Anhedonia predicts suicidal ideation in a large psychiatric inpatient sample

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ABSTRACT

This study examined the relationship among symptoms of anhedonia and suicidal ideation at baseline, at termination, and over time in 1529 adult psychiatric inpatients. Anhedonia was associated with suicidality cross-sectionally at baseline and at termination. In addition, change in anhedonia from baseline to termination predicted change in suicidality from baseline to termination, as well as level of suicidality at termination; moreover, anhedonia remained a robust predictor of suicidal ideation independent of cognitive/affective symptoms of depression. Symptom-level analyses also revealed that, even after accounting for the physical aspect of anhedonia (e.g., loss of energy), loss of interest and loss of pleasure were independently associated with higher levels of suicidal ideation at baseline, over time, and at discharge. Loss of interest was most highly predictive of suicidal ideation, providing support for recent differential conceptualizations of anhedonia. Taken together, these findings indicate that the manner in which anhedonia is conceptualized is important in predicting suicidal ideation, and that anhedonia symptoms warrant particular clinical attention in the treatment of suicidal patients.

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1. Introduction

Anhedonia may be defined as the *loss of interest or pleasure during the same 2-week period that represents a change from previous functioning diagnoses* (American Psychiatric Association, 2000). Losing the ability to experience pleasure or interest may be a pathway to suicidality. For example, anhedonia has been found to be associated with suicidality independent of several other depressive symptoms in the general population (Spijker et al., 2010) and in children and adolescents (Nock and Kazdin, 2002; Kuba et al., 2011). Furthermore, in a study of psychiatric patients, anhedonia was associated with imminent suicide within 1 year (Fawcett et al., 1990), relative to other variables that predicted suicide more distally.

1.1. Recent changes versus lifelong trait anhedonia

Anhedonia is commonly studied as a trait construct (Chapman et al., 1976; Gard et al., 2006). Indeed, the majority of laboratory studies have assessed trait, or lifelong patterns of lack of interest

or pleasure (Yan et al., 2012). However, a longitudinal study has demonstrated that state and trait symptoms of anhedonia differentially predict course over a 10-year period (Sarapas et al., 2012). On the other hand, many depression measures only assess recent feeling states in the experience of pleasure and/or interest (e.g., symptoms in the last month; Radloff, 1977), yet they do not assess state *changes from baseline*. This assessment is vital, as recent changes are associated with depression (American Psychiatric Association, 2000), whereas state symptoms with no baseline would incorporate symptoms of trait anhedonia (Yan et al., 2012).

1.2. Loss of interest in people is particularly important

Anhedonia also commonly is operationalized by including both social (e.g., loss of interest in people) and physical (e.g., loss of energy) symptoms. Recent changes in loss of interest *in people* may be especially predictive of suicidal ideation. This facet of anhedonia, potentially associated with the feeling that one does not belong to a group, may represent the beginning of a harmful pattern of social isolation that can eventuate in suicidality. A twin study demonstrated that a lack of belongingness and feelings of burdensomeness is primarily the result of environmental experience, whereas other predictors of suicide are more the result of genetic

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factors (Smith et al., 2012). Because these social factors may have environmental antecedents, they may also be more likely to respond to interventions if identified early enough. Thus, if recent changes in anhedonia were indeed to predict suicidality, there would be important treatment implications (Miret et al., 2013).

1.3. The anhedonia subscale

Anhedonia as measured by the Beck Depression Inventory-II (BDI; Beck and Steer, 1987) may represent an advance in predicting suicidal behavior, because it is comprised of items that are specifically related both to *recent changes* instead of traits and to loss of interest *in people*. Each item of the BDI is scored on a 0–3 scale; participants select which statement best describes how they have felt in the last 2 weeks (e.g., *Loss of Interest:* "I am less interested in other people and things than before"). Joiner et al. (2003) pioneered the use of the *anhedonia subscale* of the BDI in an attempt to investigate state changes in anhedonia with more reliability than a single item. The anhedonia subscale is a post hoc combination of the *Loss of Interest* item, the *Loss of Pleasure* item, and the *Loss of Interest in Sex* item of the BDI.

The anhedonia subscale is more predictive of depression than schizophrenia (Joiner et al., 2003). However, the subscale's ability to predict suicidal ideation over time in a large inpatient clinical sample has not been assessed empirically. Furthermore, whether this relationship is independent of cognitive/affective symptoms of depression that are commonly associated with suicidal ideation (Dori and Overholser, 1999) is also unknown.

In addition, whether each of the three symptoms that comprise the anhedonia subscale are equivalent is also unclear. Although one would expect that combining those symptoms would improve reliability (Kaplan and Saccuzzo, 2001), it may also sacrifice important information offered by individual anhedonia symptoms. This is because the *Loss of Interest* item, unlike the other items, explicitly asks about interest in *people*. It is thus the only item asking specifically about social aspects of anhedonia, which may be more likely to predict suicidal ideation.

1.4. Summary

Trait features and recent changes in anhedonia are often confounded. Recent changes in anhedonia may be most predictive of suicidal ideation over time. The anhedonia subscale (Joiner et al., 2003) was established to provide a reliable subscale of recent changes in anhedonia. Evidence suggests that this subscale is predictive of other symptoms of depression, but no research has examined its unique association with suicidal ideation over time when accounting for cognitive/affective symptoms of depression. Moreover, the ability of each of the symptoms that comprise the anhedonia subscale to predict suicidal ideation is also unknown. In particular, the social aspect of the *Loss of Interest* item makes it a strong candidate to predict suicidal ideation, because of previous research highlighting that environmental factors are related to levels of belongingness and burdensomeness but not to other factors associated with suicide (Smith et al., 2012).

1.5. Hypotheses

The current study examined the relationship between the anhedonia subscale and suicidality. In line with previous research (Fawcett et al., 1990), we hypothesized that the anhedonia sub-scale would predict suicidal ideation at baseline, termination, and over time. We also assessed whether the relationship between anhedonia and suicidal ideation would remain significant when accounting for other cognitive/affective symptoms of depression

(Storch et al., 2004) that have been found to be associated with suicidality in psychiatric inpatients (Dori and Overholser, 1999).

Lastly, we examined the relationship between individual symptoms of anhedonia and suicidality. We hypothesized that all anhedonia symptoms would be positively associated with suicidal ideation at baseline, and that loss of interest in people would be uniquely associated with suicidal ideation over time, due to previous research demonstrating that environmental changes in feelings of belongingness predict suicidality (Smith et al., 2012). We thus examined each symptom of anhedonia in relation to suicidal ideation, independent of the other symptoms.

2. Method

2.1. Participants

Participants were 1529 psychiatric inpatients at a private, not-for-profit psychiatric facility in the southern United States, with data collected as part of a hospital-wide treatment study (e.g., Clapp et al., 2013). Sample sizes for demographic and diagnostic variables are listed separately due to missing data on some variables. Participants' gender was evenly split (51.34% female, $N=1529$), and the average age of participants at the time of admission was 35.55 years (S.D. $=14.33$, $N=1227$). Common primary axis I diagnoses ($N=1214$) included depressive disorders (53.0%), bipolar disorders (16.06%), and anxiety disorder NOS (4.86%), with diagnosis determined by clinical interviews by staff psychiatrists using DSM-IV criteria. Participants who had previously been admitted to the facility, or who were admitted just for short-term assessment, were excluded. Participants were enrolled between April 2008 and August 2011, following approval by the Institutional Review Board of the Baylor College of Medicine. Treatment included active nursing care, medication management, psychoeducational groups, milieu therapy, individual and group therapy, and social and recreational activities. Anhedonia and depression symptoms and suicidal ideation were assessed at intake and at termination, with 1156 patients reaching termination assessment. Average length of stay for this sample was approximately 6 weeks.

2.2. Measures

The anhedonia-related symptoms and suicidal ideation were assessed using items from the Beck Depression Inventory-II (BDI; Beck and Steer, 1987). The BDI is a widely used clinical and research instrument for measuring depression; it includes 21 items each consisting of four statements describing depression symptoms of varying levels of severity. Each item is scored on a 0–3 scale; respondents select statements that best describe how they have felt during the previous 2 weeks. Anhedonia subscale symptoms were assessed using the *Loss of Interest* (ranging from 0: I have not lost interest in other people or activities" to 3: "It's hard to get interested in anything") *Loss of Pleasure* (ranging from 0: "I get as much pleasure as I ever did from the things I enjoy" to 3: "I can't get any pleasure from the things I used to enjoy"), and *Loss of Interest in Sex* (ranging from 0: "I have not noticed any recent change in my interest in sex" to 3: "I have lost interest in sex completely") items. *Loss of Energy* (ranging from 0: "I have as much energy as ever" to 3: "I don't have enough energy to do anything") was also assessed for our item-specific analysis, as studies sometimes include *Loss of Energy* when comprising the anhedonia subscales (e.g., Treadway et al., 2009) and sometimes do not (e.g., Joiner et al., 2003; Leventhal et al., 2006). Suicidal ideation was assessed using the *Suicidal Thoughts and Wishes* item, in which a 0 is "I don't have any thoughts of killing myself" and a 3 is "I would kill myself if I had the chance."

Cognitive/affective symptoms of depression were assessed using the *Past Failure* (ranging from 0: "I do not feel like a failure" to 3: "I feel I am a total failure as a person"), *Guilty Feelings* (ranging from 0: "I don't feel particularly guilty" to 3: "I feel guilty all the time"), *Punishment Feelings* (ranging from 0: "I don't feel I am being punished" to 3: "I feel I am being punished"), *Self-Dislike* (ranging from 0: "I feel the same about myself as ever" to 3: "I dislike myself"), *Self-Criticalness* (ranging from 0: "I don't criticize or blame myself more than usual" to 3: "I blame myself for everything bad that happens"), and *Worthlessness* (ranging from 0: "I do not feel worthless" to 3: "I feel utterly worthless").

3. Results

We examined the extent to which (a) symptoms of anhedonia were independently associated with suicidal ideation *at baseline*, (b) symptoms of anhedonia *at baseline* were independently associated with suicidal ideation *at termination*, (c) symptoms of anhedonia at termination were associated with suicidal ideation at

termination; (d) *changes* in anhedonia symptoms from baseline to termination were associated with suicidal ideation *at termination*, and (e) *changes* in anhedonia symptoms from baseline to termination were associated with *changes* in suicidal ideation from baseline to termination. We assessed anhedonia both as a combined subscale when accounting for depression, and at a symptom-level. This procedure allowed us both to evaluate the predictive validity of the anhedonia subscale when accounting for cognitive/affective symptoms of depression, and to evaluate the discriminant validity of each individual symptom of anhedonia, when accounting for the other symptoms of anhedonia.

3.1. Anhedonia subscale

We conducted five hierarchical regressions, with the anhedonia subscale in step 1, the cognitive/affective subscale in step 2, and suicidal ideation as the dependent measure. As predicted, the anhedonia subscale at baseline was associated with suicidal ideation at baseline, $\beta=0.39$, $p < 0.001$. Moreover, the anhedonia subscale at baseline was associated with suicidal ideation at termination $\beta=0.18$, $p < 0.001$. In addition, *even when correcting for baseline suicidal ideation,* anhedonia remained a significant predictor of suicidality at end of treatment, $\beta=0.08$, $p < 0.01$. Next, the anhedonia subscale at termination was associated with suicidal ideation at termination $\beta=0.47$, $p < 0.001$; changes in the anhedonia subscale from baseline to termination predicted suicidal ideation at termination $\beta=0.15$, $p < 0.001$; and changes in the anhedonia subscale from baseline to termination were associated with changes in suicidal ideation from baseline to termination $\beta=0.34$, $p < 0.001$. Thus, the anhedonia subscale at admission was a robust predictor of suicidality at baseline, termination, and over time.

We then added cognitive/affective symptoms of depression to analyses. The anhedonia subscale at baseline remained associated with suicidal ideation at baseline $\beta=0.18$, $p < 0.001$, independent of cognitive/affective symptoms at baseline $\beta=0.32$, $p < 0.001$; the anhedonia subscale at baseline evidenced a trend association with suicidal ideation at termination $\beta=0.06$, $p=0.08$, independent of cognitive/affective symptoms at baseline $\beta=0.19$, $p < 0.001$; the anhedonia subscale at termination remained associated with suicidal ideation at termination $\beta=0.21$, $p < 0.001$, independent of cognitive/affective symptoms at termination $\beta=0.37$, $p < 0.001$; changes in the anhedonia subscale from baseline to termination predicted suicidal ideation at termination $\beta=0.08$, $p=0.04$, independent of changes in cognitive/affective symptoms $\beta=0.13$, $p < 0.001$; and changes in the anhedonia subscale were associated with changes in suicidal ideation $\beta=0.16$, $p < 0.001$, independent of changes in cognitive/affective symptoms $\beta=0.27$, $p < 0.001$. Thus, the anhedonia subscale remained a robust predictor of suicidality at baseline, termination, even when holding cognitive/affective symptoms of depression constant.

3.2. Separate anhedonia symptoms

Separate regression analyses examined the relationship between loss of interest, loss of pleasure, loss of energy, loss of sexual interest, and suicidal ideation at different time points. To examine whether anhedonia symptoms were associated with suicidal ideation independent of each other *at baseline*, all four predictor variables were entered into the regression analyses concurrently. The overall regression was significant, $F(4, 1522)=77.11$, $p < 0.001$, $R^2=0.17$. Loss of interest, $\beta=0.25$, $p < 0.001$, and loss of pleasure, $\beta=0.16$, $p < 0.001$ each were related to suicidal ideation independently, whereas loss of energy, $\beta=0.05$, $p=0.14$, and loss of interest in sex, $\beta=0.02$, $p=0.58$, were not (see Fig. 1).
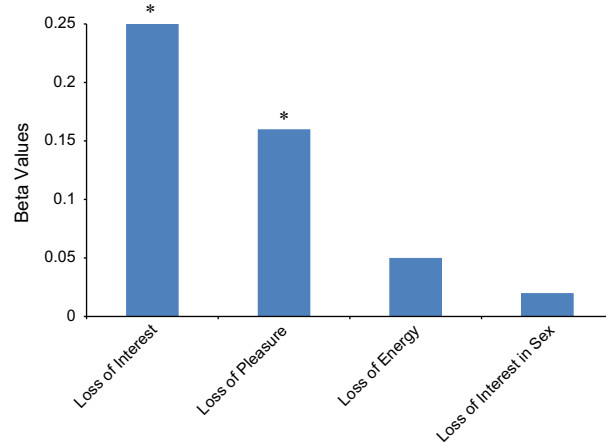

Fig. 1. Independent beta values for each baseline symptom of anhedonia associated with baseline suicidal ideation. *Note*: Asterisk indicates $p < 0.05$.
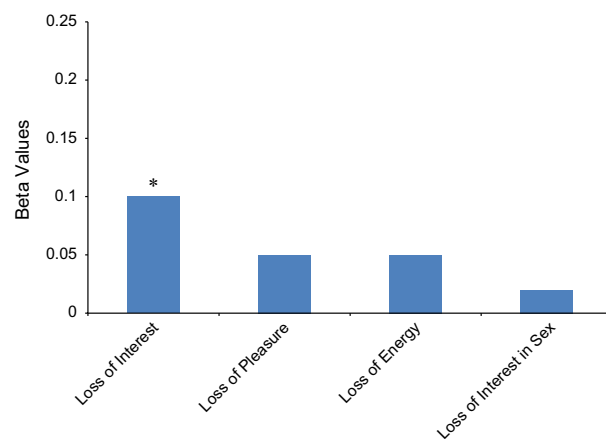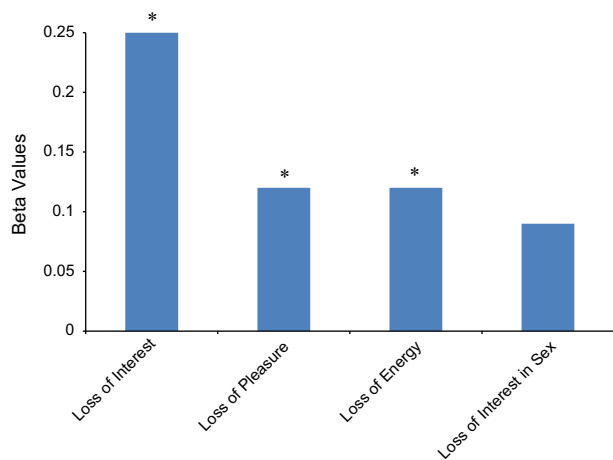

Fig. 2. Independent beta values for each baseline symptom of anhedonia associated with suicidal ideation at termination. *Note*: Asterisk indicates $p < 0.05$.
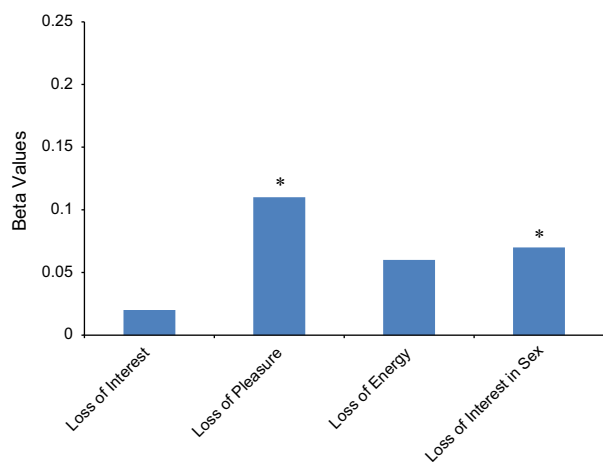
To examine whether anhedonia symptoms *at baseline* predicted suicidal ideation *at termination*, all four predictor variables were entered into the regression analyses concurrently. The overall regression was significant, $F(4, 1156)=10.39$, $p < 0.001$, $R^2=0.04$. Loss of interest at baseline predicted suicidal ideation at termination, $\beta=0.10$, $p=0.03$. However, loss of pleasure, $\beta=0.05$, $P=0.26$, loss of energy, $\beta=0.05$, $p=0.17$, and loss of interest in sex, $\beta=0.02$, $p=0.49$, did not predict suicidal ideation at termination independent of loss of interest (see Fig. 2).

To examine whether anhedonia symptoms *at termination* were associated with suicidal ideation independent of each other *at termination*, all four predictor variables were entered into a regression analyses concurrently. The overall regression was significant, $F(4, 1157)=87.00$, $p < 0.001$, $R^2=0.23$. In addition, loss of interest, $\beta=0.25$, $p < 0.001$, and loss of pleasure, $\beta=0.12$, $p < 0.01$, loss of energy, $\beta=0.12$, $p < 0.01$, and loss of interest in sex, $\beta=0.09$, $p < 0.01$, at termination were all independently related to suicidal ideation at termination (see Fig. 3).

We next examined whether *changes* in symptoms of anhedonia independently predicted suicidal ideation *at termination*, with all four predictor variables entered into the regression analyses concurrently. The overall regression was significant, $F(4, 1156)=8.62$, $p < 0.001$, $R^2=0.03$. Contrary to prediction, change in loss of pleasure $\beta=0.11$, $p=0.01$ and change of interest in sex, $\beta=0.07$, $p=0.03$ predicted suicidal ideation at termination, whereas change in loss of interest, $\beta=0.02$, $p=0.64$, and loss of energy, $\beta=0.06$, $p=0.10$, did not (see Fig. 4).

Fig. 3. Independent beta values for each symptom of anhedonia at termination associated with suicidal ideation at termination. *Note*: Asterisk indicates $p < 0.05$.
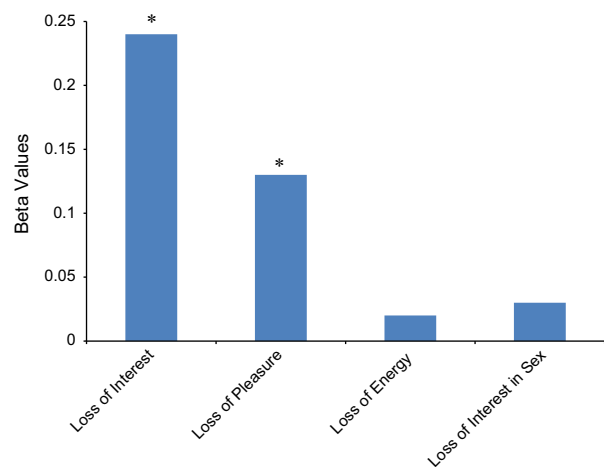

Fig. 4. Independent beta values for changes in symptoms of anhedonia from baseline to termination associated with suicidal ideation at termination. *Note*: Asterisk indicates $p < 0.05$.

We last examined whether *changes* in symptoms of anhedonia independently predicted *changes* in suicidal ideation, with all four predictor variables entered into the regression analyses concurrently. The overall regression was significant, $F(4, 1156) = 42.80$, $p < 0.001$, $R^2 = 0.13$. Change in loss of interest, $\beta = 0.24$, $p < 0.001$, and loss of pleasure, $\beta = 0.13$, $p < 0.001$ each were related to change in suicidal ideation independently, whereas change in loss of energy, $\beta = 0.02$, $p = 0.61$, and change in loss of interest in sex, $\beta = 0.03$, $p = 0.30$, were not (see Fig. 5).

4. Discussion

The *anhedonia subscale* (Joiner et al., 2003) was associated with suicidality in each of our five primary analyses. Moreover, the anhedonia subscale remained a robust predictor of suicidality at baseline, termination, and over time, even after accounting for cognitive/affective symptoms of depression (e.g., hopelessness) that have previously been associated with suicidality in inpatient populations (Dori and Overholser, 1999). These findings indicate that the anhedonia subscale is a predictive measure with regard to suicidality in inpatient populations, and perhaps others.

There were also important discriminant findings produced by individual anhedonia symptoms, with the *Loss of Interest* item evidencing the most robust association with suicidality at baseline

Fig. 5. Independent beta values for changes in symptoms of anhedonia from baseline to termination associated with changes in suicidal ideation from baseline to termination. *Note*: Asterisk indicates $p < 0.05$.

and over time, even when accounting for other symptoms of anhedonia. Thus, the loss of interest item seems to offer unique ability, even among anhedonia symptoms, to specifically predict suicidality. This finding is in line with previous results demonstrating the specific relationship between social variables and suicidal ideation (Smith et al., 2012).

4.1. Limitations and future directions

A limitation of the current study is the use of the BDI-II alone to examine multiple constructs, and the need to use individual items to enhance discriminant validity. Future studies should investigate the relationship between anhedonia and suicidality using novel, independently validated measures of anhedonia that share strengths with the anhedonia subscale and loss of interest item (Winer et al., 2014) and items indexing other important constructs of the interpersonal-psychological theory of suicide (Van Orden et al., 2010; Nadorff et al., 2014). Such research would allow for an independent assessment of whether the relationship between anhedonia and suicidal ideation is mediated by levels of thwarted belongingness or perceived burdensomeness.

4.2. Clinical implications

Taken together, these findings suggest that anhedonia symptoms warrant particular clinical attention in the treatment of suicidal patients, even when accounting for suicidality at baseline or cognitive/affective symptoms of depression. Moreover, our findings suggest that the manner in which anhedonia is conceptualized is important in predicting suicidal ideation.

Recent loss of interest in people may indicate a person who is at particular risk for losing the ability to find meaning in life or a reason to go on living. This change has important clinical implications, as these symptoms may be particularly responsive to treatment (Smith et al., 2012). Recognizing the risk of recent changes in anhedonia may allow for quicker clinical action and interventions that focus on increasing positive affect and enjoyment (Martell et al., 2010; Linehan and Lungu, 2012) and increasing feelings of belongingness and connection (Allen, 2011). Continued investigation of the associations between anhedonia and suicidality over time will allow researchers and clinicians to more accurately predict and subsequently reduce suicidal behavior.

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