

Trait Anger, Anger Expression, and Suicide Attempts Among Adolescents and Young Adults: A Prospective Study

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Abstract:

Previous studies of the relationship between anger, anger expression, and suicidal behavior have been largely cross-sectional and have yielded mixed findings. In a prospective, naturalistic study, we examined how trait anger and anger expression influenced the likelihood of suicide attempts among 180 adolescents followed for up to 13.3 years after discharge from an inpatient psychiatry unit. Results showed that higher trait anger and anger expressed outwardly over the follow-up was related to increased likelihood of suicide attempts among boys. For girls, trait anger and both the inward and outward expression of anger moderated the risk for suicide attempts associated with major depression. These results are interpreted in light of theory regarding behavioral activation and behavioral inhibition systems.

Article:

The rate of suicide attempts increases greatly through adolescence (Lewinsohn, Rohde, Seeley, & Baldwin, 2001). In this context, it is notable that adolescence is a period marked by multiple developmental transitions, both at the biological and interpersonal level, which may contribute to difficulties with emotion regulation (Arnett, 1999; Dahl, 2004). Such difficulties are sometimes associated with the development of psychopathology and behavioral problems (e.g., Mullin & Hinshaw, 2007). In particular, some adolescents have difficulty regulating behavior in the face of anger, an emotion long hypothesized to be associated with suicidal behavior.

The manner in which individuals cope with or regulate anger may be an important consideration in understanding its relationship to suicidal behavior. Individuals can cope with anger by expressing anger verbally or physically toward people or things within their environment (anger expressed outwardly; Spielberger, 1988). Alternatively, individuals may cope with anger by suppressing or withholding the anger (anger expressed inwardly) (Spielberger, Krasner, & Soloman, 1988).

Anger and the expression of anger may be associated with suicidal behavior via their relationship with the behavioral activation system (BAS) and behavioral inhibition system (BIS). The BAS is the biological system associated with appetitive or approach behavior, whereas the BIS is

associated with avoidance behaviors (Gray, 1987, 1990). Anger has been thought to be related to both the BAS and BIS, but data from young adults suggest that it is most strongly linked to behavioral activation (Smits & Kuppens, 2005). Moreover, among college students, tendencies toward expressing anger outwardly have been found to be positively associated with the BAS, whereas anger expressed inwardly has been found to be associated with the BIS (Smits & Kuppens, 2005).

Research findings regarding the relationship between anger, the expression of anger, and suicidal behavior among youths and young adults have been mixed. Cross-sectional studies variously have found that higher levels of trait anger differentiate suicidal and nonsuicidal youths (Lehnert, Overholser, & Spirito, 1994), are more common among previous or repeat adolescent suicide attempters (Esposito, Spirito, Boergers, & Donaldson, 2003; Goldston et al., 1996), do not differentiate between groups with different histories of suicidal behaviors (Horesh, Orbach, Gothelf, Efrati, & Apter, 2003; Pinto & Whisman, 1996), or are not related to suicidality after controlling for covariates (Kingsbury, Hawton, Steinhardt, & James, 1999; Pinto & Whisman, 1996). Studies regarding anger expression and suicidal behaviors also have yielded mixed findings regarding whether anger expressed inwardly, anger expressed outwardly, or both, are related to suicide attempts (Cautin, Overholser, & Goetz, 2001; Lehnert et al., 1994).

Nonetheless, physical fighting and impulsive aggression (Brent & Mann, 2006; Swahn, Lubell, & Simon, 2004), presumably related to the outward expression of anger, have been implicated as important correlates of suicidal behaviors among young people. Longitudinal studies have focused primarily on the utility of anger variables at entry to the study to predict subsequent suicidal behavior. Specifically, anger was found to predict suicide attempts over 3 years among depressed children and adolescents (Myers, McCauley, Calderon, & Treder, 1991), anger toward self was related to subsequent suicidal ideation among male but not female adolescents followed through young adulthood (Goldney, Winefield, Saebel, Winefield, & Tiggeman, 1997), and trait anger assessed at psychiatric hospitalization did not predict the time until first suicide attempts in the first 5 years after discharge among adolescents (Goldston et al., 1999). One prospective study of formerly hospitalized youths found that self-reported aggression was not directly related to suicide attempts; however, internalizing symptoms were more predictive of later attempts among highly aggressive than less aggressive youths (Kerr et al., 2007). Nonetheless, longitudinal studies generally have not examined whether the course of anger over time is related to risk for suicidal behavior. Moreover, extant cross-sectional and longitudinal studies have inconsistently examined the degree to which gender moderates the relationship between anger and suicidal behavior.

It is possible that any observed relationship between anger and suicidal behaviors simply may be reflective of the association between anger and major depressive and substance use disorders, which also convey risk for suicidal behaviors (Eftekhari, Turner, & Larimer, 2004; Knox, King, Hanna, Logan, & Ghaziuddin, 2000; Perlis et al., 2007). It also is possible that anger poses independent and especial risk when individuals are already in states of depression, or when they are disinhibited because of the effects of alcohol and drugs. These disorders also may have their own relationships with the BAS and BIS, which may interact with or add to any behavioral activation associated with anger (e.g., McFarland, Shankman, Tenke, Bruder, & Klein, 2006).

In sum, there has been little prospective research regarding the course of anger, or patterns of anger expression over time, in relation to risk for suicidal behavior among adolescents and young adults. The primary purpose of the present study was to clarify the relationship between the course of both trait anger and anger expression and risk for suicide attempts in a longitudinal, repeated assessments study of adolescents followed up to 13 years into young adulthood following psychiatric hospitalization. A second purpose was to examine whether the course of anger and anger expression were predictive of suicide attempts, even after considering the relationship of other powerful predictors of suicide attempts including number of previous suicide attempts, major depressive disorder, and substance abuse disorder. A third purpose was to examine the degree to which the risk for suicidal behavior associated with anger and patterns of anger expression over time were moderated by previous suicide attempts, major depressive disorder, or substance use disorder. We also were interested in examining the degree to which the relationship between anger and anger expression and suicide attempts was similar, or differed for male and female adolescents and young adults.

Because of clinical reports and theoretical speculation regarding the importance of anger as a risk factor for suicidality, we hypothesized that higher trait levels of anger over the follow-up period would be associated with an increased likelihood of suicide attempts during that period. Because of findings regarding a relationship between suicide attempts and physical fighting (Swahn et al., 2004) and impulsive aggression (Brent & Mann, 2006; Swahn et al., 2004), we also hypothesized that greater outward expression of anger over time would be associated with increased attempts. We hypothesized that these effects would be apparent, even after considering other risk factors for suicide attempts including number of past attempts, major depressive disorder, and substance use disorders.

METHOD

Participants

One hundred eighty adolescents hospitalized between September 4, 1991, and April 10, 1995, participated in this study. Adolescents were recruited from among consecutive discharges from an adolescent inpatient psychiatry unit in a medical school affiliated hospital in the southeastern United States. Sampling was not based on history of suicidal behavior.

Adolescents were eligible to participate if they met the following criteria: (a) ages 12 to 19 years, (b) no evidence of mental retardation, (c) hospitalization on the unit for at least 10 days, (d) no evidence of serious systemic physical disease such as insulin-dependent diabetes mellitus or seizure disorder, (e) residing in North Carolina or Virginia at the time of the first follow-up assessment, (f) not a sibling of a participant already enrolled in the study, and (g) able to cooperate with and complete the inpatient assessment (e.g., not psychotic). With regard to the length-of-stay criteria, it should be noted that according to national data, the mean length of stay on an adolescent inpatient psychiatry unit during the 1st year of recruitment for this study was 23.6 days (National Association of Psychiatric Health Systems, 1990). At the time this study was initiated, the rationale for the 10-day inclusion criterion was that youths with inpatient stays less than 10 days to this particular facility were often considered to be noncooperative with the clinical process or had denied problems upon admission to the hospital. In addition, it should be noted that state of residence was only a requirement for participation in the initial follow-up

evaluation (during which the consent and assent occurred); continued residence in these states after that point was not a requirement for participation.

To recruit the planned sample, we attempted to locate 225 youths, and were able to find 96% of this sample 6 months after their hospitalization (not counting 1 youth who died because of medical reasons). Of those contacted, 84% agreed to participate in this study (80% of the original eligible sample), including 91 girls and 89 boys, whose ages at hospitalization ranged from 12 to 18 years ($Mdn = 14.8$ years). The majority of participants were White (80%); 17% were African American; and the remainder were Hispanic, Native American, or of Asian heritage. Sixteen percent of youths enrolled in the study were in the custody of the Department of Social Services when they entered the study. The socioeconomic status of the remaining sample at hospitalization, as categorized with the Hollingshead (1957) Index, was as follows: I (highest), 3%; II, 13%; III, 22%; IV, 30%; V (lowest), 32%.

Participants were recruited over a 4-year period, so they were followed for varying lengths of time. In addition, the interval between interviews varied within and between participants because of scheduling conflicts, staff shortages, and participant requests. At the cutoff date for these analyses (May 27, 2005), participants had been followed for up to 13.3 years ($Mdn = 11.1$ years), yielding between 2 and 22 assessments per participant ($M = 10.2$, $SD = 4.0$). By the cutoff for these analyses, 9% ($n = 17$) of the sample had dropped out of the study, and 3% ($n = 6$) of participants had died, none due to suicide. The mean number of follow-up assessments for participants who died or dropped out of the study was 4.4 ($SD = 2.3$). The participants who dropped out of the study or died did not differ from those who remained in the sample in terms of number of suicide attempts ($p = .551$), trait anger ($p = .610$), anger in ($p = .221$), or anger out ($p = .487$).

The sample yielded 1,831 observations. More detailed information regarding clinical characteristics and aftercare service use of this sample, the predictors identifiable at hospitalization for subsequent suicide attempts in this sample, the temporal stability of predictors of suicide attempts, and developmental differences in the relationship between psychiatric disorders over time and suicide attempts have been described in other publications (Arnold et al., 2003; Goldston et al., 2009; Goldston et al., 1999; Goldston et al., 2001; Goldston et al., 2003; Goldston, Reboussin, & Daniel, 2006).

Procedures

As an overview of procedures, youths participated in a standardized clinical assessment at hospitalization, which included a semistructured clinical interview and self-report questionnaires. Following discharge, youths were asked to participate in a longitudinal study. Assessments were originally scheduled every 6 to 8 months and later were tapered to approximately every 10 to 12 months. At every follow-up assessment, participants completed the State Trait Anger Expression Inventory (Spielberger, 1988) and were interviewed with either the Interview Schedule for Children and Adolescents (ISCA) or the young adult version of this interview, the Follow-Up Interview Schedule for Adults (Sherrill & Kovacs, 2000). With the semistructured diagnostic interview instruments, they were asked if suicide attempts had occurred since the last assessment (or since the hospital discharge in the case of the first follow-up assessment) and about the estimated dates of the suicide attempts. Presence or absence of clinically significant symptoms of

psychiatric disorders since the last assessment, and dates of these symptoms, also were assessed at each follow-up assessment. This temporal information was used to estimate the onset and offset dates of major depressive and substance use disorders.

Parents or legal guardians signed consent forms and adolescents assented to participation in the longitudinal study at the time of the first follow-up assessment. Participants signified their consent for continued participation in the study after they reached the age of 18. Separate release of information forms were signed for obtaining treatment records (used in verifying dates of suicide attempts, as described next). Procedures of the study were approved by the Institutional Review Boards of Duke University School of Medicine, the University of North Carolina at Greensboro, and Wake Forest University School of Medicine.

Measures

Suicide attempts. The ISCA (Sherrill & Kovacs, 2000), a semistructured psychiatric diagnostic interview developed for longitudinal studies, was used to assess suicide attempts at hospitalization. The ISCA was administered to both the adolescent and the parent or primary caregiver. Auxiliary information was also obtained from prior records and data from medical charts. At each of the follow-up assessments following hospitalization, the ISCA continued to be administered to the adolescent and to a parent or primary caregiver until participants reached 18 or were living independently. After the age of 18, participants were administered the Follow-Up Interview Schedule for Adults (FISA) at each assessment (Sherrill & Kovacs, 2000), a young adult version of the ISCA. Additional information was obtained from school, treatment, and legal records. Interviewers in this study were mental health professionals trained and supervised in the administration of semistructured clinical interviews.

Suicide attempts were assessed with standardized ISCA and FISA questions (e.g., “Have you ever done anything to try to kill yourself?” “What did you do? How long ago was that? What did you think would happen when you _____?” “Was there a time before that?”). For the present investigation, we examined data regarding the presence/absence of suicide attempts and the dates of suicide attempts since the last assessment. Using definitions consistent with recommendations by O’Carroll and colleagues (1996), self-destructive behavior was classified as a suicide attempt if it was associated with any desire to die, regardless of multiple motives or ambivalence associated with the act. Self-harm behaviors with no intent to kill oneself were not considered to be suicide attempts. Suicidal acts that were stopped before they were executed were classified as suicidal ideation rather than suicide attempts. Interrater reliability of the ISCA item regarding suicide attempts in 46 cases was found to be highly reliable in a study by the developers of the instrument (Cohen $\kappa = 1.00$; Kovacs, 1981). Using data from the current sample, two raters who were blind to the identity of participants used transcribed notes from the ISCA to rate presence or absence of suicide attempts in 40 cases initially rated as having either suicidal thoughts or suicide attempts. Raters were able to classify suicide thoughts and attempts with a high degree of reliability (95% agreement, Cohen $\kappa = .95$; Goldston et al., 2001). The predictive validity of responses to the suicide attempt query of the ISCA also has been demonstrated in this sample (Goldston et al., 1999; Goldston et al., 2001).

There were 54 participants (30% of participants; 24 male, 30 female) who made at least one suicide attempt over the follow-up period. The range of suicide attempts over the follow-up

ranged from 1 to 12, with a median of 2, mean of 2.39, and standard deviation of 2.24 (a right skewed distribution of number of attempts). There were 129 total attempts over the follow-up, 56 among male participants, and 73 among female participants.

Death by suicide. The Social Security Death Index was searched to determine whether participants with whom we had lost contact had died. No deaths other than those of which we already were aware were identified in this manner. In all cases of participant death, evidence obtained from family members or other sources indicated causes of death other than suicide.

Trait anger and anger expression. The State-Trait Anger Expression Inventory (STAXI; Spielberger, 1988) is a self-report measure that was used to assess anger and anger expression at each of the follow-up assessments. For purposes of this study, we used the Trait Anger (10 items), Anger Out (8 items), and Anger In (8 items) scales. Normative data for the STAXI are available for high school students and adults (Spielberger, 1988), and standardized *T* scores were used in current analyses. Spielberger suggested that scores above the 75th percentile (a *T* score of approximately 57) represent increased risk for nonoptimal functioning, and scores above the 90th percentile (a *T* score of approximately 63) represent increased risk for poor health outcomes such as heart disease. In primarily young adult samples, 2-week test-retest reliability of STAXI Trait Anger, Anger In, and Anger Out scales have ranged from 0.70 to 0.77, from 0.66 to 0.82, and 0.64 to 0.80, respectively (Bishop & Quah, 1998; Jacobs, Latham, & Brown, 1988). Across samples, the STAXI Trait Anger and Anger Expression scales generally have been found to have acceptable internal consistency (Eckhardt, Norlander, & Deffenbacher, 2004; Reyes, Meininger, Liehr, Chan, & Mueller, 2003). For example, among middle school, high school, and college students, Cronbach's alpha for the Trait Anger, Anger In, and Anger Out scales ranged from 0.77 to 0.83, 0.65 to 0.84, and 0.70 to 0.76, respectively (Bishop & Quah, 1998; Reyes et al., 2003; Spielberger et al., 1988). In support of construct validity, Spielberger, Reyes et al., and Bishop and Quah documented statistically significant associations between the STAXI Trait Anger, Anger In, and Anger Out scales with other measures of hostility such as the Buss-Durkee Hostility Scale (Buss & Durkee, 1957) and hostility indices from the Minnesota Multiphasic Personality Inventory. In terms of intercorrelations between the STAXI scales, Spielberger found moderately high correlations between Trait Anger and Anger Out scales, suggesting that individuals who experience anger are more likely to express it outwardly rather than suppress it.

Major depressive disorder and substance use disorder. The previously described semistructured ISCA and FISA (Sherrill & Kovacs, 2000) were used to assess symptoms of psychiatric disorder. Symptoms were considered to be clinically significant based on predefined levels of functional impairment, severity, and duration. With the ISCA and FISA, we also assessed the estimated dates when symptoms were present at clinically significant levels. The “midpoint rule” described by Kovacs, Feinberg, Crouse-Novak, Pavlavskas, and Finkelstein (1984) was used to estimate the onset of symptoms when precise chronological information was not available. Using this approach, a window of time was delineated using all available information, and the onset was operationally defined as the midpoint of the defined window of time. The interrater reliability of diagnoses based on the ISCA, and the agreement between ISCA- and FISA-derived diagnoses have been found to be good (Sherrill & Kovacs, 2000). The predictive validity of diagnoses based on information obtained with the ISCA is reflected in

relationships to subsequent diagnoses, outcomes, and suicide attempts (Goldston et al., 1999; Sherrill & Kovacs, 2000).

Diagnoses were provided when participants met full *Diagnostic and Statistical Manual of Mental Disorders* (4th ed., text rev.; American Psychiatric Association, 2000) criteria for disorders. Chronological information about symptoms was used to date the onset of psychiatric disorders. When participants no longer evidenced two or more clinically significant symptoms associated with a diagnosis, the diagnosis was offset. In this regard, participants were required to be asymptomatic for 2 months (or 6 months in the case of conduct disorder or 12 months for substance use disorder) to be considered in remission. In those situations in which participants no longer met full diagnostic criteria, but continued to evidence symptoms of disorders, they were considered to still be “in partial remission” and were counted as continuing in episodes of the disorders (Kovacs et al., 1984).

Assigned diagnoses were independently reviewed by trained clinicians who did not conduct the interview and were made on the basis of all available information including data from the diagnostic interview and treatment records. The final “best estimate” diagnoses (Leckman, Sholomskas, Thompson, Belanger, & Weissman, 1982; Roy et al., 1997) were arrived at by consensus. These diagnostic methods have been used previously in longitudinal studies of youths followed into adulthood (Kovacs, Obrosky, Gatsonis, & Richards, 1997).

Sociodemographic variables at hospitalization. Gender, race, and age at hospitalization were obtained from the medical record at hospitalization.

Statistical Methods

To examine the relationship between suicide attempts over time and trait anger, anger in, and anger out, Andersen–Gill recurrent events survival models were used (Andersen & Gill, 1982). Unlike standard survival analysis, which focuses on time to a single event, recurrent events models are a modification of Cox regression survival models that can be used to examine time to multiple or repeated events among individuals. Recurrent events survival models are being used increasingly to examine health-related outcomes because many psychological and health outcomes such as suicide attempts or recurrence of disorder occur at multiple occasions over time (e.g., Kempe et al., 2007; Taylor, Fillenbaum, & Ezell, 2002; Whang et al., 2005). Andersen–Gill survival models produce estimates of hazard ratios, which indicate the ratio of the risk of an event occurring in one group compared to the risk in another group. Predictors in the Andersen–Gill proportional hazards models can be both fixed (time-invariant, e.g., gender, ethnicity) and time varying (e.g., repeatedly assessed measurements of anger). We used a version of Andersen–Gill models that uses robust standard errors to account for the within-subject correlations that arise from repeated measurements and repeated outcomes within individuals (Lin, Wei, Yang, & Ying, 2000; Wei, Lin, & Weissfeld, 1989). The longitudinal statistical methods used in this study are capable of accommodating missing data, varying amounts of data among participants, and data collected at varying assessment intervals.

In the first set of Andersen–Gill recurrent events survival models, we examined the degree to which repeatedly assessed anger variables were predictive of subsequent suicide attempts after considering the effects of sociodemographic characteristics (e.g., gender, ethnicity, age at

hospitalization), the number of pre-hospitalization suicide attempts, and whether the results differed by gender (i.e., the Gender \times Anger interactions). Because significant gender interactions were found, and because the subsequent longitudinal models with multiple interaction terms were found to be unstable, for ease and clarity of interpretation, all subsequent analyses were conducted separately for male and female participants. In the second set of survival models, we examined whether the effects of anger on future suicide attempts differed as a function of past suicide attempts (i.e., the Prehospitalization Attempts \times Anger interactions). In a third set of analyses, we examined the degree to which anger variables were predictive of suicide attempts after also considering the time-varying covariates of major depression and substance use disorders, and the potentially moderating effects of these diagnostic variables (i.e., Major Depression \times Anger and Substance Use \times Anger interactions). Covariates and interactions that were related to suicide attempts at $p < .05$ were considered to be statistically significant.

RESULTS

The mean and standard deviations for the anger variables as assessed at hospitalization are as follows: Trait Anger, $M = 50.5$, $SD = 13.1$; Anger In, $M = 50.0$, $SD = 9.4$; Anger Out, $M = 56.8$, $SD = 11.1$. The weighted means (i.e., weighted for number of within-subject assessments) and standard deviations of participants' scores over the follow-up were as follows: Trait Anger, $M = 46.6$, $SD = 11.6$; Anger In, $M = 48.0$, $SD = 9.3$; Anger Out, $M = 54.3$, $SD = 9.5$. The correlations between the three anger variables, prior suicide attempts, major depressive disorder, and substance use disorder are presented in Table 1. As expected, there was a significant interrelationship between the anger variables, with the variables sharing between 10% and 50% variance in common. The anger variables and major depressive and substance use disorders shared between less than 1% and 4% variance.

Table 1: Weighted Correlations Between Predictors of Posthospitalization Suicide Attempts

	Anger In	Anger Out	Trait Anger	Prior Attempts	SUD
Anger Out	.310*				
Trait Anger	.512*	.708*			
Prior Attempt	.191*	.030	.099		
SUD	.026	.109*	.101*	.066	
MDD	.192*	.098*	.125*	.071	.017

Note. Major depressive disorder (MDD), substance use disorder (SUD), and prior (prehospitalization) suicide attempts assessed with the Interview Schedule for Children and Adolescents and the Follow-Up Interview Schedule for Adults (Sherrill & Kovacs, 2000); Trait Anger, Anger In, and Anger Out assessed with the State Trait Anger Expression Inventory (Spielberger, 1988); based on 180 participants and 1,831 observations.

* $p < .001$.

In initial recurrent events models, it was apparent that gender significantly moderated the effects of anger expressed outwardly in particular on suicide attempts [Gender \times Anger Out $B = -0.061$, $SE = 0.022$, $\chi^2 = 7.971$, $p = .005$, Hazard Ratio (HR) = 0.941]. In light of the moderating effects of gender, we conducted initial analyses again, as well as subsequent analyses, separately for men and women. In analyses with the main effects of demographic variables and prehospitalization suicide attempts as covariates, for men, there were main effects of anger expressed outwardly and trait anger over the follow-up on suicide attempts ($B = 0.058$, $SE = 0.015$, $\chi^2 = 15.713$, $p < .001$, HR = 1.060; $B = 0.041$, $SE = 0.015$, $\chi^2 = 7.332$, $p = .007$, HR = 1.042). There also was a trend for anger expressed inwardly over the follow-up to be related to suicide attempts among men ($B = 0.026$, $SE = 0.016$, $\chi^2 = 2.740$, $p = .098$, HR = 1.026). For women, there were no main effects of anger variables on attempts following hospitalization ($ps > .417$).

Analyses also were conducted to examine whether prehospitalization number of suicide attempts moderated the effects of trait anger or anger expression on subsequent attempts. In none of these models was there a significant interaction between past attempts and anger variables for men or women ($ps \geq .183$). Hence, these interaction terms were not retained in the final models.

In analyses with diagnostic variables and their interactions, trait anger and anger expressed outwardly over the follow-up continued to be associated with suicide attempts for males, regardless of the presence of major depression and substance use disorders (see Table 2). For men, there were no significant interactions with diagnoses of major depression and substance use, so these interaction terms were dropped from the final models. For women, in contrast, there were interactions between each of the anger variables over the follow-up and the presence of major depression in predicting suicide attempts. The interaction terms between substance use disorder and anger variables were not significant, and were dropped from final models.

Table 2: Final Recurrent Event Models of Repeatedly Assessed Anger Variables on Suicide Attempts, Separately for Each Gender

Variable for Gender	B	SE	χ^2	<i>p</i>	HR
<i>Men</i>					
Trait Anger	0.033	0.017	4.047	.044	1.034
Past Attempts	0.279	0.110	6.450	.011	1.322
Age at Hospitalization	-0.378	0.143	7.015	.008	0.685
Race/Ethnicity	-0.737	0.555	1.765	.184	0.479
MDD	1.365	0.459	8.865	.003	3.917
SUD	0.850	0.448	3.604	.058	2.339
Anger In	0.016	0.016	1.000	.317	1.016
Past Attempts	0.299	0.112	7.150	.008	1.349
Age at Hospitalization	-0.397	0.164	5.845	.016	.0673
Race/Ethnicity	-0.835	0.583	2.054	.152	0.434
MDD	1.460	0.475	9.461	.002	4.306
SUD	0.896	0.460	3.793	.052	2.450
Anger Out	0.044	0.017	6.752	.009	1.045
Past Attempts	0.300	0.102	8.601	.003	1.350
Age at Hospitalization	-0.387	0.139	7.425	.006	0.685
Race/Ethnicity	-0.804	0.567	2.014	.156	0.447
MDD	1.302	0.463	7.902	.005	3.676
SUD	0.825	0.456	3.281	.070	2.282
<i>Women</i>					
Trait Anger	0.033	0.014	5.961	.015	1.034 ^b
Past Attempts	0.004	0.097	<1.000	.965	1.004
Age at Hospitalization	0.032	0.103	<1.000	.759	1.032
Race/Ethnicity	0.066	0.339	<1.000	.847	1.068
MDD	5.562	1.043	28.430	<.001	260.293 ^b
SUD	1.280	0.380	11.349	<.001	3.595
MDD x Trait Anger	-0.071	0.021	11.760	<.001	0.931
Anger In	-0.052	0.399	<1.000	.896	0.949 ^b
Past Attempts	0.143	0.111	1.676	.195	1.154
Age at Hospitalization	0.031	0.108	<1.000	.772	1.032
Race/Ethnicity	-0.006	0.363	<1.000	.986	0.994
MDD	4.737	0.704	45.254	<.001	114.072 ^b
SUD	1.059	0.394	7.215	.007	2.884
MDD x Anger In	-0.053	0.015	12.747	<.001	0.949
Anger Out	0.010	0.013	<1.000	.454	1.010 ^b
Past Attempts	-0.047	0.112	<1.000	.674	0.954
Age at Hospitalization	0.052	0.100	<1.000	.603	1.053
Race/Ethnicity	0.120	0.355	<1.000	.736	1.127
MDD	4.723	1.298	13.244	<.001	112.516 ^b
SUD	1.345	0.411	10.743	.001	3.840
MDD x Anger Out	-0.048	0.023	4.320	.038	0.954

Note. MDD = major depressive disorder; SUD = substance use disorder.

^bInteraction terms that were not statistically significant ($p > .05$) were not retained in final models.

^bThe main effects (and Hazard Ratios) of major depressive disorder and the anger variables for women cannot be interpreted in isolation from the significant interaction term between these variables.

To help in the interpretation of interactions between major depression and anger variables among women, follow-up recurrent event analyses were conducted. In these models, the repeated assessments of trait anger, anger in, and anger out were categorized into “high” (scores at or above the median of normative samples, T scores ≥ 50) and “low” groups (scores below the median of normative samples, T scores < 50). The separate models (one for each anger variable) included the presence of three variables representing various combinations of anger (or anger expression) and major depression—(a) no major depression and low anger, (b) no major depression and high anger, and (c) major depression and low anger. The reference group in these analyses was (d) major depression and high anger. To avoid clouding of interpretation, follow-up analyses included no other covariates. As can be seen in Table 3, in episodes of major depressive disorder, low trait anger was associated with significantly greater risk of suicide attempts than high trait anger. Low trait anger was associated with greater risk in the presence of major depression than in the absence of major depression. In analyses focusing on the expression of anger, episodes of major depression were always associated with increased risk for attempts relative to the absence of major depression. Moreover, in the presence of major depression, low expression of anger—either anger directed inwardly or outwardly—was associated with increased risk for attempts relative to high anger expression.

Table 3: Post Hoc Analyses of the Relationships Among Major Depression, Anger, and Suicide Attempts for Women

Variable	B	SE	χ^2	p	HR
No MDD and Low Trait Anger	-1.964	0.367	28.671	<.001	0.140
No MDD and High Trait Anger	-0.303	0.262	1.339	.247	0.739
MDD and Low Trait Anger	1.334	0.224	35.483	<.001	3.789
No MDD and Low Anger In	-1.356	0.273	24.611	<.001	0.258
No MDD and High Anger In	-0.923	0.313	8.694	.003	0.397
MDD and Low Anger In	1.784	0.198	81.388	<.001	5.957
No MDD and Low Anger Out	-1.744	0.388	20.217	<.001	0.175
No MDD and High Anger Out	-0.742	0.262	8.053	.005	0.476
MDD and Low Anger Out	1.370	0.260	27.709	<.001	3.934

Note. Low Trait Anger, Anger In, and Anger Out defined as T scores < 50 on the State Trait Anger Expression Inventory (STAXI). High Trait Anger, Anger In, and Anger Out defined as T scores ≥ 50 on the STAXI. MDD = major depressive disorder.

DISCUSSION

In this prospective, repeated assessments study, we were able to clarify the relationship between the course of trait anger and patterns over time of anger expression and risk for suicide attempts among adolescents followed through young adulthood. Previous longitudinal studies have not focused on the course of anger or patterns of anger expression over time as correlates or risk for suicide attempts during the developmental transition period from adolescence through young adulthood.

Our findings highlight the fact that gender moderated the effects of trait anger and anger expression on suicide attempts. Among male adolescents and young male adults, the presence of trait anger and anger expressed outwardly continued to be associated with suicide attempts irrespective of diagnoses of major depression and/or substance use disorders. Hence, the relationship between trait anger or the outward expression of anger and suicide attempts was not simply artifactual, a by-product of co-occurring depressive and substance use disorders. This risk among males also did not appear to differ depending on participants' history of suicidal behavior

before the hospitalization, reflecting the fact that anger was associated with risk for both first-time and repeat suicidal behavior. Consistent with prior studies (Spielberger, 1988), there was a strong relationship between trait anger and the outward expression of anger, indicating overlap in these variables and the fact that the primary way of coping with anger may be to express it outwardly. Experiences of anger that were suppressed or not openly expressed (anger in) were not reliably related to risk for suicidal behavior among men.

The findings for the male participants are consistent with the possibility that anger, and by implication, the BAS may be important in understanding the risk for suicidal behavior. For young men, anger may have activating effects that make it more likely that individuals will engage in suicidal behavior when having suicidal thoughts, or considering suicidal behavior as a possible solution to untenable life circumstances. The effects of this activation may be particularly prominent during the adolescent years, a period marked by intensity of emotion and deficits in skills for modulation of mood and behavior among some young people (Dahl, 2004). Future research is needed to further understand the nature of the relationship between anger and suicidal behaviors among adolescents and the mechanisms (e.g., the BAS), which facilitate this relationship.

In terms of the practical significance of these findings for men, we refer to the hazard ratio of 1.034 for anger expressed outwardly in the final models. As a continuous variable with a standard deviation of approximately 10, an individual with a *T* score of 60 on the anger out variable (approximately 1 standard deviation above the mean) would have approximately a 34% increased risk for a suicide attempt (3.4% increment \times 10 point increment in anger out score), relative to someone with a *T* score of 50 on this variable. An increased risk of this magnitude has important clinical implications for the assessment of anger in the context of suicidal behaviors and, in turn, the monitoring and management of suicide risk for young men.

Contrary to the findings with the male participants, low trait anger or low anger expression increased the risk for suicide attempts for women when they were depressed. Depression has been found to be related to low sensitivity to cues of reward or relief, or escape from punishment (i.e., low behavioral activation sensitivity) and high sensitivity to cues of punishment or nonreward (i.e., high behavioral inhibition sensitivity; Alloy et al., 2006; McFarland, Shankman, Tenke, Bruder, & Klein, 2006). It is possible that low trait anger increases the risk of suicidal behavior in the presence of major depression via similar sensitivities toward punishment or nonreward and tendencies toward withdrawal.

The fact that both low inward and low outward expression of anger are associated with increased risk for suicidal behavior in the presence of major depression is not straightforwardly consistent with BAS and BIS explanations for suicidal behavior. Namely, these different modes of anger expression have been thought to be related in different ways to different behavior motivation systems, with outward expression of anger positively associated with behavioral activation, and inward expression of anger positively associated with behavioral inhibition (Smits & Kuppens, 2005). Further research is needed to clarify the relationship between expression of anger, behavioral activation and inhibition, and risk for suicidal behaviors among young women in episodes of major depression.

Clinically, it is possible that young women who are depressed and have lower levels of anger or anger expression differ from depressed women with greater anger in various respects, such as greater severity of depression, greater hopelessness, or other characteristics. For example, among depressed young women, perhaps greater anger may be associated with increased motivation for problem solving or assertiveness. In this context, and if these findings are replicated, the mobilization of a certain degree of anger or the expression of anger may be useful in fighting or resisting depression and associated tendencies toward suicidal behaviors among young women.

In our previous examination of anger in this sample, trait anger was not found to predict the time until first posthospitalization suicide attempts by youths (Goldston et al., 1999). In that report, however, we focused only on self-reports of trait anger during a time of crisis (i.e., hospitalization), which may not have been representative of usual functioning. In addition, in the earlier report, the focus was on time to first posthospitalization attempts, we did not examine gender differences or the expression of anger, and the fact that many participants make multiple suicide attempts during the course of the study was not incorporated into analyses.

These findings should be interpreted in the context of the limitations of the present study. The participants in the study were recruited from an inpatient adolescent psychiatric unit at a single hospital using a restricted geographic region. This study also only included youths able to cooperate with a complete assessment during their inpatient stay, which may have excluded the youths with the most severe psychiatric difficulties (e.g., psychosis). In addition, youths were excluded from participation in this study if their length of stay in the hospital was less than 10 days. It should be pointed out that the sample was recruited from 1991 through 1995, and at the time the study was initiated (prior to the full impact of managed care), a 10-day stay on this particular inpatient unit was viewed as a brief stay. Last, unlike some other samples of inpatient youths, a relatively small proportion (<5%) of adolescents and young adults in the study met diagnostic criteria for bipolar disorder. Taken together, the inclusion and exclusion criteria may have restricted the generalizability of our findings to other clinically ascertained samples or settings. Additional limitations include the fact that the current research methods did not incorporate behavioral observations or indices of the expression of anger other than that offered by self-report. Although the STAXI (Spielberger, 1988) has shown good psychometric properties as a self-report measure, the use of multiple assessment strategies may further enhance our knowledge regarding the expression of anger among suicidal youths. Furthermore, some constructs and processes important to understanding the BAS/BIS were not assessed in this study, although conceptually linking the findings and inquiry to this theoretical perspective raise important questions about the processes via which anger may contribute to risk for suicidal behaviors.

Finally, we should acknowledge that none of the participants in this study have died by suicide, although a number have died for other reasons. The possibility that participation in a longitudinal repeated assessments study served as a “protective” factor for some young participants cannot be ruled out, particularly given findings that relatively minor contacts such as letters or postcards to former patients can reduce deaths by suicide (e.g., Motto & Bostrom, 2001).

Implications for Research, Policy, and Practice

The study findings highlight several important implications for practice, research, and policy. For clinical interventions with young at-risk men, it may be especially important to include anger modulation as a component of interventions aimed at reducing suicidal behaviors. Because the findings with young women were not predicted, they are in need of replication. However, they suggest the possibility that anger and the expression of anger may help to counteract to a degree the risk associated with episodes of clinical depression. Further clarification of these gender-specific findings among adolescent and young adult women, and their cognitive correlates (e.g., appraisals and self-thoughts associated with anger-provoking and depressive situations), may help to better inform our treatment approaches with young, at-risk women.

Taken together, the longitudinal study findings provide the foundation for future research regarding the role of gender-specific effects of anger and suicidality at different developmental periods across the lifespan. There is considerable heterogeneity in the developmental paths culminating in suicidal behavior, and the findings from this study highlight the possibility that different mechanisms or processes may be in play for young men and women who attempt suicide. Marked gender differences have been noted in suicidal behavior, with men evidencing increasingly more deaths by suicide through young adulthood, and women making more non-lethal suicide attempts during adolescence (Centers for Disease Control and Prevention, 2008a, 2008b). Although only a minority of individuals who attempt suicide go on to die by suicide, previous nonlethal suicidal behavior is still a strong risk factor for eventual death by suicide (Lonnqvist & Ostano, 1991). Because of increases in suicide deaths through young adulthood, the clear-cut relationship between anger, in particular the outward expression of anger, and suicidal behavior among men is especially concerning. In terms of policy and research, the results underscore the need to consider and better understand these gender differences in the development of treatment and preventive interventions.

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