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Ecological momentary assessment (EMA) of depression-related phenomena

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Abstract

Ecological momentary assessment (EMA) is one research method increasingly employed to better understand the processes that underpin depression and related phenomena. In particular, EMA is well suited to the study of affect (e.g., positive and negative affect), affective responses to stress (e.g., emotion reactivity), and behaviors (e.g., activity level, sleep) that are associated with depression. Additionally, EMA can provide insights into self-harm behavior (i.e. suicide and non-suicidal self-injury), and other mood disorders (e.g. bipolar disorder) commonly associated with depressive episodes. Given the increasing availability and affordability of handheld computing devices such as smartphones, EMA is likely to play an increasingly important role in the study of depression and related phenomena in the future.

Increasingly, researchers have become interested in better understanding the daily experiences of patients and research participants. Ecological Momentary Assessment (EMA), also commonly referred to as experience sampling, permits the collection of data (e.g., self-report, actigraphy, psychophysiological variables) as they occur in the real world. While not required, EMA often leverages mobile technology such as tablets and cell phones to collect these data. It is generally held that EMA reduces the impact of bias on self-report, allows the examination of within-subject processes through the examination of repeated assessments, and facilitates the simultaneous collection of multimethod data [1, 2]. Moreover, the collection of EMA data permits greater generalization of the phenomena studied [1, 2] and allows for a better understanding of contextual factors, such as situation or location, that influence behavior [3].

Here, we examine much of the extant EMA research examining depression and related phenomena (e.g., depression symptoms, suicidal ideation and behavior, non-suicidal self-injury, and bipolar symptoms). As EMA is particularly well suited for the study of dynamic constructs such as affect and activity, we focus this review on those variables. The goal of this paper is to provide a succinct overview of the research and it should be noted that other

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researchers have previously contributed detailed and valuable reviews of this literature [4, 5•, 6].

Depression and Depression Symptoms

In considering the use of EMA to explore depression-related symptoms, one question that should be asked is"does EMA provide a valid, incrementally useful, platform for the assessment of depression-related phenomena?" Although few studies have examined this question specifically, existing research suggests that EMA provides accurate data regarding depression symptoms. For example, in a sample of older participants with depression, it was found that individuals with major depression and subclinical depression reported significantly more dysphoric days than did non-depressed controls [7]. Additionally, there is some evidence that EMA measures of affective instability or reactivity show only low to moderate associations with trait self-report measures, and that EMA may be more accurate than self-report in measuring reactive processes [8•]. Consequently, EMA may provide uniquely useful means of assessing and exploring depression-related phenomena.

As depressed mood and dysphoric, self-relevant, emotional experiences are some of the core symptoms of major depressive disorder (MDD), several studies have sought to examine the nature of affect and mood in depressed samples. Ben-Zeev, Young, & Madsen [9] compared EMA-measured positive affect (PA) and negative affect (NA) to retrospectively-recalled measures of affect in both depressed and non-clinical control patients, finding that depressed patients reported more inaccuracy in their retrospectively recalled NA than controls. Another study found that, compared to non-depressed controls, depressed participants experienced increasing PA over the course of the day with greatest levels of PA occurring later in the day and higher moment-to-moment variability in NA [10]. Depressed individuals have also been shown to exhibit lower mean levels of PA and higher mean levels of NA across the day [11]. Wichers and associates [12] found that risk for depression might be understood as a tendency to respond to life stressors with NA and that this tendency was stronger in monozygotic twins than dizygotic twins. There is also some evidence that the experience of PA in moments of stress may protect against NA reactivity, and that this experience of PA may reduce the interaction of stress and the lifetime incidence of depression amongst twin-pairs, suggesting that momentary experiences of PA may buffer against genetic risk for depression [13••].

Emotion reactivity to stress also seems to be associated with depression, with potential influences on treatment and intervention. In response to daily life stress, individuals with MDD have shown an increase in NA with no change in PA, which differed from the affective response of patients with bipolar disorder and non-affective psychosis [14]. This emotion reactivity may influence treatment outcome, as patients who demonstrated less emotion reactivity responded more quickly to cognitive therapy [15]. Affective spillover of NA from the day of a stressor to the next day during the early stages of therapy has also been associated with slower symptom change [16].

Additionally, EMA has been used to explore actigraphy, psychophysiology, and sleep behavior. In general, depressed patients show lower activity levels than controls, with

associated higher mean heart rate and blood pressure [17]. Although a sample of depressed patients with melancholic features reported feeling less active and more depressed in the morning, they paradoxically showed higher levels of activity in the morning than the evening [18]. One study which examined the cortisol awakening response (CAR) found that depressed women showed a blunted CAR compared to non-depressed controls which was unrelated to time of waking or number of social contacts [19]. Another study using ambulatory actigraphy methods in a sample of depressed adolescents found lower levels of activity, lower exposure to light, and damped circadian amplitude than healthy controls [20]. However, not all studies have found that psychophysiological variables differentiate depressed from non-depressed patients [11].

Suicide

Although suicidal ideation and behavior are common symptoms of MDD, few studies have utilized EMA to examine these phenomena [21]. Despite concerns that frequent and repeated evaluations of suicidality as seen in EMA procedures might lead to increases in the frequency or intensity of suicidal ideation and behavior, research suggests that frequency of suicidal ideation does not increase as study duration increases [21]. Further, study acceptance and compliance was high among recent and past suicide attempters, suggesting that the use of EMA methods with a high-risk suicidal population is feasible and is not iatrogenic [21].

As suicidal ideation and behavior are transdiagnostic, research in this area encompasses several psychological disorders and populations. Using predictive models based on data collected during EMA procedures, it is possible to predict suicidal ideation and behavior with greater accuracy than more infrequent, in-person assessments. For example, using eight weeks of daily diary data assessing PA and NA in inter-episode bipolar disorder, researchers were able to predict suicidal ideation with 88% sensitivity and 95% specificity a week prior to assessment by a clinician [22]. In a sample of adult psychiatric inpatients with MDD, sadness, tension, and boredom predicted subsequent suicidal ideation hours later; however, worthlessness, helplessness, hopelessness, anhedonia, guilt, and difficulty concentrating did not [23]. In a sample of male inmates, increased anger was related to concurrent, but not subsequent, suicidal ideation, suggesting that for this population, anger in the moment is most salient for suicide risk [24]. Prior to experiencing suicidal thoughts, adolescents with a history of NSSI reported feeling a wide range of NA states, particularly feeling sad or worthless, anger toward self/others, and self-hatred [25••]. Finally, among patients with borderline personality disorder (BPD) and recurrent suicidal behavior, daily negative mood intensity, assessed ecologically using a signaling device and self-report, was associated with both suicidal ideation and behavior [26].

As is the case with MDD in general, mood instability is also an important predictor of suicidal ideation and behavior. In a sample at high risk for developing psychosis, NA instability over a six-day period predicted severity and frequency of suicidal ideation, while PA instability only predicted frequency; however, mean levels of negative and positive affect were not predictive of frequency or severity [27]. In a BPD sample [26], mood reactivity to environmental situations was associated with daily ratings of suicidal ideation,

whereas mood amplitude and affective dyscontrol were not. More specifically, a subgroup of this sample with high negative mood intensity and high mood amplitude had significantly more suicidal behaviors than either a subgroup with low negative mood intensity and low mood amplitude, or low negative mood intensity and high mood amplitude [28].

Non-Suicidal Self-Injury

Non-suicidal self-injury (NSSI), or deliberate harm to the body without intent to die [29], frequently co-occurs with depression, anxiety [30, 31, 32] and suicide [33]. Recently, studies have employed EMA methods to study this behavior, allowing for the identification of proximal (i.e, EMA) and distal (i.e., self-report) factors that influence NSSI engagement [34].

Research has examined the form and context of NSSI thoughts and behavior using daily diary [35] and personal digital assistants (PDAs) [25••]. In a sample of adolescents and young adults, NSSI behavior was predicted by greater thought intensity [25••] and NSSI thoughts co-occurred with thoughts of alcohol and drug use up to one-third of the time, while suicidal thoughts rarely occurred in conjunction with NSSI thoughts [25••]. One study reported that when thoughts of NSSI began, individuals were most likely to be alone [35], and another suggested that individuals were resting, listening to music, or socializing, and the majority of episodes occurred while they were sober [25••].

Although EMA studies support the assertion that NSSI fulfills an automatic negative reinforcement function [25••, 35, 36••], in which NSSI is utilized as a means of reducing or eliminating NA, some people report engaging in NSSI in order to try to “feel something,” or an automatic positive reinforcement (APR) function [25••, 37]. Individuals who had engaged in NSSI for APR functions reported increased NSSI thoughts and behaviors and intensity of thoughts, as well as more alcohol use, binge eating episodes, and impulsive spending over the course of the experience sampling protocol compared to those who did not engage in NSSI for APR [37].

EMA studies have also explored the emotional context of NSSI thoughts and behaviors [25••, 35, 36••, 38, 39, 40]. Among adolescents, NSSI thoughts most often occurred in the context of feeling sad/worthless [25••, 35], overwhelmed [25••], scared/anxious [25••], rejected/hurt [35], or criticized/insulted [35]. Interestingly, the odds of engaging in NSSI behavior increased in the presence of feeling rejected, angry toward the self and others, and numb/nothing, but decreased in the presence of feeling sad/worthless [25••]. One potential clarification of this finding comes from a daily diary study with undergraduates which found that sadness predicted NSSI urge only in those with high negative urgency [39], or the desire to push away negative feelings.

To better understand the dynamic role of NA in NSSI, studies have used EMA to examine changes in affect from before to after NSSI episodes, reporting that participants indicated a significant increase in NA prior to self-reported NSSI, followed by a significant decrease in NA following the NSSI episode [36••]. In women with bulimia nervosa (BN), NA significantly increased prior to NSSI episodes and positive affect (PA) significantly decreased; NA did not change following NSSI episodes, while PA increased significantly

[40]. That these changes were identifiable hours prior to engagement in the behavior [36••] illustrates a strength of EMA methods in our understanding of these behavior, as EMA may provide ample warning to allow for the implementation of a tailored intervention or treatment.

Daily diary methods have examined the general daily emotional experience of individuals with a history of NSSI, suggesting that individuals with a NSSI history experience greater NA and lower PA than their non-injuring counterparts [41, 42]. However, affective variability may be more salient than specific emotional states. Instability of rumination, instability of negative emotion, and their interaction prospectively predicted NSSI episodes [38], and, compared to controls, individuals with an NSSI history reported higher within-person variation in NA and lower emotional differentiation of NA, as well as lower inertia of PA [42]. Among female patients with eating disorders, variability in affective activation predicted NSSI [43], and trait affect lability moderated the relationship between past attempted suicide and NSSI in individuals with BN [44]. Taken together, studies suggest that treatment of NSSI might focus on stabilizing overall affective experience rather NA specifically.

Bipolar Disorder

Depressive episodes are an important feature of bipolar disorder (BD) in many patients; consequently, it is important to briefly explore how EMA can be a valuable tool in the assessment of bipolar disorder. For example, EMA can be useful in evaluating variability of daily stress, self-esteem, and other constructs associated with BD that fluctuate throughout the day or to identify triggers for relapse, such as stressful events and subsequent increases in NA [5].

Very few studies to date have examined symptomatic individuals meeting the full criteria for BD [45, 46, 47]. One study examining the feasibility of using EMA with BD and MDD patients showed high acceptance and compliance with EMA assessments over a period of three days, but did find some reactive effects; specifically, time in the study was associated with the frequency of assessments occurring in the company of friends [47]. In a sample of youth with remitted and current BD, BD youth experienced less PA, more NA, were less likely to report planned activities than controls, and were less likely to report being alone than youth with MDD [46]. Another study looked at a large sample of bipolar spectrum disorders, finding that bipolar spectrum psychopathology was associated with NA, thought disturbance, risky behavior, and measures of grandiosity [45].

Several studies have used EMA to study patients in inter-episode stages of BD [14, 48•, 49, 50, 51]. Two of these studies explored affect, with one finding that BD participants reported greater negative and positive emotionality, conceptually related components of NA and PA, than controls [48•] and the other showing that BD patients experienced a decrease in PA over time compared to controls [14]. Research also suggests that patients in inter-episode stages of BD reported less PA and more NA [50] and spent more time at home, alone, or engaged in passive activities [49] as compared to controls. Interestingly, cortisol reactivity to daily negative events is similar between these individuals and healthy controls, although

evidence of subtle hypothalamic-pituitary-adrenal axis dysregulation among patients with inter-episode BD was present [51].

Conclusions

EMA is a useful and innovative research method which allows for the examination of dynamic processes associated with depression and depression-related phenomena. Given the high penetration of smartphones and related devices in the general population, it is likely that researchers will increasingly employ EMA methods to explore processes related to depression. In particular, EMA appears particularly well suited to the study of affect, activity level, and behavioral variables associated with depression, suicide, and self-injury. Currently, research has focused on the role of both negative and positive affect in the occurrence of depression and related phenomena; however, it is likely that other variables related to affect and emotion reactivity (e.g., cognitive mediators of emotional expression, biological or genetic risk factors) are involved as well, and future research should seek to expand what we know about the role of momentary affect to better understand how these patterns of affective responses come into being.

References

1. Ebner-Priemer UW, Trull TJ. Ambulatory Assessment An Innovative and Promising Approach for Clinical Psychology. European Psychologist. 2009; 14(2):109–119.
2. Shiffman S, Stone AA, Hufford MR. Ecological momentary assessment. Annu Rev Clin Psychol. 2008; 4:1–32. [PubMed: 18509902]
3. Intille, SS. A.S.e., et al. The science of real-time data capture: self-reports in health research. Oxford University Press; Oxford: 2007. Technological innovations enabling automatic, context-sensitive ecological momentary assessment; p. 308-337.
4. Ebner-Priemer UW, Trull TJ. Ecological momentary assessment of mood disorders and mood dysregulation. Psychol Assess. 2009; 21(4):463–475. [PubMed: 19947781]
5. Wenze SJ, Miller IW. Use of ecological momentary assessment in mood disorders research. Clinical Psychology Review. 2010; 30(6):794–804. [PubMed: 20619520] • This is a comprehensive discussion of the benefits of using EMA techniques in mood disorders research, with a focus on methodology, feasibility, and potential research questions.
6. aan het Rot M, Hogenelst K, Schoevers RA. Mood disorders in everyday life: a systematic review of experience sampling and ecological momentary assessment studies. Clinical Psychology Review. 2012; 32(6):510–523. [PubMed: 22721999]
7. Chepenik LG, et al. A daily diary study of late-life depression. Am J Geriatr Psychiatry. 2006; 14(3):270–279. [PubMed: 16505132]
8. Solhan MB, et al. Clinical assessment of affective instability: comparing EMA indices, questionnaire reports, and retrospective recall. Psychol Assess. 2009; 21(3):425–436. [PubMed: 19719353] • Results of this study indicated low to modest agreement of trait measures of affective instability, a retrospective mood recall task, and EMA reports of affect, experiences, and behaviors. These findings suggest that EMA provides more detailed and dynamic information about mood states than retrospective and trait reports. The authors discuss research and clinical implications of these findings with a focus on the utility of EMA methods.
9. Ben-Zeev D, Young MA, Madsen JW. Retrospective recall of affect in clinically depressed individuals and controls. Cogn Emot. 2009; 23(5):1021–1040.
10. Peeters F, et al. Diurnal mood variation in major depressive disorder. Emotion. 2006; 6(3):383–391. [PubMed: 16938080]

11. Conrad A, et al. Circadian affective, cardiopulmonary, and cortisol variability in depressed and nondepressed individuals at risk for cardiovascular disease. Journal of Psychiatric Research. 2008; 42(9):769–777. [PubMed: 17884093]
12. Wichers M, et al. Genetic risk of depression and stress-induced negative affect in daily life. British Journal of Psychiatry. 2007; 191:218–223. [PubMed: 17766761]
13. Wichers MC, et al. Evidence that moment-to-moment variation in positive emotions buffer genetic risk for depression: a momentary assessment twin study. Acta Psychiatrica Scandinavica. 2007; 115(6):451–457. [PubMed: 17498156] • • This study examined genetic risk for depression among 279 female, general population twin pairs using the experience sampling method. The experience of positive emotions during stressful moments buffered against negative affect reactivity in daily life, and attenuated genetic vulnerability for depression.
14. Myin-Germeys I, et al. Emotional reactivity to daily life stress in psychosis and affective disorder: an experience sampling study. Acta Psychiatrica Scandinavica. 2003; 107(2):124–131. [PubMed: 12534438]
15. Miller DJ, Vachon DD, Lynam DR. Neuroticism, negative affect, and negative affect instability: Establishing convergent and discriminant validity using ecological momentary assessment. Personality and Individual Differences. 2009; 47(8):873–877. [PubMed: 20160976]
16. Cohen LH, et al. Negative Affective Spillover From Daily Events Predicts Early Response to Cognitive Therapy for Depression. J Consult Clin Psychol. 2008; 76(6):955–965. [PubMed: 19045964]
17. Volkers AC, et al. Motor activity and autonomic cardiac functioning in major depressive disorder. J Affect Disord. 2003; 76(1–3):23–30. [PubMed: 12943930]
18. Lemke MR, et al. Motor activity and daily variation of symptom intensity in depressed patients. Neuropsychobiology. 1997; 36(2):57–61. [PubMed: 9267852]
19. Stetler C, Miller GE. Blunted cortisol response to awakening in mild to moderate depression: Regulatory influences of sleep patterns and social contacts. J Abnorm Psychol. 2005; 114(4):697–705. [PubMed: 16351390]
20. Armitage R, et al. Rest-activity cycles in childhood and adolescent depression. Journal of the American Academy of Child and Adolescent Psychiatry. 2004; 43(6):761–769. [PubMed: 15167093]
21. Husky M, et al. Feasibility and validity of ecological momentary assessment in the investigation of suicide risk. Psychiatry Res. 2014
22. Thompson WK, et al. The prediction of study-emergent suicidal ideation in bipolar disorder: a pilot study using ecological momentary assessment data. Bipolar Disord. 2014; 16(7):669–677. [PubMed: 24903771]
23. Ben-Zeev D, Young MA, Depp CA. Real-time predictors of suicidal ideation: mobile assessment of hospitalized depressed patients. Psychiatry Res. 2012; 197(1–2):55–59. [PubMed: 22397912]
24. Humber N, et al. Anger as a predictor of psychological distress and self-harm ideation in inmates: a structured self-assessment diary study. Psychiatry Res. 2013; 210(1):166–173. [PubMed: 23643187]
25. Nock MK, Prinstein MJ, Sterba SK. Revealing the form and function of self-injurious thoughts and behaviors: A real-time ecological assessment study among adolescents and young adults. J Abnorm Psychol. 2009; 118(4):816–827. [PubMed: 19899851] • • Used EMA methods to measure suicidal and non-suicidal self-injurious thoughts and behaviors over 14 days in an adolescent and young adult sample. This study discussed form, function, contextual features (e.g., location), and overlap of self-injurious thoughts and behaviors, providing important and comprehensive information about individuals' everyday experience of self-injury.
26. Links PS, et al. Affective instability and suicidal ideation and behavior in patients with borderline personality disorder. Journal of Personality Disorders. 2007; 21(1):72–86. [PubMed: 17373891]
27. Palmier-Claus JE, et al. Affective variability predicts suicidal ideation in individuals at ultra-high risk of developing psychosis: an experience sampling study. British Journal of Clinical Psychology. 2012; 51(1):72–83. [PubMed: 22268542]
28. Links PS, et al. Elements of affective instability associated with suicidal behaviour in patients with borderline personality disorder. Can J Psychiatry. 2008; 53(2):112–116. [PubMed: 18357929]

29. Favazza AR. The coming of age of self-mutilation. J Nerv Ment Dis. 1998; 186(5):259–268. [PubMed: 9612442]
30. Andover MS, et al. Self-mutilation and symptoms of depression, anxiety, and borderline personality disorder. Suicide Life Threat Behav. 2005; 35(5):581–591. [PubMed: 16268774]
31. Ross S, Heath N. A study of the frequency of self-mutilation in a community sample of adolescents. Journal of Youth and Adolescence. 2002; 31(1):67–77.
32. Klonsky ED, Olino TM. Identifying clinically distinct subgroups of self-injurers among young adults: A latent class analysis. J Consult Clin Psychol. 2008; 76(1):22–27. [PubMed: 18229979]
33. Stanley B, et al. Are suicide attempters who self-mutilate a unique population? Am J Psychiatry. 2001; 158(3):427–432. [PubMed: 11229984]
34. Armey MF. Ecological momentary assessment and intervention in non-suicidal self-injury: A novel approach to treatment. Journal of Cognitive Psychotherapy. 2012; 26:299–317.
35. Shingleton RM, et al. Binge/purge thoughts in nonsuicidal self-injurious adolescents: an ecological momentary analysis. Int J Eat Disord. 2013; 46(7):684–689. [PubMed: 23729243]
36. Armey MF, Crowther JH, Miller IW. Changes in ecological momentary assessment reported affect associated with episodes of nonsuicidal self-injury. Behavior Therapy. 2011; 42(4):579–588. [PubMed: 22035987] • • Assessed change in affect associated with episodes of NSSI using personal digital assistants. Results of this study suggested that negative affect increased prior to an NSSI episode, peaked during the episode, and decreased in the hours following the episode. These affective changes were identifiable hours prior to NSSI episodes, which suggests the potential importance of early intervention strategies.
37. Selby EA, Nock MK, Kranzler A. How does self-injury feel? Examining automatic positive reinforcement in adolescent self-injurers with experience sampling. Psychiatry Res. 2014; 215(2): 417–423. [PubMed: 24388504]
38. Selby EA, et al. Emotional cascades and self-injury: investigating instability of rumination and negative emotion. J Clin Psychol. 2013; 69(12):1213–1227. [PubMed: 23381733]
39. Bresin K, Carter DL, Gordon KH. The relationship between trait impulsivity, negative affective states, and urge for nonsuicidal self-injury: a daily diary study. Psychiatry Res. 2013; 205(3):227–231. [PubMed: 23062776]
40. Muehlenkamp JJ, et al. Emotional states preceding and following acts of non-suicidal self-injury in bulimia nervosa patients. Behav Res Ther. 2009; 47(1):83–87. [PubMed: 19027892]
41. Victor SE, Klonsky ED. Daily emotion in non-suicidal self-injury. J Clin Psychol. 2014; 70(4): 364–375. [PubMed: 24002943]
42. Bresin K. Five indices of emotion regulation in participants with a history of nonsuicidal self-injury: a daily diary study. Behavior Therapy. 2014; 45(1):56–66. [PubMed: 24411115]
43. Vansteelandt K, et al. Variability in affective activation predicts non-suicidal self-injury in eating disorders. Eur Eat Disord Rev. 2013; 21(2):143–147. [PubMed: 23239050]
44. Anestis MD, et al. Predicting nonsuicidal self-injury episodes over a discrete period of time in a sample of women diagnosed with bulimia nervosa: an analysis of self-reported trait and ecological momentary assessment based affective lability and previous suicide attempts. Int J Eat Disord. 2012; 45(6):808–811. [PubMed: 21744378]
45. Walsh MA, et al. Looking for bipolar spectrum psychopathology: identification and expression in daily life. Comprehensive Psychiatry. 2012; 53(5):409–421. [PubMed: 21831368]
46. Axelson DA, et al. Measuring mood and complex behavior in natural environments: Use of ecological momentary assessment in pediatric affective disorders. Journal of Child and Adolescent Psychopharmacology. 2003; 13(3):253–266. [PubMed: 14642013]
47. Husky MM, et al. Computerized ambulatory monitoring in mood disorders: Feasibility, compliance, and reactivity. Psychiatry Res. 2010; 178(2):440–442. [PubMed: 20488558]
48. Gruber J, et al. Real-World Emotion? An Experience-Sampling Approach to Emotion Experience and Regulation in Bipolar I Disorder. J Abnorm Psychol. 2013; 122(4):971–983. [PubMed: 24364600] • Here, an ecologically-valid experience sampling approach was used to examine positive and negative emotionality and emotion regulation efforts among individuals with bipolar disorder, major depression, and healthy controls. The bipolar disorder group reported greater positive emotionality than the MDD group and greater negative emotionality than the control

group, as well as greater use of emotion regulation strategies than the control group. The authors discuss shared and unique features of emotionality.

49. Havermans R, Nicolson NA, deVries MW. Daily hassles, uplifts, and time use in individuals with bipolar disorder in remission. Journal of Nervous and Mental Disease. 2007; 195(9):745–751. [PubMed: 17984774]
50. Havermans R, et al. Mood reactivity to daily events in patients with remitted bipolar disorder. Psychiatry Res. 2010; 179(1):47–52. [PubMed: 20478632]
51. Havermans R, et al. Patterns of salivary cortisol secretion and responses to daily events in patients with remitted bipolar disorder. Psychoneuroendocrinology. 2011; 36(2):258–265. [PubMed: 20732746]

Highlights

- EMA is an increasingly used research method in the study of depression and related phenomena.
- EMA is well suited to the study of dynamic processes such as affect, activity level, and sleep.
- EMA provides unique insight into hard-to-study behaviors such as self-harm and suicide.
- EMA also yields data relevant to the implementation of psychotherapeutic interventions.