus the modest health life events' effects in subjects without BPD were not explained by concomitant MDE. Of interest, Borg and Stahl⁹ observed that physical illness life events were actually more common among controls than suicides.

Of note, work stress had deleterious effects only in those without BPD. This was not because of differences in employment status between those with and without BPD (data not shown). Some data have linked suicidal behavior to work stress (for a review see Woo and Postolache⁵⁷), often cited in the press as a precipitant. That the effect is not present in depressed patients with BPD is consistent with findings in a prospective study in

personality disorders.¹³ One possible explanation is that BPD patients react more intensely to interpersonal stressors.¹³

Female sex and baseline 'suicide cognitions,' but not 'depressive cognitions,' predicted suicidal behavior in the full sample and the subset without BPD. This comports with reports that lifetime suicidal ideation⁵⁸ and the Reasons For Living Inventory⁵⁹ are useful in assessing risk for future suicidal behavior. Reasons For Living Inventory scores reflect a sense of connection with and responsibility towards others, features associated with lower suicidal ideation, and thus may capture elements relevant to the 'suicidal debate' wherein individuals struggle with the decision to act on suicidal thoughts.⁵⁰ That such factors do not help patients with BPD may relate to the more impulsive nature of their suicidal behavior, minimizing protective effects of considerations captured by the Reasons For Living Inventory. The lack of effect of 'depressive cognitions' is consistent with our past findings that hopelessness does not predict suicidal behavior,^{14,19} in contrast with other reports.^{60–62}

Limitations

Our study shares limitations—including recall bias—of studies using checklists to assess life events.^{36,63,64} However, we did collect data systematically at several follow-up time points. Further, RLCQ life events' relationship to suicidal behaviors may be obscured by confounders such as appraisal and subjective scoring, as opposed to external rater scoring of the life event's magnitude,⁶³ as in contextual interview methods.^{65,66} Life events' effects may be stronger in first-time attempters, and mental illness may be more relevant to suicide re-attempters.^{4,12} With only seven first-time attempters, we could not address this. However, a Finnish study suggested that depressed mood was essential in first onset of suicidal ideation, even in the setting of life events,⁶⁷ consistent with our results. Many stressful life events were relatively rare, decreasing item-wise analyses' power. This may

be especially so for major life events (for example, death of spouse) in this relatively young sample. In addition, it may be that cumulative or chronic stress, or other complex combinations of life events rather than discrete life events affect risk for suicidal behavior, parallel to evidence in depression of cumulative effects of chronic repeated stressors when short-term adaptation to acute stressors is not adequately shut off.⁶⁸

Exclusion of patients with medical problems and with current substance or alcohol use disorders limits generalizability. Moreover, given the variability in treatment, it is difficult to ascertain its effect on suicidal behavior. However, as antidepressant treatment effects on suicide risk, over and above effects on mood, are not robust,⁶⁹ treatment data may not be as critical for this study's purposes. Finally, although the role of life events may differ for attempts and suicide, suicides were too rare for separate analyses.

CONCLUSIONS

MDE is a much stronger predictor of suicidal behavior risk than life events. Whereas the effect of life events was confined to those without comorbid BPD, MDE effect was robust regardless of comorbid BPD. Our findings show the importance of aggressive maintenance treatment strategies in preventing MDEs to reduce future suicidal behavior.

CONFLICT OF INTEREST

Dr Oquendo receives royalties from the Columbia Suicide Severity Rating Scale and received educational grants from Astra Zeneca, Pfizer, Eli Lilly, Shire, Janssen. Her family owns Bristol-Myers Squibb stock. Dr Mann received grants from GlaxoSmith-Kline and Novartis. Dr Sullivan is on the SAB of TONIX Pharmaceuticals and consulted to Ono Pharma USA. Dr Sublette received a grant from Unicity International of nutritional supplements. The remaining authors declare no conflict of interest.

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DISCLAIMER

Dr Galfalvy accessed all data with responsibility for analyses integrity and accuracy.

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