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REVIEW

The concept of violent suicide, its underlying trait and neurobiology: A critical perspective

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Abstract

Suicide is one of the leading causes of death and represents a significant public health problem world-wide. Individuals who attempt or die by suicide represent a highly heterogeneous population. Recently, efforts have been made to identify sub-populations and variables to categorize them. A popular dichotomy in suicide research of the past years is violent versus non-violent suicide - based on the method. This dichotomy is important given that there is an association between method of attempted suicide and risk of subsequent death by suicide. The differentiation concerning suicide methods is also critical regarding preventive efforts. In this review, we have tried to approach the concept of violent suicide from different perspectives, including a discussion about its definition and overlapping categories. In addition, we have critically discussed aggression as underlying trait, the question of intent to die, and socio-demographic, environmental, neuropsychological, and neurobiological factors potentially associated with violent suicide.

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1. Introduction

Suicide is one of the leading causes of death and represents a significant public health problem in the United States and

around the world. The general demographic groups impacted by a high relative rate of death by suicide in the US are middle-aged, White men, and young Native American men (Nock et al., 2008). Cross-national data from the World Health Organization shows that the burden of suicide shifted over the past fifty years from Western to Eastern Europe and now seems to have the highest impact in Asia (Varnik, 2012).

Violent suicide is in most cases defined by the method. Several publications use the Asberg's criteria (Giner et al., 2014; Penas-Lledo et al., 2015), which defines hanging

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attempts, the use of firearms, jumping from heights, several deep cuts, car crash, burning, gas poisoning, drowning, electrocution, and jumping under a train as violent attempts; whereas drug overdoses are considered to be nonviolent suicide attempts (Asberg et al., 1976). Others define violent suicide as all methods but poisoning (Stenbacka and Jokinen, 2015) and again other publications define violent suicide as all methods but drowning, gas poisoning and substance poisoning (Dumais et al., 2005). As for violent suicide, few findings are published on demographic characteristics. It has been well established that men use violent methods more often than women, both in suicide and suicide attempts. A large European study, involving four countries looked at these gender-specific differences in greater detail. Suicidal acts were 3-4 times more lethal in men than in women; men were more likely to choose more lethal suicide methods and the lethality was even higher in men when using the same method (Mergl et al., 2015). A switch from non-violent attempts to violent death by suicide was significantly more common in men compared to women (Bradvik, 2007). Individuals who attempt or die by suicide represent a highly heterogeneous population. Thus, efforts have been made to identify subpopulations and variables to categorize them. Popular dichotomies in suicide research of the past years are violent versus non-violent suicide attempters, high-lethality versus low-lethality attempters, impulsive versus non-impulsive suicide attempters and low intent to die versus strong intent to die. These dichotomous variables have been examined and operationalized by various scales (e.g., Beck's Suicide Intent Scale). Definitions and subpopulations are overlapping; hence in this review, we will focus on violent suicide but equally address related terms and definitions.

2. Aggression as the personality trait underlying violent suicide

One of the prime suspects to consider, when searching for the underlying causes of violent suicide, is aggression as a trait. The hypothesis, although not explicitly formulated, suggests that aggression as a trait is associated with both self-directed and other-directed violence. Aggression as a personality trait is not included in the Big-Five model (Goldberg, 1990), but plays an important role in theory of psychoanalysis and is hence operational in the Structured Interview of Personality Organization (Horz-Sagstetter et al., 2017). This was used by Baus et al. in a study of 120 Borderline Personality Disorder patients (Baus et al., 2014). They found that patients with a history of suicide attempt had higher aggression scores and a worse overall level of personality organization. However, when differentiated between other-directed and self-directed aggression, it became clear that the determining factor was self-directed aggression ($p < 0.001$) and not other-directed aggression ($p = 0.297$) (Baus et al., 2014). A similar study compared personality traits (by means of proxy-based interviews) of borderline patients, who died by suicide, to those who did not die by suicide. Impulsivity and aggression traits could predict suicide, but when controlling for Cluster B personality disorder, the in-between group variance was fully explained by this factor (McGirr et al., 2007). Giegling

et al. (2009) examined a sample of suicide attempters in regards to their method (violent vs. non-violent) among other variables. Also assessing anger, aggression and temperament via several interview inventories, they tried to associate these traits with violent/non-violent suicide attempt, but no significant correlation was found (Giegling et al., 2009). A study comparing data from suicide research centers in New York City and Madrid, suggested that higher lethality of suicide in New York City and concomitant higher aggression scores (assessed by the Brown-Goodwin Scale) might be derived from the same diathesis (Baca-Garcia et al., 2006).

To further elucidate the association between suicide and violence, Jokinen et al. (2010) constructed and validated the Karolinska Interpersonal Violence Scale. It measures both exposure to violence and expressed violent behaviour in both childhood and during adult life (Jokinen et al., 2010). Contrary to previous findings, the association between violent behavior in adulthood and completed suicide was significant (Jokinen et al., 2010; Stefansson et al., 2015). These investigators also found an association between violent adult behavior and non-suicidal self-injury in a sample of suicide attempters (Sahlin et al., 2015). A recent multi-center study, using the same scale, found that a high overall score was associated with repeated suicide attempts and violent suicide attempts (Haglund et al., 2016).

Another approach was to regroup individuals who had a history of self-directed violence and those who had a history of violence against others and compare their personality traits (Stalenheim, 2001) or temperament (Engstrom et al., 1999) within the groups or with a control group. Engstrom et al. (1999) matched a sample of criminal offenders and a sample of suicide attempters for age and psychiatric diagnosis and found that most of their personality traits (based on the Karolinska Scales of Personality) did not significantly differ, displaying high trait of anxiety and low socialization. Interestingly, impulsiveness and inhibition of aggression were in the normal range (Engstrom et al., 1999), again not supporting the hypothesis of a common trait of aggression in these subpopulations.

The increased risk of suicide among criminal offenders has been widely reported (Webb et al., 2011) but the nature of this correlation has not been solved yet. Stålenheim (2001) for instance, found no correlation between suicide attempts and violent criminality in a sample of criminal offenders during forensic psychiatric examinations. The subgroup of suicide attempters within this sample of forensic patients showed significantly higher scores in impulsive aggression and had a lower socioeconomic upbringing than the other examined offenders (Stalenheim, 2001).

The above listed publications aim to correlate aggression as a trait or temperament with self-directed violence including violent and non-violent suicide attempts. Other studies listed hereafter aim to find correlations between violent behavior and suicide attempts, not explicitly defining aggression as a trait that can be measured but rather implicitly suggesting a common ground between them. Webb et al. (2013) found a positive correlation between violent offenses and suicide, although when controlling for the method (violent vs non-violent), it became evident that

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