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Research paper

The temporal course and clinical correlates of subjective impulsivity in bipolar disorder as revealed through ecological momentary assessment

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ABSTRACT

Background: Impulsivity is frequently linked with bipolar disorder and is associated with mania and negative outcomes. The temporal dynamics of subjective impulsivity are unclear, in particular whether impulsivity precedes or follows changes in positive or negative affect.
Methods: A total of 41 outpatients with bipolar disorder (I or II) were provided with mobile devices for 11 weeks and completed twice-daily surveys about affective states and subjective impulsivity. We examined the association between aggregate subjective impulsivity with baseline global cognitive function, suicide risk ratings, and medication adherence, as well as concurrent and lagged associations with momentary positive and negative affect ratings.
Results: A total of 2902 ratings were available across study subjects. Higher aggregate mean ratings of impulsivity were associated with worse baseline global cognitive function, prior suicide attempts, and self-reported problems with medication adherence, as well as more severe manic (but not depressive) symptoms. Time-lagged models indicated that greater negative affect, but not positive affect, predicted subsequent increases in subjective impulsivity, which, in turn, predicted diminished positive affect.
Limitations: Other measures of impulsivity with which to validate subjective ratings were unavailable and the sample was restricted to generally clinically stable outpatients.
Conclusions: Subjective impulsivity as measured by daily monitoring was associated with worse cognitive function and self-rated medication adherence, and higher suicide risk ratings. Impulsivity may be a maladaptive strategy to regulate negative affect in bipolar disorder.

1. Introduction

Impulsivity is a multi-dimensional construct that has long been associated with hypo/manic states and bipolar disorder. Variously defined, dimensions of impulsivity include both over pursuit of short-term rewards at the expense of long-term goals, a tendency toward decision making without sufficient planning, and the failure to resist an urge to act, even if the action may cause harm to oneself or others (Moeller et al., 2001; Robbins et al., 2012). Across various measurement approaches and conceptualizations, elevated impulsivity has been associated with increased risk of negative outcomes, including cognitive impairment (Powers et al., 2013), medication adherence problems (Belzeaux et al., 2015), higher rates of suicidal behavior (Swann et al., 2014), comorbid substance abuse (Dougherty et al., 2005), and affective instability (Henry et al., 2008).

Recent work has indicated that aberrant performance on laboratory and self-report measures of impulsivity extends beyond mania to bipolar depressive and euthymic states (Swann et al., 2008). Thus, impulsivity can be seen as both a stable trait that is elevated in bipolar disorder, as well as a dynamic state that may fluctuate over the course of the illness, at least to some extent, in concert with symptoms. Global retrospective self-report measures do not address the variability of impulsivity over time nor their contextual influences (Dick et al., 2010). Behavioral tasks provide objective indication of impulsivity, but may offer limited ecological validity. Prior studies in bipolar disorder examining the impact of mood state on measures of impulsivity have employed cross-sectional designs contrasting patients experiencing episodes at different polarities, which confounds person-level variation with potential mood state effects. Thus, it is unclear to what extent impulsivity varies within individuals with bipolar disorder over

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time, and whether within-person fluctuation in impulsivity is associated with affective variability or other clinical factors such as cognitive abilities.

Ecological momentary assessment (EMA) could help further our understanding of the temporal associations with impulsivity among persons living with bipolar disorder. EMA involves intensive frequent assessment of emotions, behaviors and social contexts over time in one's naturalistic environment (Shiffman, 2008), which enables analysis of contemporaneous and time-lagged association between subjective impulsivity and other affective states. To our knowledge, there have been no EMA studies involving momentary subjective self-ratings of impulsivity in bipolar disorder. One study in borderline personality disorder employing EMA found greater momentary impulsivity than in depressive disorder (Tomko et al., 2014) and another found that urges for action were associated with bouts of later affective instability (Dixon-Gordon et al., 2014).

Although the tendency toward intense emotion appears associated with increased trait impulsivity in bipolar disorder (Muhtadie et al., 2014), it is unclear which emotions may engender impulsivity in bipolar disorder. Increases in positive affect may increase likelihood of reward seeking (Carver and Johnson, 2009). On the other hand, prior research has suggested that increases in negative affect could reduce cognitive efficiency and increase the likelihood of impulsivity, as patients with bipolar disorder and comorbid anxiety have been found to be more prone to impulsive choices on behavioral tasks (Bellani et al., 2012). As such, time-lagged models in EMA provide a potential means of testing whether increases in negative or positive emotion predict subsequent increases in subjective impulsivity. Finally, EMA affords the opportunity to examine intra-subject variability in subjective phenomena, in addition to mean levels. Mood instability is associated with somewhat unique correlates when compared to mood symptoms (Broome et al., 2015), and it is unclear if intra-subject variability of impulsivity may be also be unique compared to average impulsivity.

In this study, we examined the associations of level and intra-individual variability in self-reported impulsivity, as measured with EMA, within 41 patients with Bipolar I and II who participated in a self-management psychoeducation delivered in part by smartphone (Depp et al., 2015). Participants provided twice-daily self-ratings of affect, subjective impulsivity, and social context over 11 consecutive weeks on a smartphone device. The current study examined the associations of aggregated mean level and intra-individual variability in impulsivity with several measures that were gathered at baseline, including global cognitive function, clinician rated manic and depressive symptoms, suicide risk, and medication adherence. We also examined the association of impulsivity with concurrently gathered positive and negative affect ratings. We hypothesized that (1) level and intra-subject variability of impulsivity would relate to more severe manic and depressive symptoms at baseline, worse global cognitive function, worse medication adherence and increased suicide risk, and (2) contemporaneous and lagged associations between impulsivity and affective ratings would indicate that increases in both positive and negative affective ratings would predict subsequent increases in subjective impulsivity.

2. Method

2.1. Study overview

The data reported here derive from a parent study, which was a randomized controlled trial that evaluated the impact of augmenting brief psychoeducation with an automated mobile device-delivered intervention compared to brief psychoeducation alone. The design, methods and outcomes from this clinical trial have been reported previously (Depp et al., 2015), as has the convergent validity of an overall mood-state EMA items in relation to clinician-rated manic and depressive symptom assessments (Depp et al., 2012). The present study focused on the momentary ratings of impulsivity and affective states in the active arm of the intervention, as only the participants in the active arm of the intervention completed smartphone-based assessments ($n=41$). None of the data on impulsivity nor on individual affect ratings have been previously reported.

2.2. Participants

Participants were outpatients diagnosed with either Bipolar Disorder I or II recruited from various sources including flyers and advertisements placed online and in community residential and drop-in settings, depression and bipolar disorder self-help support groups, and outpatient psychiatric clinics in the San Diego area. To be eligible, participants needed to be: (1) aged 18 and older, (2) outpatients and currently prescribed medications for bipolar disorder, and (3) free of visual or manual dexterity disabilities that would preclude operation of a touch screen device. We excluded participants who: (1) met criteria for any substance use disorder in the prior 3 months, (2) were psychiatrically hospitalized in the prior month, or (3) scored in the severe range for either depressive symptoms (a score on the Montgomery Asberg Depression Rating Scale >32) or manic symptoms (a score on the Young Mania Rating Scale >20). We excluded patients in more severe affective states because the intervention involved limited clinician contact, and patients in more severe states would likely need more intensive interventions.

This study was approved by the University of California, San Diego (UCSD) Institutional Review Board. All participants provided written, informed consent. Participants were compensated for assessment visits, but not treatment sessions. The study was registered in Clinicaltrials.gov (NCT01670123).

2.3. Measures:

2.3.1. Demographics and diagnosis (baseline)

All participants were assessed at baseline for basic socio-demographic information, diagnosis and treatment history, current participation in treatment, and medications. Diagnoses were made by a clinically supervised research associate using the bipolar version of the MINI International Neuropsychiatric Interview for DSM-IV (Sheehan et al., 1998). Final diagnosis was attained by combining information from the MINI, chart reviews from treating providers, and confirmed in consensus meetings with the principal investigator.

2.3.2. Global cognitive functioning (baseline)

Global cognitive functioning was assessed with the Repeatable Battery of the Assessment of Neuropsychological Status (RBANS) (Gold et al., 1999). The RBANS was administered by a trained research assistant and covers 12 subtests which are then used to calculate five index scores: Immediate Memory (list learning and story memory tasks; score range=40–152), Visuospatial/Construction (figure copy and line orientation tasks; score range=50–136), Language (picture naming and semantic fluency; score range=40–137), Attention (digit span and coding; score range=40–154), and Delayed Memory (list recognition, story recall, and figure recall; score range=40–137) (Randolph, 1998). Index scores are adjusted for age and education. The index scores were then combined to create the RBANS Total Score (with higher scores corresponding to better performance), which was used in