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Available online: 02 May 2011

To cite this article: Yari Gvion & Alan Apter (2011): Aggression, Impulsivity, and Suicide Behavior: A Review of the Literature, Archives of Suicide Research, 15:2, 93-112

To link to this article: http://dx.doi.org/10.1080/13811118.2011.565265

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Aggression, Impulsivity, and Suicide Behavior: A Review of the Literature

Yari Gvion and Alan Apter

This article reviews the literature on the association between impulsivity, aggression, and suicide. The key words ‘impulsivity’, ‘aggression’, and ‘suicide’ were entered into the pubmed, psychlit, and proquest databases. Significant articles were scrutinized for relevant information. Impulsivity and aggression are highly correlated with suicidal behavior across psychiatric samples, nosological borders, and non-psychiatric populations. Impulsivity and aggression are related but the nature of this relationship remains unclear. The literature is confusing and contradictory. This is probably due to the difficulty in defining and separating out these concepts and the fact that there is much overlap between them. Future research should aim at clarifying and refining these concepts as well as their link to all the different forms of suicidal behavior.

Keywords: aggression, impulsive behavior, severe suicide, suicide

Suicide is a complex behavior that is probably the end result of the interaction of several different factors. Predictors of suicidal behavior and risk factors include a history of previous suicide attempts, certain demographic variables, clinical symptoms, and issues related to medical and social support (Apter & Wassermann, 2003; Barraclough & Pallis, 1975; Beck, Steer, Kovacs et al., 1985; Fawcett, Scheffner, Clark et al., 1987). Although of low specificity, the presence of psychopathology is probably the single most important predictor of suicide. Accordingly, approximately 90% of suicide cases meet criteria for a psychiatric disorder, particularly major depression, substance use disorders, cluster B personality disorders, and schizophrenia (Arsenault-Lapierre, Kim, & Turecki, 2004; Cavanagh, Carson, Sharpe et al., 2003). However despite the fact that most suicide attempters do not suffer from psychopathology, most persons with psychiatric disorders do not attempt suicide. Therefore other factors over and above psychopathology must be involved.

The aim of this article is to review the literature on the long-known link between aggression, impulsivity, and suicide. In order to systematically review the literature on the subject, literature databases pubmed, psychlit, and proquest were searched using the key words 'aggression', 'impulsivity', and 'suicide'. References were identified and grouped so as to delineate the major contributions surrounding the associations between the three.

DEFINITIONS

Suicide and Suicidal Behavior

Suicide is an act of intentionally terminating one’s own life (Nock, Borges, Bromet et al., 2008; Shneidman, 1985). Nevertheless...
this definition does not do justice to the complexity of the concept and the numerous usage of terms across studies. Thus the nomenclature for suicidal ideation and behavior has been the subject of considerable international attention and debate (DeLeo, Burgis, Bertolote et al., 2006; O’Carroll, Berman, Maris et al., 1996; Silverman, Berman, Sanddal et al., 2007a, 2007b; see also Heilborn, Compton, Daniel et al., 2010). The nomenclature of suicide behaviors without fatal outcome such as ideations, communications, and behaviors varies as well. Sometimes they are referred to as “suicidality” while others term these as “suicide related behaviors” (Silverman, Berman, Sanddal et al., 2007b) or “suicidal behavior” (Van Orden, Witte, Cukrowicz et al., 2010). A suicide attempt should possess the following qualities: 1) self-initiated, potentially injurious behavior; 2) presence of intent to die; and 3) nonfatal outcome (Van Orden, Witte, Cukrowicz et al., 2010).

Other related behaviors and definitions relevant to this review include deliberate self harm (DSH), parasuicide, nonsuicidal self injury (NSSI), suicidal threats, and suicidal gestures (Apter, 2010). There is also some value in separating out near-lethal or medically serious attempts (MSA) from the non-medically serious suicide attempt (NMSSA) (Levi, Horesh, Fischel et al., 2008).

Aggression and Aggressive Behavior

Although the term aggression refers to a wide spectrum of behaviors, in the psychological and psychiatric literature it is defined as any behavior intended to harm another person who is motivated to avoid being harmed (Baron & Richardson, 1994; Geen, 1998a, 1998b). Aggressive behavior is often distinguished from a high level of trait aggression, the latter identifying people who are prone to engage in physical and verbal aggression (Buss & Perry, 1992). Aggressive behaviors (aggressive states) are often engendered by actions or situations that are aversive or stressful (Berkowitz, 1984, 1989; Carlson & Miller, 1988; Dollard, Doob, Miller et al., 1939).

Although the literature uses terms such as aggression, violence irritability, and anger interchangeably some theoreticians have attempted to specify differences and overlaps. Trait anger is the tendency to feel anger more intensely, more often and for a longer period of time than others (Deffenbacher, Oetting, Thwaites et al., 1996). The definition of trait irritability includes being angrier, in general and taking offense to the slightest provocation as well as the propensity to be offensive in the use of aggressive behavior (Capara, 1982; Capara, Renzi et al., 1981; also see Bettencourt, Talley, Benjamin et al., 2006); trait irritability and violence are conceptually related (Glasser, 1985) to trait aggressiveness (Caprara & Renzi, 1981) and the construct of trait anger overlaps with trait aggressiveness (Buss & Perry, 1992). Some authors have proposed a difference between two forms of aggression: reactive and proactive aggression. Reactive aggression (RA) is an aggressive response to a perceived threat or provocation, and as such it is emotionally charged, poorly controlled, and impulsive, whereas proactive aggression (PA) is defined as an unemotional, highly controlled, and premeditated behavior that anticipates a reward (Houston, Stanford, Villemarette-Pittman et al., 2003; Kemps, Matthys, de Vries, & van Engeland, 2005; see also Conner, Swogger, & Houston, 2009).

Impulsivity and Impulsive Behavior

Impulsivity, a prominent construct in most theories of personality, encompasses a broad range of behaviors that reflect impaired self-regulation, such as poor planning, premature responding before considering consequences, sensation-seeking, risk-taking, an inability to inhibit responses,
and preference for immediate over delayed rewards (Evenden, 1999; Whiteside & Lynam, 2001). The relative inability to control one’s behavior is thought to stem from deficits in the self-regulation of affect, motivation arousal as well as working memory and higher order cognitive functions that ordinarily give rise to hindsight, forethought, anticipatory behavior, and goal directed action (Barkley, 1997). This failure is related to brain systems modulating behavioral inhibition (Gray, 1987; Mann & Courier, 2009).

From the perspective of developmental psychopathology, impulsivity can be understood as an amplification of a normal trait, which shows a range of individual differences in normal populations (Paris, 2005). Variability in impulsive behaviors can derive from genetic or temperamental roots (Derryberry & Rothbart, 1997; Livesley, Jang, & Vernon, 1998; Plomin, DeFries, & McClearn, 2000) or pharmacological and neural factors (Eveden, 1999; Roggenbach, Muller-Oerlinghausen, & Franke, 2002) that interact with psychological and environmental experiences unique to the individual (Cadoret, Yates, Troughton et al., 1995; Eveden, 1999; Millon, 2000; Paris, 1996; Robins, 1978).

Aggression and Impulsivity: A Single or Two Distinct Constructs?

Anger, aggression, and impulsivity are psychological traits associated with suicide attempts. Some authors suggested that overlap between these constructs is robust and universal, and that they should be considered together, as a single phenotype (Mann, Wateraux, Haas, & Malone, 1999; Mann & Currier, 2009; Seroczynski, Bergman, & Coccaro, 1999); others, however, believe they represent two distinct latent dimensions (Critchfield, Levy, & Clarkin, 2004; Loney, Kramer, & Milich, 1981). Be that as it may, the association among impulsivity, aggression, and suicidality is well documented both in research and in clinical practice across diagnoses (Brent, 1993; Brent, Bridge, Johnson et al., 1996; Carballo, Oquendo, Giner et al., 2006; Dumais, Lesage, Phil et al., 2005a; Renaud, Berlim, McGirr et al., 2008; Zalsman, Braun, Arendt et al., 2006; See Critchfield, Levy, & Clarkin, 2004 for a review). There is also some evidence that this association is stronger in younger individuals and decreases in importance with age (McGirr, Renaud, Bureau et al., 2008). Some recent studies have suggested aggressive/impulsive behavior as the underlying link between family history of suicide and new attempts by probands especially in youth (see review by Brent & Melhem, 2008; and review of Chachamovich, Stefanello, Botega et al., 2009; Diaconu & Tuerki, 2009).

Current models suggest that aggression and impulsivity may contribute to a summary factor predictive of suicidal behavior in patients with various types of psychiatric diagnoses (Mann, Watertaux, Haas et al., 1999; Mann & Currier, 2009). This is particularly true for a subtype of aggression marked by angry, impulsive responses to perceived acute stress (Coccaro, Bregman, Kavoussi et al., 1997; Seroczynski, Bergman, & Coccaro, 1999) which is externally directed and related to other manifestations of impulsivity (Fulwiler, Gross, Forbes et al., 1997; Malone, Haas, Sweeney et al., 1995; Mann, 1994) predisposing individuals to the development of psychopathology strongly associated with suicide (e.g., substance abuse and cluster B personality disorders) (McGirr, Renaud, Bureau et al., 2008; McGirr, Alda, Seguin et al., 2009). Reactive aggression has been associated with lowered serotonin-mediated brain activity, interpersonal rejection, and a pattern of emotional deregulation in the context of interpersonal difficulties and other stressful life events, all of which can lead to suicide (Conner, Duberstein, Conwell et al., 2003; Conner, Swoeger, M.T., & Houston, 2009).
Disinhibition may predispose individuals to suicidal behavior when it occurs in conjunction with high levels of hostility-aggression (Michaelis, Goldberg, Davis et al., 2004).

Studies in recent years have attempted to determine which of these constructs is most strongly associated with suicidal behavior (Keilp, Gorlyn, Oquendo et al., 2006). One of the problems that arises when trying to decide which is most relevant is the lack of clarity of the definitions: There are studies that use the terms aggression and hostility synonymously (Michaelis, Goldberg, Davis et al., 2004). Others use composites of constructs, namely impulsivity, hostility, and aggression and terming them interchangeably, as impulsive aggression (McGirr, Renaud, Bureau et al., 2008; McGirr, Alda, Seguin et al., 2009). Some authorities prefer the term irritability believing that it is the measure that best conceptualizes reactive aggression (Conner, Meldrum, Wieczorek et al., 2004; Stringaris, Cohen, Pine, 2009). Problems arise from the fact that hostility is a mood state, aggressive acts may be impulsive or premeditated, and impulsivity is a trait encompassing spontaneous, poorly planned, and situationally inappropriate behaviors, without necessarily including aggression (McGirr, Renaud, Bureau et al., 2008). From a suicidology perspective, they are all facets of the same underlying predisposition, none a necessary and sufficient cause of the other, never precluding the other, but each a manifestation of a predisposition to suicide subsumed under the impulsive aggressive suicide diathesis (McGirr, Paris, Lesage et al., 2007).

Aggression and Suicidal Behavior

Multiple epidemiologic, clinical, retrospective, prospective, and family studies have identified a strong link between aggression and suicide, (Brent, Bridge, Johnson et al., 1996; Conner, Duberstein, Conwell et al., 2001; Romanov, Hatakka, Keskinen et al., 1994).

Research suggests a common neurobiology of suicide and other forms of aggressive behavior (Mann & Currier, 2009); lower levels of central serotonin distinguish clinical samples of suicide attempters from non attempters (Asberg, Nordstrom, & Traskman-Bendz et al., 1986; Romanov, Hatakka, Keskinen et al., 1994) and are associated with more lethal suicide attempts after psychiatric illness has been controlled for (Mann & Malone, 1997; Ninan, van Kammen, Linnoila et al., 1985). From a familial point of view it was found that familial transmission of suicidal and aggression behaviors are related (Brent, Bridge, Johnson et al., 1996).

Many persons who attempt suicide have significantly higher scores for lifetime and trait aggression (Conner, Duberstein, Conwell et al., 2001; Doihara, Kawanishi, Yamada et al., 2008; Mann, Waternaux, Haas et al., 1999; Plutchik, 1995; Skodal & Karasu, 1978; Tardiff & Swellam, 1980). Thus, much of the research on the interrelationship of suicide and aggression has focused on personality traits and psychiatric diagnoses related to self-reported hostility and aggression (Conner, Duberstein, Conwell et al., 2001). A longstanding hypothesis posits that reactive aggression underlies the association between aggression and suicidal behavior, although, Conner, Swogger, and Houston (2009), found that both types of aggression are associated with suicidal behavior and ideation.

Nonetheless, the relation between aggression and suicide completion is still not clear. Many of the studies performed over the last century emphasized the role of hostility, aggressive behavior, and anger in completed suicide (Plutchik, 1995) and longitudinal investigations have demonstrated associations of self-reported aggression and hostility with completed suicide (Angst & Clayton, 1986; Romanov, Hatakka, Keskinen et al., 1994). In an attempt to study the relationship between aggression and suicide, different perspectives
were taken. One of them compared medically serious suicide attempters to healthy controls. Trait aggression was significantly higher in the medically serious attempters (MSA) group (Doihara, Kawanishi, Yamada et al., 2008), however, that study did not include a non-medically serious attempters (NMSA) control group. In another study designated to look for differences among more specific psychiatric pathologies, personality-disordered individuals, particularly those who are more impulsive and aggressive and who have a co-morbid depressive disorder were found to have a higher risk for more frequent and more medically severe suicidal behavior in comparison to individuals with Major Depressive Disorder (MDD) or Bi-Polar-Depression alone (Black, Bell, Hulbert et al., 1988; McGlashan, 1987). That difference might be connected to the aggressive impulsive features. Studies on choices of methods for the suicide attempt found that use of violent methods of suicide is a behavioral marker of a higher level of lifetime impulsive-aggressive behaviors (Dumais, Lesage, Lalovic et al., 2005b) and is more often used by males than females, and in suicide completers affected by psychosis. Others even suggest that aggression may be indirectly linked to high lethality attempts. It was found that violence during the last year of life is more frequent among suicide victims than accident victims (Conner, Cox, Duberstein et al., 2001). On the other hand Soloff and colleagues (2005), found that high lethality and low lethality suicide attempters with borderline personality disorder (BPD) patients were not different in their levels of aggression.

People who experience anger differ in their style of anger expression specifically whether anger is directed toward others or themselves (Spielberg, 1988). This difference was explored extensively in the classic psychoanalytic literature (Menninger, 1933). This may be relevant to the association of anger to suicide with differing levels of lethality. For example, strong associations have been reported between depression and anger-in (Brody, Haaga, Kirk et al., 1999) between anxiety and anger-out (Olatunji, Ciesielski, & Tolin, 2010) and between psychopathy and anger out (Blair, 2010). Some of these pathologies are highly associated with suicide attempts, whereas evidence for associations between depression and anger-out or between anxiety and anger-in, is inconsistent (Spielberg, Reheiser, & Sydeman, 1995; Whiteside & Abramovitz, 2004). Some recent studies on suicide looked at more specific aspects of aggression when studying suicide attempts (Giegling, Olgiati, Hartmann et al., 2009) such as gender differences between trait anger, anger expression, and suicide attempts among adolescents and young adults (Goldston, Reboussin, & Daniel, 2006). However those studies did not control for different levels of the medical seriousness of the attempt.

### Impulsivity and Suicidal Behavior

Suicide attempts are often impulsive (Brown, Overholser, Spirito et al., 1991; Nock, Borges, Bromet et al., 2008; Williams, Davidson, & Montgomery, 1980), and many studies have identified impulsivity as a common correlate and risk factor for suicidal behavior (Apter, Gothelf, Orbach et al., 1995; Apter, Kotler, Sevy et al., 1991; Apter, Plutchik, & van Praag, 1993; Apter, van Praag, Plutchik et al., 1990; Apter & Wasserman, 2003; Horesh, Gothelf, Ofek et al., 1999; Horesh, Rolnick, Iancu et al., 1997; Kingsbury, Hawton, Steinhardt et al., 1999; Mann, Watersaux, C., Haas et al., 1999; Nock, Borges, G., Bromet et al., 2008; Wu, Liao, Lin et al., 2009).

Although not characterizing all suicide attempters, impulsivity may serve to identify high-risk subgroups. Many studies have shown a relationship between high levels of impulsive personality characteristics and a
higher likelihood of suicide attempts or suicidal ideation. This relationship was found across different nosological entities (Giegling, Olgiati, Hartmann et al., 2009; Zouk, Tousignant, Seguin et al., 2006) and is also true of non-psychiatric populations.

There is a marked lack of consensus on the relationship between impulsivity and the medical seriousness of the attempt. Although some authors believe impulsivity is a characteristic of nonlethal suicide attempts or suicide gestures (Baca-Garcia, Díaz-Sastre, Basurte et al., 2001), others report evidence of higher levels of impulsivity in those who die by suicide than in those who do not (Dumais, Lesage, Lalovic et al., 2005b; Maser, Akisal, Schettler et al., 2002; Swann, Dougherty, Pazzaglia et al., 2005). The dissimilarities may be explained by the confusion between the state and trait dimensions of the impulsivity-suicide relationship, differing definitions of impulsivity, the measures used and the population studied.

Planned vs. Impulsive Suicide; Acts vs. Personality

The literature does not always discriminate between the state and trait dimensions of the impulsivity-suicide relationship, that is, impulsivity of the attempt (state) and impulsivity of the attempter (trait). These may not completely overlap or be equivalent.

It may thus be crucial to distinguish between a suicidal act that can be impulsive (or not) and a person who can be impulsive or not (Baca-Garcia, Díaz-Sastre, C., Garcia-Resa et al., 2005).

Recent research has shown that although people who attempt suicide tend to be more impulsive than those who do not, the actual act of completed suicide is often not made impulsively (Anestis, Selby, & Joiner, 2007). Impulsive suicide attempts are acts of self-harm involving little preparation or forethought; non-impulsive suicide attempts are preceded by preparation and forethought (Conner, 2004). Suicidal planning is related to, but not synonymous with, suicidal intent. Planned suicide is a more complicated construct that involves a more subjective element drawn from the desired outcome and perceived lethality of the act of self-harm (Beck, Schulyer, & Herman, 1974). Thus it seems that the amount of planning involved in the suicide attempt is another estimate of impulsivity (Brown, Overholser, Spirit et al., 1991; O’Donnell, Farmer, & Catalan, 1996).

One way to operationalize impulsivity of the suicide attempt is to look at the degree of objective signs of planning. This can be done by using the planning subscale of the Suicide Intent Scale (SIS; Baca-Garcia, Díaz-Sastre, Basurte et al., 2001; Beck, Schulyer, & Herman, 1974; Beck, Morris, & Beck, 1974; Hjelmeland, Nordvik, Bille-Brahe et al., 2000; Soloff, Lynch, Kelly et al., 2000). The SIS planning subscale consists of eight objective items: 1) isolation, 2) timing, 3) precautions against discovery, 4) help-seeking, 5) final acts, 6) preparation, 7) leaving a note, and 8) suicidal communication.

A second way to evaluate impulsivity of the attempt is to examine the amount of time spent between the decision to attempt suicide and the actual attempt. One of the conservative criterions suggested by Williams and colleagues (1980) was 5 minutes premeditation. Other time criterions suggested are, 20 minutes (Dorpat & Ripley, 1960), 2 hours (Li, Philips, Wang et al., 2003), and 24 hours (Brent, 1987). It was found that 40% of hospital patients treated for self-injury reported less than 5 minutes premeditation (William, Davidson, & Montgomery, 1980). In another study, by Simon and colleagues (2001), 24% of survivors of nearly lethal suicide attempt thought about their suicide attempt for less than 5 minutes. Those who made their attempt within 5 minutes of deciding to attempt suicide were less likely to have considered another method of suicide. They also had a greater likelihood of discovery and had a
lower expectation of death (Simon, Swann, Powell et al., 2001).

Some studies indicate that impulsive suicides are not that common. Baca-Garcia and colleagues (2005) assessed attempt impulsivity (i.e., state) and attempter (i.e., trait) impulsivity in an inpatient population. They found that impulsivity of the attempter was not a good predictor of impulsivity of the attempt (i.e., attempting suicide without prior planning) and that non-impulsive attempts (i.e., those that involved prior planning) were more lethal compared to impulsive attempts (see also Baca-Garcia, Diaz-Sastre, Basurte et al., 2001). These findings highlight the importance of planning and preparation for suicide in determining lethality. An additional study (Wyder & De Leo, 2007) surveyed a community sample regarding past suicidal behavior. Only one quarter of these described a pattern consistent with an impulsive attempt (i.e., attempting suicide with little planning). Finally Witte and colleagues (2008) studied 3 groups of adolescents: those who had planned a suicide attempt but did not actually attempt; those who did not plan a suicide but attempted; and those who both planned and attempted suicide. They found that individuals who planned suicide without attempting were significantly less impulsive than those who attempted without planning and those who planned and attempted. Furthermore, participants who attempted without planning were less impulsive than those who both planned and attempted.

Finally, yet another aspect of planning and impulsivity is the issue of repeated suicide attempts. There is probably a difference between a person who commits one act of suicide and a person who commits repeated attempts (so called “repeaters”). A study that compared patients with repeated suicide related behaviors to ones with a single episode found that patients with repeated episodes were more depressed, hopeless, and impulsive, and had higher scores on factors associated with expected outcome and planning activities of the Suicide Intent Scale (Sheikholeslami, Kani, Kani et al., 2009).

These results may pose further questions about the relationship between impulsivity and suicidal behavior. If impulsive individuals commit suicide after a period of planning the implications are that the associations between these apparently contradictory constructs are more complex than what has been previously supposed.

Measures of Impulsivity

Given the prominence of impulsivity in psychopathology, it is surprising to note the many inconsistencies in the current conceptualizations and measurements of this trait (Whiteside & Lynam, 2001). Impulsivity has been used to describe different types of behaviors from novelty seeking and risk taking through non-planning and short attention span (Glenn & Klonsky, 2010). The various theoretical perspectives on impulsive, traits, personalities, and states (behavior) have yielded specific measures of impulsivity that look at a wide assortment of various constructs, such as cognitive impulsivity, risk taking, and novelty seeking (Depue & Collins, 1999). Adding to the confusion, are scales with disparate names, such as Control (Tellegen, 1982) and Decision Time (Patton, Stanford, & Barratt, 1995), which in fact measure operationalizations of impulsivity. Although all measures aim to assess impulsivity the various aspects of impulsivity do not always come out in these scales.

For example, in the study of bipolar patients by Swann and colleagues (2005), the authors used two methods of assessment: the Barrat Impulsive Scale (BIS) (Patton, Stanford, & Barratt, 1995), which measures three dimensions, cognitive (not focusing on the task at hand), motor (acting on the spur of the moment), and
non-planning impulsivity; and behavioral laboratory performance tests consisting of immediate memory and delayed memory tasks (see also Dougherty, Bjork, Harper et al., 2003; Dougherty, Marsh, & Mathias, 2002). Although there was no difference in the BIS scores between subjects with and without a history of suicide attempts or by severity of previous attempts, suicidality was associated with an increase in responses on impulsive continuous performance tasks, consistent with earlier reports (Dougherty, Mathias, Marsh et al., 2004; Horesh, 2001). However it should be noted that, the BIS scores were numerically higher in the subjects with a positive history, suggesting that in a larger sample, the association of BIS score and history of attempted suicide might have reached statistical significance (Swann, Dougherty, Pazzaglia et al., 2005). Thus, although the BIS is considered a stable trait measure of impulsivity, it is apparently not as strongly related to past suicidal behavior as is performance on immediate memory tasks, often considered a state-dependent instrument (Swann, Pazzaglia, Nichols et al., 2003). The BIS relies on the subject’s recall of behavior and attitudes whereas the immediate memory task measures impulsivity as expressed by rapid, unplanned responses, made before the subject has been able to assess the stimulus adequately (Swann, Bjork, Moeller et al., 2002). In an attempt to bring clarity to the wide assortment of measures Whiteside and Lynam (2001) constructed the UPPS (Urgency, Premeditation, Perseverance, Sensation) impulsive Behavior Scale which assesses four distinct facets of personality associated with impulsive behavior: urgency, lack of premeditation, (lack of) perseverance, and sensation seeking. This scale represents a personality approach to understanding impulsive behavior and is based on factor analysis of frequently used impulsive scales (Whiteside & Lynam, 2009).

Yet another line of investigation into impulsivity is via neuropsychological computerized tests such as the Iowa gambling task (Jollant, Bellivier, Leboyer et al., 2005) and measures of executive functions such as those included in the computerized batteries such as CANTAB and BRAC. Sometimes these tests can be administered in an MRI scanner adding further sophistication. A full discussion of this issue is beyond the scope of this review.

In summary, clinical research uses three types of measures to study impulsivity: objective history and case notes, self-report questionnaires, and neuro-cognitive psychological tasks. All these measures are useful and yield interesting data, but the need for clear and consistent use of terms might help to provide standard operational definitions and measures bringing order to the complex concept of impulsivity.

Aggression, Psychopathology and Suicidal Behavior

The correlation between aggression and suicidality has been studied across psychiatric samples, and non-psychiatric populations (Becker & Grilo, 2007; Buie & Maltsberger, 1989; Conner, Cox, Duberstein et al., 2001; Conner, Meldrum, & Wieczorek, 2004; De Hert & Peuskens, 2000; Giegling, Olgiati, Hartmann et al., 2009; Inamdar, Lewis, Siomopoulos et al., 1982; Kelip, Gorlyn, Oquendo et al., 2006; Kerkhof, 2000; Kerr Washburn, Feingold et al., 2007; McGirr, Renaud, Bureau et al., 2008; Solof, Lynch, Kelly, et al., 2000).

Popular conceptualizations of suicide among schizophrenic patients have posited that many suicides of schizophrenic patients involve the use of violent methods to commit suicide thus implying a correlation between aggression and suicidality. Although some studies did find that patients suffering from schizophrenia usually attempt suicide with a potentially lethal method (Fenton, McGlashan, Victor et al., 1997), this was not confirmed by most studies. Recent
reports found that methods used in suicide attempts by persons suffering from schizophrenia were largely nonviolent with more violent methods more often associated with older men (Kerkhof, 2000). These results were supported by a later study by Symonds and colleagues (2006) that compared suicidal intent, violence of method, and motive in patients suffering from schizophrenia and adjustment reactions with self-harm. They also examined the effect of positive symptoms of schizophrenia on self-harm. The schizophrenic group did not significantly use more violent methods. The high incidence of self-poisoning in both groups (over 90%) also went against the stereotype of violent schizophrenic self-harm. The use of a violent method was also not significantly associated with the presence of positive symptoms in schizophrenia. Along the same lines Mitrev and Massaldjieva (2004) found no significant relation between current aggressive behavior and current suicide risk, as well as between lifetime aggression and lifetime suicide behavior in male inpatients with schizophrenia and other psychotic disorders. Finally, in a study by McGirr and colleagues (2006) on 81 psychotic subjects of whom 45 died by suicide it was found that impulsive-aggressive behaviors did not play a role in schizophrenic and chronic psychotic suicide. This is contrary to findings in other diagnostic groups, implying heterogeneity in predisposing mechanisms of suicide.

Depression is also associated with suicide risk (Apter, Bleich, Plutchik et al., 1988; Apter, Gothelf, & Orbach, 1995; Becker & Grilo, 2007; Marttunen, Aro, Henriksson et al., 1991; Vermeiren, Schwab-Stone, Ruchkin et al., 2003; Zalsman, Braun, Arendt et al., 2006). Several studies found a correlation between suicide attempters suffering from depression and high levels of impulsive and aggressive behaviors (Malone, Haas, Sweeney et al., 1995; Pendse, Westrin, & Engstrom, 1999; Stein, Apter, Ratzoni et al., 1998), especially when comorbid with Borderline Personality Disorder or substance use disorders (Cheng, Mann, & Chan, 1997). It remains unclear whether the association between impulsive and aggressive behaviors and the risk of suicide is at least partly explained by axis I disorders that are commonly associated with suicide, such as major depressive disorder. In an attempt to clarify that question, Dumais and colleagues (2005a) compared a large sample of male suicide completers who died during an episode of major depression to living depressed males. They found that impulsive aggressive personality disorders and alcohol abuse were two independent predictors of suicide in major depression.

Bipolar disorder also is associated with suicidal behavior. Aggression but not impulsivity appears to be a factor in this group. Oquendo and colleagues (2000), and Michaelis and colleagues (2004) report that hostility was elevated in bipolar suicide attempters relative to non attempters. In clinical practice, impulsiveness and hostility may function as suicide attempt risk indicators because they indicate the likelihood of Borderline Personality Disorder (BPD), which itself carries a heightened risk for suicidal behavior. Therefore there are quite a few studies that investigated the association between suicide attempts and violence among personality disorders, especially BPD (Brodsky, Malone, & Ellis, 1997; Krakowski & Czobor, 2004; Zalsman, Braun, Arendt et al., 2006). One of the studies had a large sample of 120 BPD subjects, 50 controls, and 70 who died by suicide (McGirr, Paris, Lesage et al., 2007). Interviews on proxy-based structured diagnostic instruments and personality trait assessments were performed. They found that BPD individuals who died by suicide differed from those borderlines typically encountered in acute psychiatric settings. They suggest that the lethality of BPD suicide attempts results from an interaction between impulsivity and the violent-aggressive features associated
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with cluster B comorbidity. Similar results were obtained by Brodsky and colleagues (2006) who found that attempters with comorbid BPD and major depressive disorder (MDD) had a higher number of lifetime suicide attempts, made their first attempt at a younger age, reported more interpersonal triggers, and had higher levels of lifetime aggression, hostility, and impulsivity, compared with attempters with major depression only. Similar results were obtained with adult major depressives in a study conducted by Kelip and colleagues (2006).

In hospitalized adolescents there also is a robust association of aggression and suicide behavior (Becker & Grilo, 2007; Borowsky, Ireland, & Resnick, 2001; Brent, Johnson, Bartle et al., 1993; Brent, Johnson, Perper et al., 1994; Horesh, Orbach, Gothelf et al., 2003; King, Schwab-Stone, Fisher et al., 2001; Olsson, 1999; Shaffer, Gould, Fisher et al., 1996). Studies on hospitalized adolescents found 2 types of suicidal behaviors: one characterized by depressive symptoms and another characterized by impulsivity. In the first study on hospitalized adolescents, although suicidality scores were correlated with depression scores; suicidality scores were higher in patients with conduct disorder than in those with depression (Apter, Bleich, Plutchik et al., 1988). A later study found that suicidal behavior correlated with both depression and violent behavior but that depression and violent behavior were not correlated (Apter, Gothelf, Orbach et al., 1995). This model of 2 types of suicidal behavior was affirmed in a later study on younger male subjects (M age = 9.81) that supported a direct relation between depressive symptoms and suicidal ideation independent of impulsivity and aggression, as well as a significant path from impulsivity to suicidal ideation and attempt through aggression and depressive symptoms (Greening, Stoppelbein, Fite et al., 2008).

The association of aggression to suicidal behavior also was found in non-patient adolescents. Conner and colleagues (2004) gathered data from a community sample of 625 adolescent and young adult males. Impulsivity and irritability were associated strongly with suicidal ideation after accounting for alcohol dependence and other aggression related constructs including psychopathy. Vermeiren and colleagues (2003) conducted a school-based study, using self-report measures. They observed that suicidal and violent adolescents shared characteristics related to internalizing problems, aggression, and risk-taking behavior (see also Woods, Lin, Middleman et al., 1997).

Impulsivity, Psychopathology, and Suicidal Behavior

Impulsivity is one of the most frequently implicated risk factors for engaging in maladaptive behaviors, such as serious self-injury (Anestis, Selby, & Joiner, 2007). A number of studies have assessed the relationship between impulsivity and suicide attempts across different nosologies (Baca-Garcia, Diaz-Sastre, Basurte et al., 2001; Brent, 1987; Brown, Overholser, Spirito et al., 1991; Dumais, Lesage, Phil et al., 2005a; Dumais, Lesage, Lalovic et al., 2005b; Soloff, Lynch, Kelly et al., 2000; Swann, Dougherty, Pazzaglia et al., 2005; Williams, Davidson, & Montgomery, 1980).

Swann and colleagues (2005) evaluated bipolar patients with and without a definite history of attempted suicide using the Barratt Impulsiveness Scale and a behavioral laboratory performance measure. They found that a history of suicide attempts, especially medically severe attempts, was associated with impulsive responses on an immediate memory task. In a study of men with major depression, more than half of whom had committed suicide during a depressive episode, Dumais and colleagues (2005a) noted an association of suicide with high levels of impulsivity and aggression, in addition to alcohol and drug dependence,
and cluster B personality disorders. Finally, Maser and colleagues (2002) compared the personality characteristics of three groups of patients with affective disorders who were followed naturalistically for 14 years: 36 patients who committed suicide; 120 patients who attempted suicide; and 373 patients with no record of a suicide attempt. Impulsivity was common to both suicide attempters and completers, and together with assertiveness was the best predictor of completed suicide beyond 12 months.

However, there also are studies that did not confirm the relation between impulsivity and suicidality in subjects suffering from affective pathologies. In a study of impulsive and non-impulsive suicide in depressed and non-depressed patients, Simon and colleagues (2001) showed that although impulsive suicide attempts occurred in both groups, the depressed patients were significantly less likely to have attempted suicide impulsively. These findings were consistent with other studies of suicide survivors (Baca-Garcia, Diaz-Sastre, Basurte et al., 2001; Brent, 1987; Brown, Overholser, Spirito et al., 1991; Soloff, Lynch, Kelly et al., 2000; Williams, Davidson, & Montgomery, 1980).

Impulsivity may also constitute a temperamental vulnerability to suicide independent of Axis I diagnosis. Impulsive and suicidal behaviors are among the most characteristic features of borderline personality disorder (Gunderson, 2001; Paris, 1994, 2002; Siever & Davis, 1991). Zouk and colleagues (2006) investigated suicide completers with very extreme phenotypes, defined as a score above the 70th and below the 30th percentile on the BIS. Clinical, behavioral, and psychosocial suicide risk factors were assessed by structured psychological autopsy with informants who knew the victims well. The results showed that compared to less impulsive suicide completers, the highly impulsive subjects were more likely to have a cluster B diagnosis, exhibited higher measures of aggressive behavior, and as well as a lifetime and 6-month prevalence of alcohol and drug dependence.

Suicide attempts in alcoholics have also been linked to behavioral disinhibition, impulsivity, and aggression; with the use of violent methods for the attempts (Bergmann & Brismar 1994; Mezzich, Giancola, Tarter et al., 1997; Suominen, Isomets, Henriksson et al., 1997). Recently, Wojnar and colleagues (2009) investigated 154 patients with alcohol dependence admitted for addiction treatment and assessed for suicidal behavior, severity of alcohol dependence, impulsivity, childhood abuse, and family history. A stop-signal procedure was used as a behavioral measure of impulsivity. Forty-three percent of the subjects reported lifetime suicide attempts of which 62% were impulsive. The only significant factor that distinguished patients with impulsive suicide attempts from patients with a non-impulsive suicide attempts and non-suicidal patients was a higher level of behavioral impulsivity on the stop-signal test. Similar results were obtained in a study that compared two groups of psychiatric subjects, a group with substance dependence and another without. The substance dependent group had a tendency towards more impulsive aggressive personality and a history of suicidal thoughts and behaviors (Pompili, Innamorati, Lester et al., 2009). The statistical significance of these findings was, however, low.

A similar association of impulsivity and suicide was found in non-psychiatric community samples. Dougherty and colleagues (2004) recruited 50 adults from the community through a newspaper advertisement for paid research volunteers. The participants were divided into three groups by suicide attempt history (no attempt, single attempt, or multiple attempts) and compared for performance on a laboratory measure of behavioral impulsivity. The authors found that the multiple attempters made the highest percentage of errors.
In a recent case study, Cheah, Schmitt, and Pridmore (2008) describe a person with no Axis I or II psychiatric diagnosis who jumped off a bridge under threat of disgrace and possible prosecution because of a gambling debt. The authors identified impulsivity as a significant factor underlying his suicidal act. Finally, Wyder and De Leo (2007) surveyed a community sample of attempters. Twenty-five percent of this subgroup described a pattern consistent with an impulsive attempt. Surprisingly, there were no differences in mean scores of trait impulsivity between those who made impulsive and non-impulsive attempts.

The mechanism by which impulsivity and aggression combine with psychopathology to produce suicidal behavior remains uncertain. The literature is somewhat confusing probably since, as noted above, impulsivity is an ill defined concept, different nomenclature are used for aggression, and the operational definitions of both terms varies a lot too. Other problems arise from the fact that the boundaries between impulsivity and aggression are unclear and many disparate measures are used. From clinical experience and much research there is intuitively a very important role for impulsivity and aggression in the understanding of suicide and thus further research based on clearer conceptual refinement in this area is imperative. As can be seen from our review the vast majority of studies use scales for measuring most of the constructs involved. As functional brain imaging techniques develop alongside more sophisticated neuropsychological measures it may be possible to clarify some of the issues but even so without more rigorous phenomenological definitions this line of study can also not precede. Yet another line of study not reviewed here but of potential importance for our topic is the field of emotional arousal and regulation. Thus such topics such as attention bias and appraisal and reappraisal (Carthy, Horesh, Apter et al., 2010) which have made such valuable contributions to the field of anxiety may also be relevant for the study of suicide in the future.

SUMMARY

The association between aggression, impulsivity, and suicidal behavior is well established, well documented and is based on decades of research and clinical practice. Nonetheless the literature is confusing and contradictory and not easy to organize in a coherent manner. This is probably due to the difficulty in defining and separating out these concepts and the fact that there is much overlap between them. Even definitions of the various suicidal behaviors are not completely satisfactory. Looking at aggression and impulsivity in near lethal attempters may be very different from examining these associations in suicide attempt repeaters who frequently are present at emergency rooms. The future probably lies in looking at some basic underlying biological phenotypes such as those described in the work of Mann and Currier (2009) or some of the sociological problem behavior theories of Jessor (1991). Since aggression and impulsivity are so ubiquitous in suicidal behaviors and so obvious a target for intervention, this area of enquiry must be pursued despite all the inherent difficulties involved in such endeavor.

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