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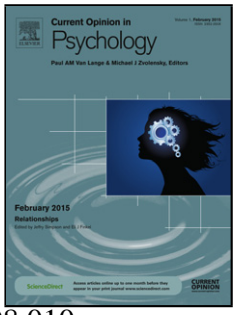

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Highlights

Suicide and aggression are highly comorbid and destructive behaviors.

Rates of suicidal behavior are increased among those with aggression-related disorders.

Aggression may serve as a facilitative factor for suicidal behavior.

Future directions for research on the suicide-aggression relationship are discussed

RUNNING HEAD: SUICIDE AND AGGRESSION

Suicidal Behavior and Aggression-Related Disorders

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Abstract

Studies of suicidal behavior among those with aggression-related disorders (i.e. intermittent explosive disorder, borderline personality disorder, antisocial personality disorder, and conduct disorder) were examined. The presence of an aggressive disorder generally increased the risk of suicide attempts and mortality, with this effect (when examined) usually existing independent of other psychopathology. However, this may not be the case for antisocial personality disorder. Furthermore, with the exception of intermittent explosive disorder, the extant research suggests severity of aggression was associated with suicide attempt risk in aggression-related disorders. Future research is needed to better understand what mechanisms may influence the suicide-aggression relationship.

Suicidal Behavior and Aggression-Related Disorders

Suicide and extreme aggression (i.e. homicide) are among the leading causes of death in the United States [1] and consequently areas of major public health concern. Psychology has identified and postulated about the relationship between suicide and aggression for over 100 years, with early theories [2] conceptualizing suicide as anger turned inward, while more recent theories suggest that aggression may increases one's ability to enact lethal self-injury [3]. The link between suicide and aggression is also supported by a rich empirical literature identifying a predisposition towards aggression (i.e. verbal and physical acts of unwanted intentional harm) as a risk for suicidal thoughts and behavior (i.e. suicidal ideation, attempts and decedents) and vice versa [4,5]. Furthermore, suicidal and aggressive behavior share several psychological and biological correlates [4]. Given the relationship between aggression and suicidal behavior, one would expect psychological disorders that either are defined by pathological aggression (i.e. intermittent explosive disorder), or otherwise have aggression as part of their diagnostic criteria (e.g. borderline personality disorder, antisocial personality disorder, conduct disorder) to be associated with increased suicidal behavior. We examined the relationship between suicidality and these aggression-related disorders with a focus on the role of aggression in potentiating suicidal behavior.

Intermittent Explosive Disorder and Suicidal Behavior

Intermittent Explosive Disorder (IED) is the only disorder for which excessive levels of aggressive behavior is a required for receiving the diagnosis. Within IED, excessive aggression is defined as frequent (two or more times a week, on average, over three months) acts of minor aggression in excess of provocation that does not cause physical harm, and/or less frequent (three

or more acts in a year) acts of major aggression in excess of provocation that does cause physical harm [6]. IED is a common (3%-5% lifetime prevalence) and chronic disorder that is associated with significant impairment across interpersonal, occupational and health domains [7,8], features that may aid in the progression to suicidal behavior.

The extant data on the relationship between IED and suicidal behavior suggest that those with IED are at increased risk for both suicidal ideation and suicide attempts, with suicide attempt rates ranging from 8.1% to 12.5% [9,10]. This was supported by a large cross-national study that found those with IED were two times more likely to have subsequent suicidal ideation and two to three times more likely times more likely to report a subsequent suicide attempt [11]. These findings were replicated (with slightly lower, but still significant odds ratios) in a national epidemiological study [12]. Notably, both studies showed that the increased suicide attempt risk was specific to planned (versus unplanned) attempts [11,12]. Though IED is categorized as an impulse control disorder, the specificity to planned suicide attempts suggests that the greatest factor conveying suicide risk in IED may be a general willingness to harm (oneself and others). Among a military sample, IED predicted post-enlistment suicide attempts, even when accounting for other psychiatric disorders. In fact, IED was the only disorder that was significantly associated with suicide attempt among suicidal ideators [13]. The presence of IED also increased the likelihood of suicide attempts among those with post-traumatic stress disorder (PTSD) to over 40% [14]. Overall, this evidence suggests that the pathognomonic aggressive behavior in IED confers risk for suicidal behavior.

Less is known about what factors may facilitate and or inhibit suicidal behavior among those with IED. With regard to diagnoses, increased overall comorbidity increases the risk for presence of suicide attempts, as do the individual diagnoses of major depression, drug

dependence, some personality disorders and PTSD [9,10,14]. Beyond diagnostic indicators, however, few studies have focused on cognitive-affective factors that may be influential in the relationship between IED and suicide. One study that examined over 500 individuals with IED found that, though aggression and affect lability mediated the relationship between IED participants with a comorbid personality disorder and non-suicidal self-injury, only impulsivity mediated the relationship with suicidal behavior [9]. This result, which is seemingly inconsistent with the earlier finding that IED increases the risk of only planned suicide attempts, may suggest that both willingness to harm and impulsivity are be associated with the willingness to contemplate suicide as a viable option. If so, one may impulsively start planning a suicide attempt when encountering negative life events. This would be consistent with recent research showing the specific facet of impulsivity associated with responding rashly in response to negative affect (i.e., negative urgency) best discriminated IED from other diagnostic groups [15]. In sum, the limited research suggests that IED is a risk factor for suicidal ideation and attempts. However, the research on mechanism(s) that confers suicide risk in IED is limited and no known published studies have examined the relationship between IED and completed suicide.

Borderline Personality and Suicidal Behavior

Borderline personality disorder (BPD) is a serious, chronic psychological disorder that affects approximately 1-2% of individuals in the community [16] and up to 20% of psychiatric inpatient samples [17]. Marked by an unstable self-concept and affective dysregulation, BPD is one of the psychological disorders most associated with suicidal behavior. Anywhere from 50% to 90% of BPD clients report engaging in suicidal behavior at some point [18], with up to 10% of individuals with BPD committing suicide [19]. This is almost 50 times greater than the general population, making BPD a major psychiatric risk factors for suicide [20].

BPD is also significant risk factor for other directed aggression, as difficulty with anger is a symptom of BPD. As evidence of the relationship between BPD and aggression, over 70% of individuals with BPD report engaging in violence in the past year [21] and those with BPD show increased retaliatory aggression on laboratory analogues of aggression [22,23]. Furthermore, this increase in aggression in BPD relative to other psychiatric disorders was shown to be consistent over a 10-year follow-up [24], though some forms of aggression (i.e. intimate partner violence) may be more central to BPD than others [25].

Research examining suicidal behavior among those with BPD has identified several important risk factors. Most notably, increased levels emotion of dysregulation and affect lability confer greater risk for suicidal behavior [26], as do several behaviors and personality traits linked to emotion dysregulation. For example, the presence of bulimia nervosa increases suicide risk [27], and more frequent non-suicidal self-injury in adolescence may precede more frequent suicidal behavior in adults with BPD [18]. The presence of childhood maltreatment also significantly contributes to risk of suicide attempts among those with BPD [28]. Taken together, there is strong support for the role of emotion dysregulation and related personality and behavior features in the occurrence of suicidal behavior among those with BPD.

Several recent studies also support the role of aggression as a facilitator of suicidal behavior in BPD. Among individuals with BPD, those with a suicide attempt reported greater life history of aggression [26], and among depressed suicide attempters, those with a diagnosis of BPD reported higher levels of lifetime aggression [29]. Furthermore, among those with BPD, aggression was one of the only trait-level predictors of attempting suicide over an 8-year follow-up period [30]. However, aggression may be less associated with the lethality of suicide attempts among suicide attempters [31]. Further research is needed to better understand the temporal

nature of these relationships, or if there is a common factor of both aggressive and suicidal populations that may mediate the relationship, such a high trait anger. Recent models of aggression in BPD that emphasize the different dimensions of aggression (e.g. prefrontal limbic dysregulation, hormone response, attributional bias, rejection sensitivity, etc.) may inform the research [32]. For example, among those with BPD, a history of suicide attempts is associated with orbitofrontal dysregulation to aversive stimuli [33], and orbitofrontal dysregulation is associated with aggression [34], suggesting a possible common mechanism for aggression and suicidal behavior in BPD.

Antisocial Personality Disorder and Suicidal Behavior

Aggression, specifically repeated physical assaults, is also a part of the criteria set for antisocial personality disorder (ASPD). Characterized by aggressiveness, impulsiveness, lack of social conformity and disregard for others, individuals with ASPD self-report high levels of aggression and display higher levels of aggressive responding on laboratory tasks (e.g. [35]). These individuals also demonstrate high rates of violent crime, with ASPD present in almost 50% of the prison population [36] despite only a 2%-4% prevalence in the general population [6]. ASPD is also associated with increased risk of mortality, with one study finding a 33-fold increase in death by age 40 among those with ASPD [37].

ASPD has long been associated with suicide attempts [38] and completed suicides [39], with completed suicide in ASPD at approximately 5% [40]. One likely contributory factor is that individuals with ASPD are at increased risk for more medically serious suicide attempts [41]. Though ASPD is associated with suicide risk, it is less clear if this risk is independent of the psychiatric comorbidity associated with ASPD as a recent longitudinal study showed the

univariate relationship between ASPD and suicide attempts to disappear after controlling for other personality disorders [42].

Aggression may play a moderating role in the relationship between ASPD and suicidal behavior. Aggression levels predicted suicide attempts in a sample of prison inmates [38], and fighting in adolescence and (at a trend level) adulthood was associated with increased suicide attempt risk among an ASPD sample with comorbid alcohol dependence [43]. Increased aggression and ASPD were also present in first-degree relatives of children who attempted suicide [44]. Despite preliminary evidence that higher levels of aggression among those with ASPD, an already aggressive population, may heighten suicide risk, there is limited research aimed at better understanding this relationship.

Conduct Disorder and Suicidal Behavior

Conduct Disorder (CD) is the childhood disorder most associated with aggression, with bullying, physical fights, and use of a weapon representing three of the 15 possible CD symptoms [6]. Conduct disorder is also a required precursor to ASPD [6] and the presence of CD is significantly associated with adult aggression and other antisocial behavior (e.g. substance abuse), as well as educational problems, especially among those with callous-unemotional traits [45].

Several studies have shown a relationship between CD and both attempted [41,46] and completed [47] suicides with odds ratios often ranging between 5 and 7. However, these studies often failed to examine CD independent of other comorbid problems, such as ASPD and depression. In response to this, a recent longitudinal study of Taiwanese adolescents compared 3,711 participants with CD to 14,844 age-and gender-matched controls [48]. The results showed a greater rate of suicide attempts in the CD group relative to control (.9% vs. .1%). Furthermore,

CD remained associated with suicide attempts after controlling for other forms of psychopathology (e.g. depressive disorders, substance use disorders) with a hazard ratio of over 5 [48]. There is some research to suggest aggressive and antisocial behavior in adolescents more generally may also be prospective predictors of the occurrence of suicide attempts and completions in later adulthood [49]. However, more work is needed to understand to what extent aggression moderates and/or mediates suicide risk in CD.

Conclusions

As expected, aggressive disorders do appear to convey increased suicidal risk. The evidence is strongest for suicide attempts, with IED, BPD and CD all showing increased risk of suicide attempts independent of comorbid psychopathology, with more mixed findings among those with ASPD. Aggression-related disorders were also associated with completed suicide, with suicide rates in ASPD and BPD at approximately 5% and 10% respectively [19, 40], though studies on suicide mortality risk in IED are still needed. Level of aggression does not appear to mediate the relationship between IED and suicide attempts, but this may be due to a lack of aggression variance in IED, as by definition all individuals with IED are highly aggressive. For the other aggression-related disorders, aggression did appear to moderate the suicide risk, with the strongest support for this relationship in BPD. Beyond the simple relationship between aggression and suicidality, more research is needed to understand the role that aggression plays in facilitating suicidal behavior. For example, does aggression facilitate suicidal behavior by increasing capability for suicide, as some current suicide theories suggest [3]? Also, considering the multi-determined nature of both aggression and suicidal behavior, more research is needed what other factors (e.g. emotion dysregulation, impulsivity, co-morbid psychopathology and/or

environmental factors such as the presence of aggressive / suicidal models) may influence the suicide-aggression relationships in these high-risk diagnostic groups.

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Conflict of Interest
The authors (MM, BA) report no conflicts of interest.