



Research report

Attachment and social adjustment: Relationships to suicide attempt and major depressive episode in a prospective study

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ABSTRACT

Objective: To study two aspects of interpersonal function – attachment security and social adjustment – in relation to suicide attempt and major depressive episode (MDE) during naturalistic follow-up of up to one year after presentation with MDE.

Method: 136 adults who presented with a DSM-IV MDE completed the Adult Attachment Scale and the Social Adjustment Scale-Self Report at study entry. Based on follow-up interviews at three months and one year, we used survival analysis to investigate the relationship of scores on these measures with time to a suicide attempt and time to recurrent MDE.

Results: Less secure/more avoidant attachment predicted increased risk of suicide attempt during the 1-year follow-up (Wald $\chi^2 = 9.14$, $df = 1$, $p = 0.003$, HR = 1.16, 95% CI = 1.05 to 1.27). Poorer social adjustment predicted increased risk of recurrent MDE (Wald $\chi^2 = 6.95$, $df = 1$, $p = 0.008$, HR = 2.36, 95% CI = 1.25 to 4.46), and that in turn increased the risk of a suicide attempt ($z = 4.19$, $df = 1$, $p < 0.001$, HR = 17.3, 95% CI = 4.6 to 65.5).

Conclusions: Avoidant attachment in the setting of major depressive disorder is a potential therapeutic target to prevent suicidal behavior. Enhancing social adjustment may reduce relapse in major depressive disorder and thereby reduce risk of a suicide attempt. Study limitations include small sample size and use of a self-report attachment scale.

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1. Introduction

Prevention of suicide, most commonly associated with Major Depressive Disorder (MDD), is an NIMH “area of high priority” (2009). Interventions aimed at reducing suicidal behavior in depressed individuals must target modifiable risk factors. One established risk factor for suicidal behavior is the domain of interpersonal relationships. “There is consistent evidence indicating an association between suicidal behavior and difficulties in interpersonal relationships” (Bongar et al., 2000; Weissman, 1974).

Interpersonal bonds require an ability to form an attachment and then to maintain and negotiate the relationship. Attachment

theory, pioneered by Bowlby and Ainsworth, holds that early experiences of child–caregiver relationships profoundly influence an individual's ability to navigate social situations throughout life (Crowell et al., 2008). Difficulties in the development of secure attachment patterns appear to “reduce resilience in times of stress and contribute to emotional problems and poor adjustment” (Mikulincer and Shaver, 2008).

An insecure attachment style in adults predicts the onset (Bifulco et al., 2002; Bifulco et al., 2003) and a more severe course (Conradi and de Jonge, 2009) of depression. However, although MDD is the disorder most frequently associated with suicide, “surprisingly few studies have examined the risk of suicide from an attachment perspective,” particularly in adults (Mikulincer and Shaver, 2007). Seven studies, mostly in adolescents, which found a correlation between insecure attachment and suicidal ideation or behavior were retrospective or cross-sectional (Adam et al., 1996; de Jong, 1992; DiFilippo and Overholser, 2000; Lessard and Moretti, 1998; Riggs and Jacobvitz, 2002; Stepp et al.,

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2008; West et al., 1999). To our knowledge, no study has examined the predictive effect of attachment on suicidal behavior using a prospective design.

Social adjustment is a broader phenotype than attachment. It represents an ability to negotiate interpersonal relationships defined by an individual's different roles, such as worker, friend, spouse, or parent. Decades of research has focused on social adjustment both as predictor and outcome of depressive disorders (Brown and Harris, 1978; Garnezy, 1993; Henderson, 1998; Kleinman, 1988; Wade and Kendler, 2000). In a female twin registry study, Wade and Kendler found evidence of bi-directional causal relationships between social support and MDD and also a third pathway implicating genetic factors which raise the risk both for MDD and for lower social support (Wade and Kendler, 2000).

Several measures exist for measuring social adjustment (reviewed by Hirschfeld et al. (2000)). Three studies used one such measure, the Social Adjustment Scale (Weissman and Bothwell, 1976; Weissman et al., 2001), to assess this domain as a predictor of depressive symptoms, and reached varying results (Bauwens et al., 1998; Nierenberg et al., 1995; Reimherr et al., 2001). These studies did not test the relationship of social adjustment to suicidal ideation or behavior.

We used a prospective design to investigate the relationships of these two aspects of interpersonal function with MDD and suicidal behavior. We hypothesized that less secure attachment and poorer social adjustment would both predict greater risk of major depressive episode (MDE) and of suicide attempt during one year of follow-up after presentation with a MDE.

2. Methods

2.1. Subjects

The sample included 136 patients who presented to our research clinic for evaluation and treatment of a MDE and who were re-assessed at three months and one year of prospective follow-up. Patients were recruited through advertisements in local newspapers and clinician referral, participated in neurobiological studies of depression, and then received open clinical treatment. For inclusion, subjects had to meet DSM-IV criteria for unipolar MDE and score ≥ 16 on the 17-item Hamilton Depression Rating Scale (HAM17). Exclusion criteria included bipolar disorder, current substance abuse or dependence within six months, anorexia or bulimia within one year, electro-convulsive therapy within six months, unstable medical problems, significant neurological illness, or past head injury. After complete description of the study, participants gave written informed consent approved by the Institutional Review Board.

The sample was 60% female, 73% non-Hispanic white, and 14% Hispanic. The mean age was 39.2 y (SD 12.3) and mean total education was 15.4 years (SD 2.6). 39% were currently employed. At study entry, the sample was 24% married, 63% were inpatients, 35% had a lifetime history of substance use disorder, and 49% had a lifetime history of a suicide attempt. The mean baseline HAM17 score was 19.4 (SD 5.4). Subjects had a median of three lifetime MDEs (maximum truncated at 20, as some reported too many to count). The median duration of the baseline MDE was 24 weeks (maximum truncated at 104). The median follow-up time in the study was 306 days (range 36 to 365).

2.2. Measures

Baseline consensus Axis I and II diagnoses utilized the Structured Clinical Interview for DSM-IV patient edition (SCID I and II) (First et al., 1996; Spitzer et al., 1990). Depression was assessed with the HAM17 (Hamilton, 1960) and the Beck Depression Inventory (BDI) (Beck et al., 1961). Raters assessed suicide attempt history with the Columbia Suicide History Form (Oquendo et al., 2003). Lifetime aggression, hostility, and impulsivity were rated with the Brown–Goodwin Aggression Inventory (BGAI) (Brown et al., 1979), Buss–Durkee Hostility Inventory (BDHI) (Buss and Durkee, 1957), and Barratt Impulsivity Scale (BIS) (Barratt, 1965). Suicidal ideation was assessed using the Scale for Suicidal Ideation (SSI) (Beck et al., 1979), hopelessness with the Beck Hopelessness Scale (BHS) (Beck et al., 1974), and reasons for living with the Reasons for Living Scale (RFL) (Linehan et al., 1983). Raters were psychologists or social workers with a masters or Ph.D. Inter-rater agreement and intra-class coefficients for clinical scales were good to excellent (ICC 0.71–0.97) (Mann et al., 1999).

Attachment style was rated at study entry with Simpson's Adult Attachment Scale (AAS) (Simpson, 1990). The AAS, a 13-item measure, asks subjects to rate themselves on a series of statements about "how you usually feel toward your romantic partners." Examples include, "I find it relatively easy to get close to others," "I'm not very comfortable having to depend on other people," "I rarely worry about being abandoned by others," and "I find it difficult to trust others completely." Subjects rate themselves on 7-point Likert scales ("Strongly agree" to "Strongly disagree"). We followed Simpson's recommendation to score the measure using a secure vs. avoidant factor (items 1–3 and 5–9) and a secure vs. anxious factor (items 4 and 10–13) (Simpson et al., 1992). In our sample, Cronbach's alpha was 0.77 for the secure vs. avoidant factor and 0.76 for the secure vs. anxious factor, indicating acceptable reliability. For simplicity, we will refer to these as the avoidant and anxious factors.

Social adjustment was assessed at study entry using the Social Adjustment Scale–Self Report (SAS-SR), a 54-item measure of social role function (Weissman and Bothwell, 1976; Weissman et al., 2001). It assesses the prior two weeks in six areas: work (paid, unpaid homemaker, or student); social and leisure activities; relationships with extended family; marital/primary relationship partner; parenting; and family unit, including economic wellbeing (Weissman and MHS staff, 1999). Questions cover: 1) task performance; 2) friction with others; 3) interpersonal relations; and 4) feelings and satisfactions. Questions are rated on a five-point scale, with higher score indicating greater impairment. Item scores are summed and divided by number of items answered to obtain overall and sub-scale means (Weissman and MHS staff, 1999). The SAS-SR has shown good agreement with the clinician-rated version, has high internal consistency, good test–retest reliability, and norms are available for community and clinical samples (Weissman and MHS staff, 1999).

2.3. Follow-up

During follow-up, subjects who enrolled as inpatients received open treatment in the community after hospital discharge whereas those who enrolled as outpatients received

six months of open treatment in our clinic followed by treatment in the community. Treating psychiatrists determined pharmacotherapy according to clinical judgment. Follow-up assessments included an inventory of pharmacotherapy regimens.

Follow-up evaluations used the SCID I (Spitzer et al., 1990) to measure whether or not DSM-IV criteria for MDE were met during each month since the last assessment. Episode onset/offset dates were coded as follows: for consecutive months of MDE (at least one month), the starting day was coded as the first of the month and lasting until the last day of the last month in which full MDE criteria were met. For MDEs of less than a month's duration, onset date was coded as starting on the 15th and ending on the last day of the month.

2.4. Statistical analysis

The primary analysis focused on the relationship of baseline scores on the AAS and SAS-SR to suicide attempt and MDE during the follow-up. Cox proportional hazard regression was used, first in unadjusted models and then adjusting for potential confounds. The assumption of proportional hazards was checked for each of these models. Because some AAS items are reverse-coded, all were recoded so that higher score indicates less secure attachment of the avoidant or anxious type, depending on the factor.

The relationship at baseline of the AAS and SAS-SR to potential confounds was tested using correlation, *t*, and non-parametric tests. Analyses were performed using SPSS version 16.0 for Windows (SPSS, Inc., Chicago, IL) and SAS (SAS Institute Inc., Cary, NC).

Since a substantial proportion of subjects had not experienced any suicidal ideation at the three months and one-year follow-up assessment, we tested whether AAS and SAS-SR scores predicted dichotomous suicidal ideation (yes/no) using logistic regression.

Analyses with time to MDE as outcome were restricted to the subgroup (*N* = 83, 61%) that did not meet criteria for MDE during the first three weeks of follow-up. This time frame was chosen to approximate ACNP task force recommendations on defining remission (Rush et al., 2006). Many variables we tested were correlated, thus Bonferroni correction, which assumes independent tests, would be extremely conservative. Since the study had two primary outcomes, suicide attempt and MDE, we chose $\alpha = 0.025$ for all tests.

As a secondary aim, we performed a longitudinal analysis to test whether MDE mediates the relationship of attachment or social adjustment to suicide attempt during follow-up. This analysis used Cox regression with MDE (present/absent) as a time-dependent covariate. Therefore, follow-up time for each subject was divided into periods with and without MDE.

3. Results

3.1. Prediction of suicide attempt during follow-up: AAS

During the one year follow-up, 12 subjects (9%) made a total of 26 suicide attempts. Of the attempters, 11 (92%) had a suicide attempt history prior to study entry. The median lethality of the attempts was 3, corresponding to moderate injury requiring outpatient medical treatment (e.g. asleep

Table 1

Unadjusted Cox regression models tested for different outcomes.

Predictor variable	Wald	<i>p</i>	Hazard ratio	95% CI
<i>Outcome = Suicide attempt during 1-year follow-up (N = 136)</i>				
Avoidant attachment	9.14	.003	1.16	1.05 to 1.27
Avoidant attachment (categorical; median split)	4.63	.031	5.29	1.16 to 24.19
Anxious attachment	0.08	.78	0.99	0.91 to 1.07
Social Adjustment Scale-Self Report mean score	3.66	.056	2.56	0.98 to 6.69
<i>Outcome = Suicidal ideation at 3-month follow-up (N = 136)</i>				
Avoidant attachment	8.12	.004	1.07	1.02 to 1.12
Anxious attachment	3.41	.065	1.06	0.99 to 1.12
<i>Outcome = Major depressive episode during 1-year follow-up (N = 83)</i>				
Avoidant attachment	3.14	.076	1.03	0.99 to 1.07
Anxious attachment	0.036	.850	1.00	0.96 to 1.05
Social Adjustment Scale-Self Report mean score	6.95	.008	2.36	1.25 to 4.46

*df = 1 for all tests.

after a sedative overdose, suturing of self-inflicted wound necessary, limb fracture).

Avoidant attachment predicted greater risk of suicide attempt in an unadjusted model (Table 1). For each point more avoidant, risk of suicide attempt increased 16%. Using a median split, the group with more avoidant attachment showed a trend toward a fivefold increased risk of suicide attempt during follow-up (Table 1 and Fig. 1). Anxious attachment did not predict suicide attempt (Table 1).

Since a past suicide attempt is one of the strongest predictors of future attempt, we tested a model of time to attempt adjusted for baseline attempter status. Both past attempt history (Wald $\chi^2 = 5.77$, *df* = 1, *p* = 0.016, HR = 12.3, 95% CI = 1.59 to 95.68) and avoidant attachment as a continuous variable (Wald $\chi^2 = 8.82$, *df* = 1, *p* = 0.003, HR = 1.15, 95%

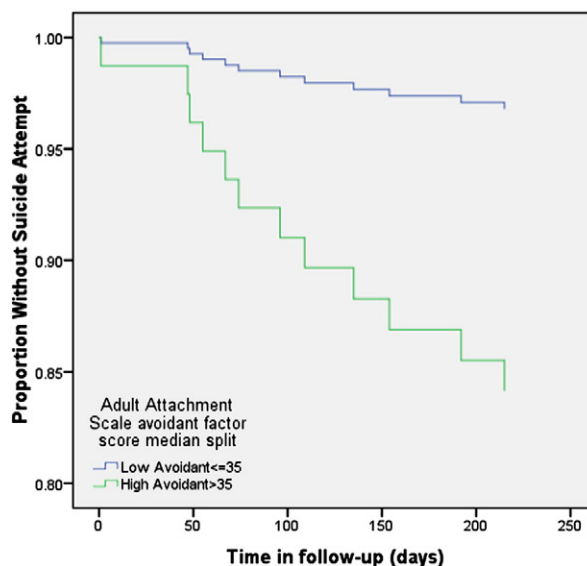


Fig. 1. Survival plot of time to suicide attempt during one year follow-up after presenting with major depressive episode for groups with high vs. low avoidant attachment. Cox proportional hazard comparison of groups (Wald $\chi^2 = 4.63$, *df* = 1, *p* = .031, HR = 5.29, 95%CI = 1.16 to 24.19).

CI= 1.05 to 1.25) predicted suicide attempt during follow-up. The small change in the adjusted hazard ratio for attachment indicates minimal confounding by past attempt.

Avoidant attachment predicted suicidal ideation at the 3-month follow-up (Table 1), but not at 1-year ($p=0.35$). Anxious attachment did not predict suicidal ideation at 3-months (Table 1) or 1-year ($p=0.16$).

At baseline, avoidant attachment correlated modestly with subjective depression, hopelessness, HAM17, SAS-SR, and inversely with reasons for living (Table 2). Avoidant attachment was not associated with age, sex, marital status, in/outpatient status, past suicide attempt, past substance use disorder, comorbid borderline personality disorder, recent suicidal ideation (SSI), trait impulsivity (BIS), hostility (BDHI) and aggression (BGAI), number of past major depressive episodes, length of the current MDE, or number of follow-up days taking antidepressant medication (Table 2).

We tested separate Cox models of time to attempt with avoidant attachment as a predictor, adjusting for one potential confounder (RFL, BDI, BHS, HAM17, and SAS-SR). Avoidant attachment remained a significant predictor in each model ($p \leq 0.01$) with hazard ratios ranging from 1.12 to 1.16 except in the model adjusting for baseline BDI, in which avoidant attachment showed a trend (Wald $\chi^2 = 4.66$, $df = 1$, $p = 0.031$, $HR = 1.11$) and BDI score was marginally significant (Wald $\chi^2 = 5.01$, $df = 1$, $p = 0.025$, $HR = 1.08$). In the model adjusting for SAS-SR, avoidant attachment was significant (Wald $\chi^2 = 7.58$, $df = 1$, $p = 0.006$, $HR = 1.15$) and SAS-SR was not (Wald $\chi^2 = 1.22$, $df = 1$, $p = 0.27$, $HR = 1.79$).

3.2. Prediction of suicide attempt during follow-up: SAS-SR

Social adjustment (SAS-SR score) did not predict suicide attempt during 1-year follow-up (Table 1).

3.3. Prediction of MDE during follow-up: AAS

Neither the avoidant nor the anxious attachment factor predicted MDE during follow-up (Table 1).

3.4. Prediction of MDE during follow-up: SAS-SR

Poorer social adjustment (higher SAS-SR score) predicted greater risk of recurrent MDE during 1-year follow-up (Table 1). A 1/2-point poorer mean score predicted 50% greater risk of MDE during follow-up.

At baseline, poorer social adjustment was associated with unmarried status, impulsivity, hostility, subjective depression, hopelessness, and avoidant attachment (Table 3). SAS-SR was not associated with age, sex, education, income, in/outpatient status, length of baseline MDE, number of past MDEs, recent suicidal ideation, past suicide attempt, past substance use disorder, comorbid borderline personality disorder, trait aggression, reasons for living, anxious attachment, HAM17, or follow-up days taking antidepressant medication.

We tested separate models with SAS-SR as a predictor, adjusting for one potential confounder. In the models adjusting for marital status, impulsivity, hostility, hopelessness, and avoidant attachment, SAS-SR remained a significant predictor

Table 2
Association of Adult Attachment Scale avoidant factor with baseline variables.

Characteristic	N	Test statistic (r)	df	p		
Age	135	0.08		.37		
Recent suicidal ideation	127	0.12		.19		
Reasons for living	127	-0.22		.015		
Impulsivity	127	0.10		.26		
Trait aggression	134	0.06		.53		
Hostility	133	0.08		.36		
Subjective depression (BDI)	132	0.37		<.001		
Hopelessness (BHS)	133	0.21		.013		
Objective depression (HAM17)	135	0.22		.01		
Social adjustment (mean SAS-SR score)	135	0.26		.002		
Number of past major depressive episodes (MDE)	135	0.13		.15		
Length of baseline MDE	122	0.11		.25		
Total days taking any antidepressant medication	135	0.12		.16		
	N (%)	Mean (SD)	t	df	p	
Sex	Female	80 (59)	35.4 (9.2)	-1.4	133	.16
	Male	55 (40)	33.2 (8.3)			
Married	Yes	31 (23)	33.9 (8.5)	0.42	133	.67
	No	104 (77)	34.7 (9.0)			
Inpatient at baseline	Yes	85 (63)	34.8 (9.1)	-0.46	132	.65
	No	49 (36)	34.0 (8.7)			
Past suicide attempter	Yes	65 (48)	34.7 (9.3)	0.23	133	.82
	No	70 (52)	34.4 (8.5)			
Lifetime substance use disorder	Yes	47 (35)	36.2 (8.4)	1.58	133	.12
	No	88 (65)	33.6 (9.1)			
Borderline personality disorder	Yes	39 (29)	35.9 (9.3)	1.21	132	.23
	No	95 (70)	33.9 (8.7)			

*Cases where total $N < 136$ due to missing data.

Table 3

Association of Social Adjustment Scale-Self Report mean score with baseline variables in subgroup ($N = 83$) not meeting major depressive disorder criteria for the first three weeks of follow-up.

Characteristic	N	Test statistic (<i>r</i>)	df	<i>p</i>		
Age	83	−0.01		.96		
Recent suicidal ideation	80	0.13		.25		
Reasons for living	76	−0.25		.029		
Impulsivity	81	0.25		.025		
Trait aggression	82	0.17		.13		
Hostility	81	0.34		.002		
Subjective depression (BDI)	80	0.43		<.001		
Hopelessness (BHS)	81	0.34		.002		
Objective depression (HAM17)	83	0.18		.11		
Avoidant attachment	82	0.28		.011		
Anxious attachment	80	0.25		.027		
Number of past major depressive episodes (MDE)	83	0.16		.15		
Length of baseline MDE	74	0.01		.96		
Total days taking any antidepressant medication	83	0.04		.70		
	<i>N</i> (%)	Mean (SD)	<i>t</i>	df	<i>p</i>	
Sex	Female	51	2.6 (0.5)	−0.61	81	.54
	Male	32	2.6 (0.5)			
Married	Yes	22	2.4 (0.5)	2.42	81	.018
	No	61	2.7 (0.5)			
Inpatient at baseline	Yes	55	2.6 (0.5)	0.55	80	.59
	No	27	2.6 (0.4)			
Past suicide attempter	Yes	45	2.7 (0.5)	0.79	81	.43
	No	38	2.6 (0.5)			
Lifetime substance use disorder	Yes	23	2.7 (0.5)	−1.39	81	.17
	No	60	2.6 (0.4)			
Borderline personality disorder	Yes	23	2.7 (0.5)	−0.88	80	.38
	No	59	2.6 (0.5)			

*Cases where total $N < 83$ due to missing data.

of MDE with hazard ratios from 2.16 to 2.37 ($p = 0.01$ to 0.023). In the model adjusting for subjective depression at baseline, BDI score predicted MDE (Wald $\chi^2 = 7.93$, $df = 1$, $p = 0.005$, $HR = 1.06$, $95\% CI = 1.02$ to 1.09) and SAS-SR was not significant (Wald $\chi^2 = 0.90$, $df = 1$, $p = 0.34$, $HR = 1.42$, $95\% CI = 0.69$ to 2.9).

3.5. Mediation by MDE of prospective suicide attempts

In a longitudinal Cox model with time-dependent covariate, MDE during follow-up predicted suicide attempt ($z = 4.19$, $df = 1$, $p < 0.001$, $HR = 17.3$, $95\% CI = 4.6$ to 65.5). The risk of suicide attempt was 17 times greater during MDE. Using the same method, results for SAS-SR were not significant ($z = 1.66$, $df = 1$, $p = 0.097$, $HR = 2.02$, $95\% CI = 0.9$ to 4.6). With both predictors in the model, the hazard ratio for SAS-SR decreased to 1.5 ($p = 0.32$) while for MDE it was little changed ($HR = 16.1$, $p < 0.001$), suggesting that any suicide attempt risk associated with social adjustment is largely mediated through higher risk of MDE during the follow-up period.

The parallel analysis using avoidant attachment as predictor did not show mediation by MDE. The hazard ratio for avoidant attachment was significant in the unadjusted model ($z = 3.82$, $df = 1$, $HR = 1.16$, $p < 0.001$, $95\% CI = 1.07$ to 1.25) and was not appreciably smaller in the model adjusted for recurrent MDE ($z = 3.81$, $df = 1$, $HR = 1.13$, $p < 0.001$, $95\% CI = 1.06$ to 1.20).

4. Discussion

The main finding of this study is that avoidant attachment predicted greater risk of suicide attempt during one year

follow-up of adults after presentation with an MDE. The effect was independent of potential confounds including past attempt status, objective depressive severity, hopelessness, reasons for living, and social adjustment. In the model adjusted for subjective depression severity at baseline (BDI), avoidant attachment was at the trend level ($p = 0.031$) and BDI was marginally significant ($p = 0.025$). To our knowledge, this is the first study to demonstrate that an insecure attachment style is a predictor of suicide attempts using a prospective, longitudinal design.

The results support two of the four study hypotheses. Insecure avoidant attachment predicted risk of suicide attempt and poorer social adjustment predicted risk of MDE during 1-year follow-up. The converse was not true. Neither attachment factor predicted MDE during follow-up. Any effect of poorer social adjustment on prospective suicide attempts appeared to be mediated by greater risk of recurrent MDE.

The fact that avoidant attachment predicted suicide attempt, whereas social adjustment was a better predictor of MDE, supports the view that MDE and suicidal behavior are distinct phenomena with some shared variance (Mann et al., 1999). The model of suicide attempt with avoidant attachment and BDI score as predictors suggested that greater subjective depression may explain some of the effect of avoidant attachment. MDE during follow-up conferred a 17-fold higher risk of suicide attempt. However, we did not find evidence that recurrent MDE mediated the effect of avoidant attachment. The results underscore the importance of treatment of depression for suicide attempt prevention and also suggest that avoidant attachment may represent an independent risk factor deserving further exploration as an intervention target. Clinical trials

of two therapies aimed, in part, at ameliorating maladaptive attachment in borderline personality disorder showed efficacy in preventing suicidal behavior (Bateman and Fonagy, 1999) or “suicidality” (Clarkin et al., 2007), with the latter showing evidence of improving attachment patterns (Levy et al., 2006).

Avoidant attachment predicted suicidal ideation at three months, but not one year. This could be explained by the fact that suicidal ideation is a common symptom of depression and avoidant attachment was more weakly associated with MDE than with suicide attempts. Avoidant attachment may be a more specific marker of risk for suicide attempt, rather than ideation. If so, this would be more important for suicide prevention.

The fact that half the items comprising the avoidant attachment factor assess ease with close relationships is consistent with the identification by others of temperamental risk factors for suicidal behavior. Two case-control studies found associations of “interpersonal aversiveness” (Nordström et al., 1995) and low reward dependence, associated with aloofness (van Heeringen et al., 2000), with history of suicide attempt. The latter study found that low reward dependence correlated with higher urinary cortisol (van Heeringen et al., 2000), suggesting a link to stress responsiveness. Individuals with an avoidant attachment style or aloof temperament may have smaller support networks to buffer them against stressful life events. Alternatively, persons who are more sensitive to interpersonal stress may develop avoidant attachment styles as a self-protective coping mechanism.

It is of interest that in our study anxious attachment did not predict MDE whereas most studies have found depression to be associated with an anxious rather than avoidant attachment style (Shaver et al., 2005). This may relate to the limitations of the 13-item scale we used, in comparison to more established, finer-grained attachment instruments. It could also relate to findings that an avoidant style may be important in more severely depressed persons or to self-critical and self-punitive dimensions of depression (Mikulincer and Shaver, 2007).

Our finding that poorer social adjustment predicted MDE during follow-up replicates studies of this subject over several decades (Brown and Harris, 1978; Garmezy, 1993; Henderson, 1998; Kleinman, 1988; Wade and Kendler, 2000). Social adjustment is a complex construct with many facets, including social support (Leskela et al., 2006), family function (Keitner et al., 1995), response to stress (Paykel, 1978), and capacity for resilience (Garmezy, 1993; Rutter, 2006). Hirschfeld et al. summarized the construct as, “the ability to function socially, maintain and enjoy relationships and work, and provide for themselves and family” (Hirschfeld et al., 2000).

A case-control study found that suicide was associated with poorer social function, independent of psychiatric illness (Duberstein et al., 2004). However, the effect of poorer social adjustment on suicide attempts in our study appeared to be mediated by greater risk of recurrent MDE.

Few interventions have been shown to prevent suicide in patients with MDD (reviewed by Mann et al. (2005)). The present findings suggest that avoidant attachment may represent a characteristic deserving further study with the goal of understanding and preventing suicidal behavior. For example, depressed patients with avoidant attachment

tendencies may comprise a high risk subgroup where suicide prevention trials might be more likely to detect an effect. Alternatively, suicidal depressed patients for whom antidepressant medication does not readily alleviate suicidal feelings may benefit from augmentation with psychotherapy that focuses on avoidant attachment tendencies.

Attachment security and social adjustment likely increase individuals' resilience to stress. Uncovering biological correlates of these factors may suggest new treatments. An fMRI study in humans showed that attachment insecurity correlated with greater amygdala activity and autonomic reactivity during a stress and attachment related task (Lemche et al., 2006). (For a review of the psychobiology of attachment in animal models see Polan and Hofer (2008)).

The relatively small sample size, particularly for the analysis with MDE as the outcome, is a limitation. The fact that the sample comprised patients seeking treatment in a clinic known to focus on suicide research and that unstable medical problems and current substance use disorders were excluded may limit applicability to other populations.

Another limitation is that the sample was restricted to those for whom we had obtained follow-up data. Differential attrition among those with different attachment and social adjustment styles could have affected our results. However, it seems that attrition would be more likely among more avoidant or poorly adjusted subjects. This would have depleted the sample of those most vulnerable to the effects we found and thus might have been expected to bias results toward the null.

The AAS and SAS-SR are both self reports and thus vulnerable to recall bias. A recent review of self-report measures of adult attachment, including the AAS, agreed with its two-dimensional structure as reflecting “the basic functioning of the attachment system” (Fraley and Phillips, 2009). Depressed patients and their close relatives appeared to agree on level of impairment using the SAS-SR (Weissman and Bothwell, 1976).

Because subjects completed the AAS and SAS-SR during a baseline MDE, scores on both scales most likely represent a combination of state and trait effects. Nonetheless, correlations of the two scales with baseline BDI ($r=0.37$ and 0.45 , respectively) and HAM17 ($r=0.22$ and 0.17 , respectively) scores were modest. We adjusted for depression severity in the regression models. Furthermore, the model with MDE as a time-dependent covariate did not provide evidence that recurrent MDE mediates the effect of avoidant attachment on suicide attempts.

In the model of MDE during follow-up adjusted for baseline BDI, the lack of significance for social adjustment may have reflected limited statistical power. Additionally, our use of the three-week time frame to define remission from MDE may be too narrow.

Treatment during follow-up was not controlled, but neither AAS nor SAS-SR was associated with number of follow-up days that subjects reported taking antidepressant medication. Finally, we performed many statistical tests and some may consider $\alpha=0.025$ to be too liberal.

In summary, our findings suggest that avoidant attachment predicts suicide attempt and poorer social adjustment predicts recurrent MDE during 1-year follow-up of this sample of in- and outpatients who presented with MDE.

Clinical intervention trials could target these important non-symptomatic domains in the hopes of improving prognosis.

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Conflict of interest

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