DO MOOD DISORDERS ALTER CRYING? A PILOT INVESTIGATION

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Clinical commentators widely interpret crying as a sign of depressed mood. However, there is virtually no empirical data on this topic, and the evidence that mood disorders alter crying is surprisingly weak. This study compared mood disordered patients to a nonpsychiatric reference group on the frequency, antecedents, and consequences of crying behavior using a well-validated questionnaire measure of crying. Forty-four outpatients diagnosed with three forms of mood pathology were age and gender matched to a reference group of 132 participants sampled to be representative of the Dutch population. Both groups completed the Adult Crying Inventory, which provides estimates of the self-reported frequency, antecedents, and consequences of crying behavior. Depression severity and psychiatric symptom severity data were also collected from patients. Compared with the reference group, patients with mood pathology reported increased cry proneness to negative antecedents. By contrast, patients and controls did not differ in reported cry proneness to positive antecedents. Patients reported less mood improvement after crying than did controls. Among male patients, but not female patients, depression severity was associated with increased crying proneness and increased crying frequency. This pilot investigation suggests that mood disorders increase the frequency of negative emotional crying, and may also alter the functions of this behavior. Mood disorders may influence male crying to a greater extent than female crying. Future directions designed to clarify the causal pathways between mood disorders and alterations in crying behavior are discussed. Depression and Anxiety 25:E9–E15, 2008. © 2008 Wiley-Liss, Inc.

Key words: crying; mood disorders; depression; sex differences

INTRODUCTION

Crying has long been viewed as a basic human behavior that communicates distress and a need for help [Darwin, 1872; Hendriks et al., in press]. It has often been observed that people cry more when they are in a depressed state. As early as the sixteenth century, Bright noted: “Of all the actions of melancholie…none is so manifolde and diverse in partes, as that of weeping [Bright, 1586, p 135]”. From Darwin [1872] onward, clinical commentators have continued to see tight links between tearfulness and depression [e.g., Beck et al., 1979; Hamilton, 1967; Nelson, 2000, 2005; Patel, 1993, 2001]. Despite these widespread assertions, DSM-IV does not currently require changes in crying behavior for diagnosing mood disorders. Moreover, the empirical record concerning the relationship between crying and depression is surprisingly scanty and unsettled. Before presenting data designed to yield
a more detailed picture of how mood pathology influences crying, we briefly review theoretical and empirical work on crying in depression [for a more detailed review, see Vingerhoets et al., in press].

THEORETICAL PERSPECTIVES ON CRYING IN DEPRESSION

There have been two primary theoretical perspectives on the relationship between crying and clinical depression. A first posits that crying is: (a) increased in depressed persons and (b) linearly related to the severity of depression [e.g., Beck et al., 1979]. This first perspective is intuitive, given that sad mood is a major characteristic of unipolar mood disorders, and that sadness is considered to be a common antecedent of crying [Vingerhoets et al., 2001; Wallbott and Scherer, 1988]. A second theoretical perspective posits a nonlinear relationship between depression and crying [Nelson, 2000; Patel, 1993]. According to this perspective, increased crying is characteristic of milder forms of depression, but more severe forms of depression actually suppress crying, leading to an inability to cry in severe depression [e.g., “beyond weeping,” Hamilton, 1967].

Inventories of depression severity often include items measuring crying, but often diverge on how items measuring crying are scored. Most inventories such as the Center of Epidemiological Studies Depression Scale [CES-D, Radloff, 1977], the Zung Self-rating Depression Scale [Zung, 1965], and the Edinburgh Postnatal Depression Scale [EPDS, Cox et al., 1987] score their crying items linearly, assuming a positive linear relationship between crying and depression severity. By contrast, the Beck Depression Inventory-II [Beck et al., 1996] scores the crying item nonlinearly, with increased crying associated with mild and moderate depression, and an inability to cry scored as indicating severe levels of depression.

Also signaling the unsettled status of crying in the mood disorders, the last four editions of the Diagnostic and Statistical Manual of Mental Disorders (DSM) have varied considerably in how the symptom of crying is addressed in mood pathology. For example, DSM-III [1980] listed crying proneness and fits of crying as one of 13 symptoms for the mood disorder diagnosis of dysthymia. However, later editions of the DSM no longer mention crying as a symptom of dysthymia. In the last four editions of DSM, adjustment disorder may receive the additional qualifier ‘with depressed mood’ if symptoms such as increased tearfulness, depressed mood, and feelings of hopelessness are present. In DSM-III and DSM-III-R [1987], crying was not mentioned as a symptom of major depressive disorder (MDD). Subsequently, in DSM-IV [1994] and DSM-IV-TR [2000], it is noted that depressed mood, one of the two cardinal symptoms necessary for a MDD diagnosis, can be derived either from subjective reports, or observations of tearful behavior made by others.

In sum, both contemporary theoretical perspectives and clinical diagnostic practices suggest a relationship between crying and the mood disorders, but they do not present a unified picture of what that relationship is. We now review the limited empirical work that has addressed the relation between crying and mood pathology.

EMPIRICAL FINDINGS ON CRYING IN DEPRESSION

Extant studies of crying and depression have predominantly been conducted with nonclinical samples. In general this work has not evidenced robust relations between crying and depressive symptoms. Two studies found statistically significant but small effects for reported crying frequency, with dysphoric individuals reporting more frequent crying than non-dysphoric individuals [Frey et al., 1983; Hastrup et al., 1986]. However, studies taking a correlational approach to this question have either found no association between depression severity and reported crying [Kraemer and Hastrup, 1986; Labott and Martin, 1987], or associations that held for only one gender in the study sample [females: Frey et al., 1983; males: Choti et al., 1987; Hammen and Padesky, 1977].

Empirical studies of crying conducted with individuals who have diagnosable mood conditions are extremely limited, generally only describing demographic and clinical features associated with this behavior. For example, on the basis of ward observations, Davis et al. [1969] concluded that crying was more common among neurotic than among psychotic depressives. Importantly, the only experimental study in this area of research used a controlled sad stimulus to elicit crying and did not find that depressed persons were any more likely than healthy participants to exhibit crying behavior, nor were significant relations found between depression severity and the likelihood of observable crying behavior [Rottenberg et al., 2002]. In sum, studies with diagnosed participants have yet to adduce strong evidence of a relation between depression and crying [for a more detailed review that reaches this conclusion, see Vingerhoets et al., in press].

THE PRESENT STUDY

Crying is a complex, contextually dependent behavior that cannot be summarized by a single item measure [Vingerhoets et al., 2000]. Thus, in the present study, we used a well-validated measure of crying behavior that addressed several domains of crying. Questionnaire items were included to ascertain whether mood disorders alters the antecedents, the frequency, and the consequences of crying. For example, while it is well known that crying can be precipitated both by negative emotions (e.g., sadness) and by positive emotions (e.g., joy) [see Vingerhoets...
et al., 2001], to the best of our knowledge, clinical studies have not differentiated between these antecedent states. Second, crying often has important consequences, such as altering interpersonal relations, mood state, and physical arousal [Hendriks et al., in press; Rottenberg et al., 2003]. Thus, we measured these consequences of crying. Finally, one of the most robust determinants of crying in adulthood is gender. It has been found consistently that women cry more often and intensely than men [reviewed in Bekker and Vingerhoets, 2001; Vingerhoets and Scheirs, 2000]. Thus it important to examine whether depression may mute or maintain gender differences in crying. Although some work suggests depression will mute these effects [Hamilton, 1967] other findings suggest that these gender differences in crying are maintained, as revealed by self-reports of crying [Carter et al., 2000; Okada, 1991; Salokangas et al., 2002] and observations of tearful behavior [Rottenberg et al., 2002].

In sum, to move the field toward a more differentiated picture of how mood disorders alter crying, this study compared patients with a range of mood disorder diagnoses to a nonpsychiatric control on several aspects of crying including: (a) overall crying frequency, (b) proneness to cry to positive and negative antecedents; and (c) emotional and physical consequences of crying. Secondary analyses examined links between depression severity and crying among the patients, as well as gender differences in crying as a function of mood pathology.

**METHOD**

**PARTICIPANTS**

Forty-four outpatients with mood diagnoses (25 women and 19 men) were recruited to participate in this study. All participants were fluent Dutch speakers between the ages of 18 and 60 years ($M = 36.3$ years, $SD = 11.37$). Informed consent was obtained from all participants.

Patients with mood pathology met DSM-IV criteria for either dysthymia, adjustment disorder with depressed mood, or major depressive disorder. Diagnoses were established by trained psychologists and mental health nurses using standard interview procedures based on DSM-IV. Thirty-four percent of patients were diagnosed with dysthymia ($N = 15$), 30% with adjustment disorder with depressed mood ($N = 13$), and 36% with major depressive disorder ($N = 16$). Patients had no other current diagnosable Axis-I disorders or signs of current alcohol or substance dependence. Forty-three percent of patients were receiving antidepressant medication.

All patients were receiving treatment from a centre for ambulatory mental health care in the Netherlands. Sixty-five patients who had qualifying mood pathology were contacted by telephone and solicited to join the study. Eleven of these contacted patients declined participation. The 54 remaining patients received questionnaires to complete at home. Eighty-two percent of these patients completed their questionnaires and returned them in person (Table 1).

The control group was composed of 132 participants (75 women and 57 men). These individuals were selected from of a large ongoing study of social and economic status in the Netherlands, which has enrolled 1,843 panelists sampled to be representative of the Dutch population [Reimus and Vingerhoets, 2006; Reimus et al., in press]. Controls were matched to patients on gender and age with a ratio of 3:1.

**MEASUREMENT OF CRYING**

Patients and controls completed a 17-item version of the Adult Crying Inventory [ACI-S, Vingerhoets and Cornelius, 2001], containing emotions possibly associated with shedding tears. The patient group additionally completed eight items referring to situations (reunion, therapeutic setting, etc.) for explorative purposes. The instructions on the ACI defined crying to participants as tearful behavior not due to local irritation in the eye.

**Antecedents.** Participants used a seven-point-scale (rating from never to always) to indicate how often they tend to cry to four positive ($\alpha = 0.73$) and 13 negative ($\alpha = 0.92$) antecedents that can elicit tears.

**Frequency.** Patients and controls estimated their overall crying frequency in the last 4 weeks.

**Consequences.** Finally, both patients and controls completed single-item measures concerning changes in emotional and physical state after crying. These items were scored on a three-point scale with options, worse than before, the same, and better than before.

### TABLE 1. Mood disorder patient characteristics by gender

<table>
<thead>
<tr>
<th></th>
<th>Men (N = 19)</th>
<th>Women (N = 25)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symptom severity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean SCL-90 score</td>
<td>185.6</td>
<td>185.1</td>
</tr>
<tr>
<td>Mean BDI-II score</td>
<td>27.0</td>
<td>24.7</td>
</tr>
<tr>
<td>Mood diagnosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dysthymia</td>
<td>7 (37%)</td>
<td>8 (32%)</td>
</tr>
<tr>
<td>Major depressive disorder</td>
<td>7 (37%)</td>
<td>9 (36%)</td>
</tr>
<tr>
<td>Adjustment disorder</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>6 (32%)</td>
<td>13 (52%)</td>
</tr>
<tr>
<td>No</td>
<td>13 (68%)</td>
<td>12 (48%)</td>
</tr>
</tbody>
</table>

Note: SCL-90 = Symptom Check List-90; BDI-II = Beck Depression Inventory II.
Changes in crying threshold and inability to cry. Patients answered a single question concerning how often they experienced an inability to cry, indicating on a five-point scale, ranging from never to almost always, as well as questions concerning changes in their crying behavior since their onset of mood symptoms. Using 10 point scales, patients also rated their crying tendency (ranging from “I rarely cry” to “I cry very often”) and their ease of crying (ranging from “I cry hardly” to “I cry very easily”) for the period before the onset of mood symptoms and for the last 4 weeks.

SYMPTOM SEVERITY MEASURES
To determine depression severity in patients, we used the Dutch version of the Beck Depression Inventory-II (BDI-II; Beck et al., 1996, Dutch translation by Van der Does, 2002) The BDI-II is a 21-item self-report questionnaire, which measures the severity of depressive symptoms (α = 0.92). Psychiatric symptom severity was measured with the Symptom Check List-90 [SCL-90; Derogatis, 1983; Dutch translation by Arrindell and Ettema, 1986]. The SCL-90 measures a variety of psychiatric symptoms and has been commonly used as an overall measure of psychiatric symptomatology. Participants indicated on the SCL-90 the extent to which they suffered from the described symptoms in the last week.

RESULTS
PRELIMINARY ANALYSES
Preliminary analyses first examined whether there were effects of medication or diagnostic category among mood disorder patients. Patients receiving antidepressant pharmacotherapy did not differ from unmedicated patients with respect to the overall depression levels (BDI; M = 28.3 versus 24.0, t = 1.46, ns), reported levels of crying proneness (M = 2.63 versus 2.87, t = −0.76, ns), 4-week crying frequency (M = 3.83 versus 7.20, t = −1.52, ns), or in post-crying self-reported mood (M = 2.21 versus 2.29, t = −0.36, ns) or post-crying physical state (M = 1.84 versus 2.04, t = −0.94, ns). ANOVA analyses conducted on mood disorder group found no effect of diagnostic group for levels of reported crying proneness (F(2, 40) = 0.19, ns), crying frequency (F(2, 40) = 1.92, ns), or in post-crying self reported mood (F(2, 40) = 0.96, ns) or physical state (F(2, 40) = 0.75, ns). Given that no effects of medication or diagnostic category were observed, we pooled patients into a single mood pathology group in subsequent analyses.

GROUP DIFFERENCES IN REPORTED CRYING FREQUENCY, ANTECEDENTS, AND CONSEQUENCES
The patient and control groups differed in overall crying frequency, with patients reporting higher crying frequency than controls (M = 5.79 versus 1.50, t = 3.81, P < 0.001). Patients also reported higher overall crying proneness on the ACI-S across all antecedents (M = 2.77 versus 2.00, t = 4.69, P < 0.001). These group differences in crying frequency and crying proneness held for both men and women. Separate analysis of responses to positive and negative antecedents on the ACI-S, however, revealed that group effects were carried by negative antecedents. That is, patients with mood pathology reported higher crying proneness to negative antecedents than the control group (M = 2.96 versus 1.96, t = 4.86, P < 0.001). In contrast, patient and control groups reported similar crying proneness to positive antecedents (M = 2.13 versus 2.14, t < 1, ns) (Tables 2 and 3).

The control group reported significantly more improvement in mood state after crying episodes than did patients (M = 2.61 versus 2.26, t = 2.90, P < 0.05). Patients and controls did not differ in reported physical state after crying (M = 1.95 versus 2.09, ns).

DEPRESSION SEVERITY AND CRYING
Within the patient sample, depression severity scores did not evidence linear relationships with estimated crying frequency and overall crying proneness (rs, .21−.27, ns), nor any significant nonlinear quadratic effects (all P > .05). To further analyze possible nonlinear relations between depression and crying, we compared depression severity between patients who reported that they often or almost always experienced the inability to cry with those who never or rarely had this feeling. Consistent with the idea that more severe mood disturbance may suppress crying, depression severity was greater among patients who reported a consistent inability to cry than those who rarely or never had this feeling (M = 29.7 versus 21.52, t = −2.63, P < 0.05).

<table>
<thead>
<tr>
<th>TABLE 2. Reports of crying proneness to positive and negative crying antecedents by mood status and gender</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crying proneness</td>
</tr>
<tr>
<td>Positive antecedents</td>
</tr>
<tr>
<td>Men</td>
</tr>
<tr>
<td>Women</td>
</tr>
<tr>
<td>Overall</td>
</tr>
</tbody>
</table>

Depression and Anxiety
TABLE 3. Correlations between depression severity and crying frequency, crying proneness, and the inability to cry among patients with mood pathology

<table>
<thead>
<tr>
<th></th>
<th>Overall (N = 44)</th>
<th>Men (N = 19)</th>
<th>Women (N = 25)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crying frequency</td>
<td>.24</td>
<td>.39</td>
<td>.09</td>
</tr>
<tr>
<td>Crying proneness,</td>
<td>.27</td>
<td>.47*</td>
<td>.20</td>
</tr>
<tr>
<td>negative antecedents</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crying proneness,</td>
<td>.21</td>
<td>.55*</td>
<td>.04</td>
</tr>
<tr>
<td>positive antecedents</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unable to cry</td>
<td>.28</td>
<td>.43</td>
<td>.23</td>
</tr>
</tbody>
</table>

*P<0.05.

Note: Depression severity = Beck Depression Inventory II total score (without crying item).

GENDER DIFFERENCES IN CRYING

As expected, there were significant gender differences in crying in the control group. Women reported greater crying proneness (Mf = 2.37 versus Mm = 1.54, t = 6.23, P<0.001) and higher estimated crying frequency (Mf = 2.24 versus Mm = 0.53, t = −4.53, P<0.001) than did men. Among patients, however, women and men did not differ in crying proneness (Mf = 3.03 versus Mm = 2.42, t = 1.90, ns) or estimated crying frequency (Mf = 6.46 versus Mm = 4.95, t = −0.67, ns).

Among patients, we also examined whether the onset of mood symptoms led to reported changes in female and male patients’ crying behavior. Paired t-tests revealed that male patients exhibited a significant increase in estimated crying frequency from before the onset of symptoms to the past four weeks (M = 2.0 versus 3.8, t = 2.41, P<0.05) and in the reported ease of crying (M = 2.6 versus 4.2, t = 2.36, P<0.05). By contrast, female patients did not exhibit increases in estimated crying frequency (M = 4.0 versus 4.6, t = 1.01, ns) or reported ease of crying (M = 5.56 versus 6.00, t = 0.79, ns).

Consistent with this pattern of stronger depression-crying relations in men, only male patients’ depression severity was significantly associated with crying proneness (see Table 3; positive antecedents, r = 0.55, P<0.05; negative antecedents, r = 0.47; P<0.05; female rs, r09–.20, both ns). Finally, only among males was psychiatric symptom severity significantly associated with crying proneness (r = 0.54, P<0.05) and with estimated crying frequency (r = 0.53, P<0.05).

DISCUSSION

Clinical commentators have long insisted that mood disorders alter crying behavior, but the lack of empirical data on this question remains striking. To provide an initial empirical investigation of this question, measures of the frequency, antecedents, and consequences of crying behavior were obtained in outpatients diagnosed with mood pathology and in a nonpsychiatric reference group. Partially consistent with prior theories and observations that depression increases crying behavior [Beck et al., 1979], patients with mood pathology reported greater 4-week crying frequency and overall crying proneness than a nonpsychiatric reference sample. These effects are important simply in demonstrating that there is an empirical relationship between crying and depression, which has heretofore only been shown in nonclinical samples [e.g., Frey et al., 1983; Hastrup et al., 1986]. At the same time, and underscoring the complexity of the relationship between crying and depression, within-group analyses of patients yielded only limited evidence of linear or nonlinear relations between depression severity and measures of crying.

Interestingly, patients with mood pathology reported greater crying proneness only to negative antecedents, and not to positive events. There are several possible explanations for this effect. It may be that mood disorders selectively alter the functions of negative emotional crying. Or it may be that mood disordered individuals have a reduced experience of the positive emotions that typically precede crying [Allen et al., 1999]. It is tempting to speculate that anhedonia—the loss of the capacity to feel pleasure commonly observed in depressed patients—is responsible for reduced crying in positive contexts. To verify this idea, it will be useful to assess the corresponding emotions that occur in positive and negative situations that elicit crying.

Healthy individuals typically report retrospective mood improvement after crying [see Cornelius, 1997, 2001; Hendriks et al., in press]. Consistent with the possibility that mood pathology alters the consequences of crying [Rottenberg et al., 2002], patients in this study reported less mood improvement after crying than their nonpsychiatric counterparts. Theories have proposed that mood improvement after healthy crying is due to endogenous physiological factors associated with crying [increased parasympathetic activity, Rottenberg et al., 2003], or from the success of crying in securing help from the social environment [see Cornelius, 1997, 2001 and Hendriks et al., in press for reviews]. Consequently, the finding of reduced mood improvement after depressed crying may reflect physiological deficits, a reduced ability of patients to draw comfort and attention from the social environment, and/or simply that the situations that evoke depressed crying [e.g., memories of loss and failure, Teasdale, 1988] are not as easily corrected as the situations that lead healthy individuals to cry.

Our study also investigated gender effects in crying as manifested in mood disorders. Unlike the reference sample, which exhibited substantial gender effects, male and female patients did not differ reliably in crying proneness or crying frequency. This null result differs from prior findings of increased reports of
crying in depressed women [Carter et al., 2000; Okada, 1991] and may stem from differences in how crying was assessed in this study. Although our data are consistent with the idea that depression may mute the large gender differences in crying behavior that characterize adult populations [see Bekker and Vingerhoets, 2001; Vingerhoets and Scheirs, 2000], it is also possible that limitations in statistical power constrained our ability to detect gender effects among the patients. Reinforcing the idea that mood disorders may alter typical sex differences in crying, however, men (but not women) reported that the onset of depression led to increases in their crying frequency and cry proneness. Finally, there were also associations between symptom severity and crying in men, but not in women, a pattern previously found only in nonclinical samples [Choti et al., 1987; Hammen and Padesky, 1977].

We submit this study as a modest step designed to move the field toward a more differentiated picture of crying in the mood disorders. Nevertheless, four limitations of the current study should be noted. First, this study relied upon self-reports of crying. Although the ACI-S has demonstrated validity and the use of self-reports of crying has been shown to be valid in many contexts, it is also known that retrospective self-reports can be vulnerable to bias due to implicit theories or memory failures [van Tilburg et al., 2003]. Thus, it becomes imperative for future work to use a variety of different measures to index crying in mood disorders, including on-line measures of crying using experience sampling or daily diary methodologies, as well as designs that incorporate observational data and data from other informants. Second, sample sizes of individual mood diagnoses were too small to make strong comparisons between diagnoses (sample sizes were large enough, however, to detect differences between mood pathology patients as a whole and a reference population sample); thus, replication and extension of these findings with larger sample sizes are warranted. Third, although the reference sample was nonpsychiatric and was constructed to be representative of Dutch society, it may have contained individuals who suffered from mood disorders. Thus, it is possible that our study is conservative in estimating group differences in crying. Fourth, the cross-sectional nature of the data precludes causal inferences concerning the relationship between the onset of mood symptoms and changes in crying behavior. It is possible that onset of mood disorders may lead to more frequent and ready crying to negative antecedents. Alternatively, individuals who are vulnerable to depression may exhibit differences in crying propensity premorbidly, owing to differences in personality or attachment style [Nelson, 2005]. To clarify these issues of causation, collection of longitudinal crying data in a depression-vulnerable sample, including measures of relevant premorbid person factors (i.e., attachment style) will be critical.

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