Personality and attempted suicide. Analysis of anger, aggression and impulsivity

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ABSTRACT

Suicide is one of the leading causes of death worldwide, mortality from suicide being approximately 2%. Attempted suicide appears to be a major risk factor for suicide completion. Anger, aggression and impulsivity are personality traits associated with suicide attempt. In this study we analysed a part of a previously reported sample in order to test anger, impulsivity and temperament/character scales as predictors of aggression and self-aggression in suicide attempters and to compare anger- and aggression-related traits between impulsive and premeditated suicide attempts as well as between violent and non-violent suicide methods.

One-hundred-eleven consecutively admitted inpatients with a lifetime history of attempted suicide were assessed for anger (State-Trait Anger Expression Inventory, STAXI), aggression (Questionnaire for Measuring Factors of Aggression, FAF) and temperament/character (Temperament and Character Inventory, TCI).

Higher aggression scores, as measured by FAF, were predicted by being male, meeting criteria for borderline personality disorder and having higher angry temperament scores as assessed by STAXI; low cooperativeness was also associated with aggression but not after controlling for STAXI scales. TCI dimensions associated with self-aggression were high harm avoidance, high impulsivity and low self-directedness; state anger, inwardly directed anger and inhibition of aggression were also predictors of self-aggression.

In conclusion, impulsivity and harm avoidance have emerged as temperament dimensions independently associated with self-aggressive tendencies in personality. Such interactions could explain the correlation between temperament and suicidality but further research is needed. Anger and self-directedness appear to have some effects on suicide attempt.

1. Introduction

Suicide accounts for almost 2% of the world’s death (World Health Organization, 2005). Suicide has emerged as one of the leading causes of death among individuals aged 15–34 years in all countries which provided information on suicidality to the World Health Organization (World Health Organization, 2005). Epidemiological research shows that close to 90% of individuals who complete suicide have diagnosable psychiatric disorders at the time of death (Moscicki, 1997). Attempted suicide, that occurs 10–20 times more frequently than completed suicide, is currently regarded as the most important predictor of a future death from suicide (Gunnell and Lewis, 2005). Almost one quarter of suicides are preceded by non-fatal suicidal behaviors in the previous year (Owens and House, 1994) and approximately 2% of suicide attempters end their own life during the 12 months subsequent to the index event (Owens et al., 2002). In the years following an initial suicide attempt, studies indicate a suicide risk ranging from 3.2% (Suokas and Lonnqvist, 1991) to 11.6% (Nielsen et al., 1990) within 5 years, 4.8% (Beck and Steer, 1989) to 12.1% (Nielsen et al., 1995) within 10 years, 6.7% within 18 years (De Moore and Robertson, 1996), and 10–15% within lifetime (Suominen et al., 2004). As non-fatal suicide attempt is often the first step of a process that ends with suicide completion, intervention on attempted suicide could reasonably reduce mortality from suicide. Personality traits have several properties that make them attractive targets for suicidality research and intervention. (1) They affect variables that may contribute to the diathesis for suicide, namely, our perception of and adaptations to the environment and “self” (Dean et al., 1996). (2) Their maturational patterns may render them more suitable for long-term public health interventions compared with other, more changeable risk factors. More specifically, even though traits are amenable to modification only relatively early in life, any
intervention that is carried out at this time would have longer-lasting effects (Roberts and DelVecchio, 2000). (3) Personality may be useful in early identification of subgroups of suicidal individuals, such as repeated attempters (Evans et al., 1996; Laget et al., 2006) and older completers (Useda et al., 2007). (4) Gender-specific personality differences may contribute to gender dissimilarities observed in suicide attempts and completions (Widiger and Anderson, 2003). (5) Personality traits, that are partly under genetic control, may be endophenotypes for the genetic component of suicidal behavior (Baud, 2005).

Clinical and community research suggest links between suicide attempts and psychological traits of aggression, anger and impulsivity. Aggressiveness has been related to suicidality in mood disorders. Straub et al. compared four groups of depressed women with suicide ideation, violent suicide attempt, non-violent suicide attempt and depression without suicidality: aggression scores, together with other psychophysiological features, were shown to differentiate between such groups (Straub et al., 1992). In their sample of psychiatric inpatients (51% with mood disorder) Mann et al. found higher rates of lifetime aggression in suicide attempters compared to non-suicidal patients (Mann et al., 1999; Oquendo et al., 2000; and, more recently, Crunebaum et al. (2006) reported that lifetime aggression traits did correlate with suicide attempts in patients with mood disorder. In a recent study, regression tree analysis applied to a large group of bipolar patients identified current depression and aggressive traits as indicators of a remote suicide attempt (Mann et al., 2008). A link between aggressiveness and suicidal behavior has also been shown in schizophrenia (Hong et al., 2004; Malone et al., 2003; Mann et al., 2008; McGirr and Turecki, 2008), borderline personality disorder (Brodsky et al., 2006; Horesch et al., 2003) and substance use disorders (Sher et al., 2005, 2008; Tremaeu et al., 2008), and in non-clinical samples (Ille et al., 2001). In suicidal patients, aggressive traits have often been studied together with impulsivity. Aggression/impulsivity and pessimism have emerged as clinical predictors of suicidal acts after a major depressive episode in patients with mood disorder (Oquendo et al., 2004). Suicide completers with impulsive personality features exhibited higher measures of aggressive behavior (Zouk et al., 2006). Aggressive traits and impulsivity appear to be more common in suicide attempters with bipolar disorder (Zalsman et al., 2006). Anger-related personality traits have also been linked to suicidal behavior. The association between anger and suicidality has been demonstrated in depression (Painuly et al., 2007; Seidtiz et al., 2001; Velting et al., 2000), eating disorders (Nickel et al., 2006; Verkes et al., 1996; Youssef et al., 2004) and alcohol use disorders (Haw et al., 2001). In adolescent samples studies reveal a strong correlation of anger with self-harm (Hawton et al., 1999) and attempted suicide (Cautin et al., 2001; Esposito et al., 2003; Kirkcaldy et al., 2006; Stein et al., 1998). Temperament and character dimensions have been widely investigated as personality components associated with suicidal behaviors in patients with mood disorders (Engstrom et al., 2004; Rothenhaeuser et al., 2006; Sayin et al., 2007), eating disorders (Anderson et al., 2002; Bulik et al., 1999; Favaro et al., 2008) and substance use disorders (Evren and Evren, 2005, 2006) as well as in samples with mixed psychiatric diagnoses (Becerra et al., 2005; Guillem et al., 2002). Overall these studies report elevation in the temperament dimensions of “novelty seeking” (NS) and “harm avoidance” (HA) (Becerra et al., 2005; Calati et al., 2008; Rothenhaeuser et al., 2006) and decrease in the character dimensions of “self-directedness” (SD) and “cooperativeness” (CO) (Becerra et al., 2005; Evren and Evren, 2006; Favaro et al., 2008; Rothenhaeuser et al., 2006) in suicide attempters compared to non-suicidal controls.

Despite this great research effort, the relationship between personality and suicidality is still a controversial area of study with unresolved definitional, conceptual and research quandaries. One such quandary is the link between impulsivity and aggressiveness. A variety of studies, in particular conducted by the McGill Group for Suicide Studies (Canada), demonstrated an association between impulsive personality traits and lifetime aggression in suicidal subjects (McGirr et al., 2008; McGirr and Turecki, 2007; Turecki, 2005; Zouk et al., 2006). Such findings have led researchers to speculate on a common impulsive–aggressive dimension that may predispose to suicidality (McGirr and Turecki, 2007; Turecki, 2005). Conversely others reported a weak correlation between measures of aggression and impulsivity (Critchfield et al., 2004). Such inconsistent findings may be due to different operationalizing criteria and instruments used to assess aggression and impulsivity in suicide research. Aggressiveness has been measured by self-report questionnaires on aggressive tendencies (Dohlara et al., 2008; Giegling et al., 2006; 2007; Pompili et al., 2008) or operationalized as a lifetime history of aggressive behaviors (McGirr et al., 2008; Oquendo et al., 2007, 2004; Renaud et al., 2008; Zouk et al., 2006). Impulsivity may be conceptualized as the inability to resist impulses, which, from the strict phenomenological point of view, refers to explosive and instantaneous, automatic or semi-automatic psychomotor actions that are characterized by their sudden and incoercible nature (Kempf, 1976). A more behavioral definition considers impulsivity as a predisposition toward rapid, unplanned reactions to external or internal stimuli without regard to the negative consequences of these reactions to the impulsive individual (Moeller et al., 2001). The lack of consensus about a definition of impulsivity leads to difficulties in its measurement. Impulsivity self-report scales exhibit low intercorrelations, are subject to response bias, and incorporate multiple sub-factors (Gorlyn, 2005). An alternative approach is to define impulsivity from the point of view of temperament by considering NS dimension according to Cloninger’s model (Cloninger et al., 1993). High NS was found to be an important predictor of risk of a future suicide attempt in cohort studies (Fergusson et al., 2003, 2000).

In clinical evaluation of suicide attempt premeditation is a critical factor. Indeed different interventions may be necessary for a subject who has carefully planned his attempt for a long period or is liable to act out suddenly in response to circumstances. A considerable proportion of attempts are made without premeditation. Although such impulsive suicide attempts are often pointed to being different from planned attempts, few studies have compared the two forms yielding inconsistent results (Brown et al., 1991; Mitrev, 1996; Polewka et al., 2005; Simon et al., 2001; Witte et al., 2008; Wyder and De Leo, 2007). Methods chosen for suicide attempt should be carefully considered in prevention tasks as they vary considerably in terms of violence and lethality. Research suggests that personality traits of anger, aggression and impulsivity may influence the choice of suicide methods, although there are no consistent results from available studies (Dumais et al., 2005b; Held et al., 1998; Seidtiz et al., 2001; Straub et al., 1992).

Our research group used two independent samples previously collected for genetic association studies in order to ascertain temperament and character correlates of suicidal behavior (Calati et al., 2008). One group, recruited in our research centre in Munich (Germany), included 144 mental disorder patients with history of suicide attempt, 76 mood disorder patients without suicide attempt and 1148 non-psychiatric controls who completed the Temperament and Character Inventory (TCI) (Cloninger et al., 1994). A second sample, enrolled in our mood disorder centre in Milan (Italy), consisted of 46 suicide attempters and 147 mood disorder patients without history of suicide attempt who were also evaluated with the TCI. The study could differentiate patients from healthy controls by their temperament and character features; however there were similar TCI profiles in suicide attempters and non-suicidal mood disorder subjects. Moreover TCI profiles
did not statistically differ between impulsive and planned suicide attempts as well as between violent and non-violent suicide methods. These findings did not allow to infer an association between attempted suicide and attempter’s temperament and character features.

This study analysed a part of the same sample with a different research focus, no longer history of suicide attempt but personality predisposition to self-aggressive behaviors regardless of their severity (self-aggression). In brief, the objective of the study was to explore the correlation of aggression and self-aggression with anger, impulsivity (defined by the temperament dimension of NS) and the other temperament and character dimensions of personality in suicide attempters. In addition the study compared anger- and aggression-related traits between impulsive and premeditated suicide attempts as well as between violent and non-violent suicide methods.

2. Materials and methods

2.1. Sample

Suicide attempters were inpatients consecutively admitted to the general psychiatric ward of the Department of Psychiatry, Ludwig-Maximilians-University, Munich (Germany). Inclusion criteria were: (1) age > 18 years; (2) a lifetime history of at least one clear-cut suicidal behavior, according to the definition of suicide and suicide attempt proposed by De Leo et al. (2004); (3) presence of an Axis I disorder and no additional Axis I disorder; (4) presence of an Axis II disorder, no additional Axis II disorder and no comorbid Axis I disorder. Instead patients with mental retardation or cognitive disorders, substance use disorders as well as mental disorders due to a general medical condition were excluded. These criteria were chosen to obtain homogeneous diagnostic groups, as the patients were originally recruited for genetic association studies (Giegling et al., 2006, 2007; Rujescu et al., 2002, 2003, 2001).

One hundred and forty four patients met eligibility criteria reported above and they were included in our previous work on attempted suicide (Calati et al., 2008). Assessments of anger and aggression were not available for 33 of such patients, who were excluded from the present study. The final sample included 111 suicide attempters; their diagnostic composition was as follows: 76 patients with mood disorder and no additional Axis II disorders (additional axis I disorders were not allowed), 17 patients with schizophrenic-spectrum disorders and 18 patients with borderline personality disorder and no additional axis I disorders (presence of comorbid axis II disorders was an exclusion criterion). Systematic information on suicide attempts was collected by repeated interviews with the patients, all available medical records and the Basic Documentation for Suicidal Behavior (Basisdokumentation suizidalen Verhaltens) (Kulessa et al., 1987). This instrument allows differentiating between suicide attempts and other forms of self-harming behaviors and accidents. The Basic Documentation for Suicidal Behavior was used in various studies on suicide (Neuner et al., 2001; Shields et al., 2003; Spiessl et al., 2002). The suicide attempts were classified as violent (hanging, stabbing, shooting, jump from buildings or in front of vehicles, severe deliberate car accident, electricity, fire) or non-violent (illicit or prescription drugs, gas suffocation, drowning) according to the methods used and the severity of the attempt. Patients with a past history of violent suicide attempt were classified as violent regardless of the method used for the most recent attempt. The German version of the Intent Score Scale (Pierce, 1981) was used to classify suicidal behavior as being impulsive or non-impulsive. Patients with impulsive suicidal behavior, impulsive attempters, had no suicide-related thoughts prior to the attempt (i.e., scoring ‘0’ on item ‘premeditation’). Current and lifetime diagnoses of mental disorders were assessed close to discharge using the Structural Clinical Interviews for DSM-IV SCID I (First et al., 1995) and SCID II (First et al., 1990).

2.2. Evaluation instruments

Each patient was assessed by German versions of the Temperament and Character Inventory (TCI) (Cloninger et al., 1994), State-Trait Anger Expression (STAXI) (Spielberg, 1991) and Questionnaire for Measuring Factors of Aggression (FAF-Fragebogen zur Erfassung von Aggressivitätsfaktoren) (Hampel and Selg, 1975). Patients were assessed close to discharge. A GAF score >80 was required for assessment. No patient was excluded due to lower GAF score.

2.2.1. Temperament and character inventory

The TCI, based on Cloninger’s psychobiological theory of personality (Cloninger et al., 1993), is suitable for measuring temperament and character dimensions in both normal individuals and patients with mental disorders. The TCI comprises four temperament scales which describe aspects of the personality that are probably hereditarily influenced, are automatic, unconsciously influence the learning processes, and can already be observed early in childhood years. The three character scales refer to dimensions that become fully developed at adult age, influence personal and social effectiveness, as well as the acquisition of conscious self-perception. The temperament scales are called Novelty Seeking (NS), Harm Avoidance (HA), Reward Dependence (RD) and Persistence (PE). The character scales are: Self-Directedness (SD), Cooperativeness (CO) and Self-Transcendence (ST). With the exception of the Persistence scale, the main scales have a total score of three to five subscales. NS includes four subscales: exploratory excitability (NS1; 11 items), impulsiveness (NS2; 10 items), extravagance (NS3; 9 items), disorderliness (NS4; 10 items). The TCI can be filled in by persons from 15 years of age. The 240 questions of the TCI are answered with “correct” or “incorrect”. The TCI can be filled in approximately 40 min.

2.2.2. State-trait anger expression inventory

The STAXI was developed to measure components of anger in the context of both normal and abnormal personality. The STAXI consists of 44 items which are distributed across five main scales: State Anger (10 items), which measures the respondent’s current feelings of anger; Trait Anger (10 items), that is divided into Angry Temperament (expression of anger without provocation) and Angry Reaction; Anger-In (8 items), that measures the frequency with which the respondent expresses his/her anger to other people or objects; Anger-Out (8 items), that determines the frequency with which the respondent expresses his/her anger to other people or objects; Anger Control (8 items), that measures the degree to which the respondent attempts to control his/her expression of anger. All items are rated on a four-point scale and are assigned a score of between 1 and 4. A total score is computed for each scale. The psychometric properties of the German version of the STAXI questionnaire were reported by Schwenkmezger and Hodapp (1991). The questionnaire had good internal consistency (Cronbach’s alpha values varied between 0.70 and 0.87) and test-retest reliability. Age appears to have a profound effect on STAXI scores: adolescents score highest and adults score lowest on all measures.

2.2.3. Questionnaire for measuring factors of aggression

The self-administered Questionnaire for Measuring Factors of Aggression (Fragebogen zur Erfassung von Aggressivitätsfaktoren-FAF), a German adaptation of the Buss Durkee Hostility Inventory,
is composed by 76 items, of which 66 explore five components of aggressive behavior: spontaneous aggression (19 items), reactive aggression (13 items), irritability (13 items), self-aggression (11 items) and aggression inhibition (10 items); 10 items belong to a ‘openness’ control scale. The Cronbach’s alpha values of each scale, ranging from 0.61 to 0.79, indicate a good internal consistency. Test-retest reliability is also good (Hampel and Selg, 1975).

2.3. Statistical analyses

Multiple regression analysis was performed to identify predictors of aggression (FAF total score) and self-aggression (FAF self-aggression scale) respectively. Impulsivity was defined by the impulsiveness-reflection subscale of TCI NS dimension. Demographic variables and clinical factors (psychiatric diagnosis; premeditation of suicide attempt; use of violent suicide methods) were included in regression model along with TCI scales. Demographic variables were initially controlled for (model ‘A’), then clinical factors were added to demographic variables (model ‘B’). Personality scales were included on a subsequent step; two models were tested: TCI scales added to demographic and clinical variables (model ‘C’) and anger/aggression scales added to demographic and clinical variables (model ‘D’). Finally TCI scales and anger/aggression scales were added to demographic and clinical variables (model ‘E’).

Anger and aggression traits were compared between impulsive and planned suicide attempts as well as between violent and non-violent suicide methods using Student t test and χ² test. Statistical significance threshold was conservatively set at α = 0.01, due to the large number of comparisons. Multivariate comparisons of suicidal groups were replicated via logistic regression. Clinical variables and TCI scores were controlled for using the same procedure as reported above. A 0.05 alpha level was considered for statistical significance in multivariate analysis.

3. Results

3.1. Characteristics of the sample

The sample’s characteristics are reported in Table 1.

3.2. Predictors of aggression and self-aggression

Multiple regression analysis was performed to identify personality trait predictors of aggression and self-aggression component. Tested models are reported above (see statistical analysis).

3.2.1. Predictors of aggression

Model ‘A’: \( F = 2.31, df = 4.11, p = 0.062 \); education level showed an inverse correlation with aggression score. (β = -0.22, t(106) = 2.38, p = 0.019).

Model ‘B’: \( F = 3.69, df = 7.10, p = 0.001 \); education confirmed to be associated with aggression (β = -0.22, t(103) = 2.44, p = 0.016); being male (β = -0.20, t(103) = 2.01, p = 0.045) and meeting diagnostic criteria for borderline disorder (β = 0.38, t(103) = 3.82, p < 0.001) were also associated with aggression.

Model ‘C’: \( F = 3.84, df = 14.9, p < 0.001 \); gender (β = -0.20, t(96) = 2.10, p = 0.037) and diagnosis (β = -0.32, t(96) = 3.02, p = 0.003) were associated with aggression as well as low CO (β = -0.36, t(96) = 3.60, p < 0.001).

Model ‘D’: \( F = 10.3, df = 13.9, p < 0.001 \); gender (β = -0.20, t(97) = 2.61, p = 0.01) and high level of angry temperament (β = 0.49, t(97) = 3.84, p < 0.001) were predictors of aggression.

Model ‘E’: \( F = 6.47, df = 20.9, p < 0.001 \); gender (β = -0.22, t(90) = 2.59, p = 0.01), diagnosis (β = 0.19, t(90) = 2.12, p = 0.036) and angry temperament (β = 0.50, t(90) = 3.55, p < 0.001) confirmed their role as predictors of aggression.

3.2.2. Predictors of self-aggression

Model ‘A’: \( F = 3.19, df = 4.09, p = 0.016 \); age emerged as the only significant predictor showing an inverse correlation with self-aggression (β = -0.24, t(109) = -2.39, p = 0.021).

Model ‘B’: \( F = 4.02, df = 7.16, p = 0.001 \); a lower education level (β = -0.15, t(159) = -2.08, p = 0.03) and psychiatric diagnosis (β = 0.29, t(159) = 3.69, p = 0.003).

Model ‘C’: \( F = 6.85, df = 14.9, p < 0.001 \); HA (β = 0.38, t(109) = 4.21, p < 0.001) and impulsivity (β = 0.21, t(109) = 2.70, p = 0.008) showed a positive correlation with self-aggression, SD was inversely correlated (β = -0.35, t(109) = 3.19, p = 0.002); psychiatric diagnosis was also associated with self-aggression (β = 0.29, t(109) = 2.92, p = 0.004).

Model ‘D’: \( F = 6.74, df = 17.9, p < 0.001 \); psychiatric diagnosis (β = 0.19, t(93) = 2.21, p = 0.023) was confirmed to be associated with self-aggression; in addition state anger (β = 0.26, t(93) = 2.80, p = 0.006), anger-in (β = 0.29, t(93) = 3.03, p = 0.003) and aggression inhibition (β = 0.31, t(93) = 3.83, p < 0.001) showed a positive correlation with self-aggressive behavior.

Model ‘E’: \( F = 7.00, df = 24.8, p < 0.001 \); HA (β = 0.23, t(109) = 2.58, p = 0.011), impulsivity (β = 0.21, t(109) = 2.93, p = 0.004) and SD (β = -0.24, t(109) = 2.26, p = 0.026) were still associated with self-aggression along with state anger (β = -0.22, t(109) = 2.50, p = 0.014), anger-in (β = 0.20, t(109) = 2.03, p = 0.04) and aggression inhibition (β = 0.24, t(109) = 3.02, p = 0.003).

3.3. Impulsive versus non-impulsive suicide attempts

Sixty-five of 111 suicide attempters (58.5%) made their attempt without premeditation and were classified as impulsive attempt-
**4. Discussion**

This study used a part of a previously reported sample (Calati et al., 2008) in order to investigate personality correlates of aggression and self-aggression in suicide attempters. Unlike previous study, the current one was concerned with a different measure of self-harm. Research focus was on anger and impulsivity. Temperament and character dimensions were controlled for as covariates. The study also investigated how personality traits could impact on clinically meaningful characteristics of suicide attempt such as premeditation and violence of suicide methods.

### 4.1. Aggression and impulsivity

We first analysed the relationship between aggressiveness and impulsivity: impulsive traits were associated with self-aggression, but not with aggression.

A large number of studies show correlations between aggressiveness, impulsivity and suicide attempts in mental disorders. One of the most implicated diagnoses is borderline personality disorders (Brodersky et al., 2006; Horesh et al., 2003), but also mood disorders and psychosis align a series of positive studies. For instance, Mann et al. found greater rates of lifetime aggression and impulsivity in a group of suicide attempters included in a sample with affective and psychotic disorders (Mann et al., 1999). Dumais et al. reported that higher levels of impulsivity and aggression were associated with a greater suicide risk in major depressive disorder (Dumais et al., 2005a). An aggression/impulsivity factor was found to be a predictor of suicide acts in major depression.
and bipolar disorder (Oquendo et al., 2004) and a precursor of early-onset suicidal behavior in offspring of patients with mood disorders (Melhem et al., 2007). To compare these findings with ours, it should be considered that we did not analyse personality traits associated with suicide attempt, but with a broader spectrum of self-aggressive behaviors. Beside attempted suicide, non-suicidal self-harm has also been associated with impulsivity and aggression in eating disorders (Davis and Karvinen, 2002; Paul et al., 2002; Svirko and Hawton, 2007), personality disorders (Krysinska et al., 2006). Impulsivity and aggression traits were correlated with non-suicidal self-harm in alcohol use disorder (Haw et al., 2001). Although impulsive-aggression is considered to be one of the most consistent psychological correlates of suicidal behavior (McGirr and Turecki, 2007; Turecki, 2005), not all studies support this construct in suicide phenomenology. Hawton et al. investigated the role of psychological factors in repetition of deliberate self-harm by adolescents: higher trait anger scores, higher degree of hopelessness and lower self-esteem were reported in adolescents who repeated self-harm as compared to non-repeaters, while impulsivity did not differ in the two groups (Hawton et al., 1999). In a sample of bipolar disorder patients suicide attempters were differentiated from non-attempter counterpart by more lifetime aggression; instead lifetime impulsivity was similar in the two comparison groups (Oquendo et al., 2000). Critchfield et al. examined the relationship between multiple measures of impulsivity, aggression and impulsive-aggression in a borderline personality disorder sample. Their results showed little relationship between measures of aggression and impulsivity, impulsive-aggression correlated with aggression measures only (Critchfield et al., 2004). Our results suggest that it might be necessary to differentiate between aggression and self-aggression in order to explore the relationship with impulsivity. Aggression and self-aggression were characterised by distinct personality correlates, which may imply different pathophysiological mechanisms behind the two phenomena. This is in contrast with prior works showing similar temperament traits in suicide attempters and violent offenders (Engstrom et al., 1999). Unlike previous studies, the current one used a different definition of impulsivity as a component of NS. Moreover it did not collect information on lifetime aggressive behaviors, but assessed personality traits of aggression.

### Table 3
Comparison between violent and non-violent suicide attempt.

<table>
<thead>
<tr>
<th></th>
<th>Violent SA</th>
<th>Non-violent SA</th>
<th>p</th>
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<tbody>
<tr>
<td>N</td>
<td>N = 40</td>
<td>N = 71</td>
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</tr>
<tr>
<td><strong>Age</strong></td>
<td>39.27 ± 12.79</td>
<td>39.15 ± 14.20</td>
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<tr>
<td><strong>Gender</strong></td>
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<tr>
<td>Males</td>
<td>22 (51.2%)</td>
<td>21 (48.8%)</td>
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<tr>
<td>Females</td>
<td>18 (26.4%)</td>
<td>50 (73.6%)</td>
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<td><strong>Marital status</strong></td>
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<tr>
<td>Single</td>
<td>19 (34.5%)</td>
<td>36 (65.5%)</td>
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<tr>
<td>Married</td>
<td>14 (36.8%)</td>
<td>24 (63.2%)</td>
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<tr>
<td>Separated/divorced</td>
<td>7 (38.8%)</td>
<td>11 (61.2%)</td>
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<tr>
<td><strong>Education</strong></td>
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<td>Primary education</td>
<td>15 (44.1%)</td>
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<td>Secondary education</td>
<td>13 (31.7%)</td>
<td>28 (68.3%)</td>
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<td>University education</td>
<td>12 (33.3%)</td>
<td>24 (66.7%)</td>
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<tr>
<td><strong>Diagnosis</strong></td>
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<tr>
<td>Mood disorder</td>
<td>47 (61.8%)</td>
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<td>Schizophrenia-spectrum</td>
<td>10 (88.8%)</td>
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<td>Borderline disorder</td>
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<td><strong>Premeditation</strong></td>
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<tr>
<td>Impulsive</td>
<td>19 (29.2%)</td>
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<td>Non-impulsive</td>
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<td>25 (34.4%)</td>
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<td><strong>STAXI</strong></td>
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<tr>
<td>State anger</td>
<td>13.92 ± 4.97</td>
<td>15.64 ± 6.79</td>
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</tr>
<tr>
<td>Angry temperament</td>
<td>8.95 ± 2.40</td>
<td>8.51 ± 3.49</td>
<td>0.444</td>
</tr>
<tr>
<td>Angry reaction</td>
<td>10.92 ± 3.14</td>
<td>11.25 ± 3.62</td>
<td>0.035</td>
</tr>
<tr>
<td>Anger in</td>
<td>18.87 ± 5.69</td>
<td>19.47 ± 6.45</td>
<td>0.028</td>
</tr>
<tr>
<td>Anger out</td>
<td>13.05 ± 4.04</td>
<td>12.98 ± 5.15</td>
<td>0.945</td>
</tr>
<tr>
<td>Anger control</td>
<td>23.31 ± 4.21</td>
<td>23.37 ± 5.11</td>
<td>0.946</td>
</tr>
<tr>
<td><strong>FAF</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spontaneous aggression</td>
<td>22.50 ± 4.07</td>
<td>22.30 ± 4.07</td>
<td>0.795</td>
</tr>
<tr>
<td>Reactive aggression</td>
<td>17.55 ± 2.83</td>
<td>16.97 ± 3.31</td>
<td>0.346</td>
</tr>
<tr>
<td>Irritability</td>
<td>18.50 ± 2.47</td>
<td>18.19 ± 3.33</td>
<td>0.022</td>
</tr>
<tr>
<td>Self-aggression</td>
<td>17.68 ± 3.00</td>
<td>17.90 ± 2.85</td>
<td>0.840</td>
</tr>
<tr>
<td>Aggression control</td>
<td>16.60 ± 2.31</td>
<td>15.88 ± 2.18</td>
<td>0.113</td>
</tr>
<tr>
<td><strong>TCI</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impulsivity (NS2)</td>
<td>14.52 ± 2.23</td>
<td>14.27 ± 2.44</td>
<td>0.581</td>
</tr>
<tr>
<td>Harm avoidance</td>
<td>57.07 ± 7.90</td>
<td>57.90 ± 7.89</td>
<td>0.598</td>
</tr>
<tr>
<td>Reward dependance</td>
<td>39.27 ± 4.20</td>
<td>39.66 ± 3.44</td>
<td>0.601</td>
</tr>
<tr>
<td>Persistence</td>
<td>11.17 ± 2.81</td>
<td>11.69 ± 2.40</td>
<td>0.310</td>
</tr>
<tr>
<td>Self-directedness</td>
<td>68.62 ± 13.8</td>
<td>65.63 ± 16.5</td>
<td>0.335</td>
</tr>
<tr>
<td>Cooperativeness</td>
<td>72.80 ± 5.12</td>
<td>71.82 ± 6.78</td>
<td>0.427</td>
</tr>
<tr>
<td>Self-transcendence</td>
<td>45.55 ± 7.03</td>
<td>46.35 ± 7.41</td>
<td>0.578</td>
</tr>
</tbody>
</table>

NS2: impulsiveness-reflection subscale of the TCI dimension “Novelty seeking”.

* Statistical significance: p < 0.01.
4.2. Harm avoidance, character and self-aggression

Higher HA and lower SD were other personality traits that revealed a significant correlation with self-aggression in suicide attempters. The same traits have been pointed to as psychological features differentiating suicide attempters from non-suicidal patients in various mental disorders (Becerra et al., 2005; Calati et al., 2008; Evren and Evren, 2006; Favaro et al., 2008; Rothenhausler et al., 2006). A connection between temperament and character dimensions, self-aggressive behaviors and suicidality may imply a common pathophysiological mechanism underlying all these phenomena. This hypothesis, consistent with psychobiological data, is centred on the serotonin system. Several studies have demonstrated the involvement of serotonin neurotransmission in aggressiveness and suicidality (Joiner et al., 2005; Mann et al., 2001; Roggenbach et al., 2002; van Heeringen, 2003). Further support comes from genetic studies which have indicated that polymorphisms in the 5-HT2A and TPH genes are associated with suicidal behavior and anger/aggression/personality traits (Giegling et al., 2006; Oquendo et al., 2006; Rujescu et al., 2002). The serotonin system is also implied in the temperament dimension of HA. PET studies have shown correlations between 5-HT2A receptor binding and HA in healthy subjects (Moreno et al., 2002) and suicide attempters (van Heeringen et al., 2003). The serotonin receptor 5-HT2A gene has been found to moderate the influence of parental socioeconomic status on adulthood HA. The TPH gene affected HA in bulimic women (Monteleone et al., 2007). 5-HT2 receptor sensibility measured by Ca2+ release from intracellular stores has been correlated with HA scores in a nonclinical sample (Peirson et al., 1999). A reduction in HA has been reported in psychiatric patients receiving treatment with serotoninergic antidepressants (Black and Sheline, 1997; Boz et al., 2007; Tse and Bond, 2001). Other lines of evidence implicate serotonin neurotransmission in SD. Indeed antidepressant drugs that act on the serotonin system have been found to increase SD in healthy volunteers (Tse and Bond, 2001). The 5-HTTLPR polymorphism of the serotonin transporter gene was associated with neuroticism-related traits and SD in a recent study (Gonda et al., 2009). We previously demonstrated that the rs594242 polymorphism of the 5-HT2A gene could modulate SD (Serrretti et al., 2007).

However, it should be noted that HA and SD were independently associated with self-aggression, which suggests that their contribution to this personality construct may involve different mechanisms.

4.3. Differences between impulsive and premeditated suicide attempts

The prevalence of impulsive suicide attempt was 58.5%. This rate is higher than 20–25% reported in previous studies (Simon et al., 2001; Witte et al., 2008; Wyder and De Leo, 2007), whereas other works pointed to rates of 55–60% (Baca-Garcia et al., 2001; Wojnar et al., 2008), which are close to ours. Reasons for such inconsistent findings are still unclear. Unlike other studies, we analysed older suicidal patients, with no alcohol and substance use disorders, and only a small group meeting criteria for borderline personality disorder. In addition criteria adopted to define impulsive suicide attempt varied considerably across studies. For instance Simon et al. used spending less than 5 minutes between the decision to attempt suicide and the actual attempt (Simon et al., 2001). In other studies impulsive suicide attempt was defined by combining two items of Beck’s Suicide Intent Scale (Baca-Garcia et al., 2001; Brown et al., 1991).

Available literature suggests that impulsive attempters may be younger, more often diagnosed with borderline personality disorder and less likely to use violent suicide methods than their non-impulsive counterparts (Baca-Garcia et al., 2001, 2005, Horesh, 2003 #114; Levinson et al., 2007). Similar trends were observed in our sample, although they did not reach statistical significance most likely because of a relatively small sample size. It is an apparent contradiction that borderline personality disorder patients, who have higher anger and aggressiveness, were less likely to use violent methods in their suicide attempts. This emphasizes differences between suicidality and forms of aggression, which anyway are usually lumped together in suicide research.

The relationship between impulsive attempt and impulsive personality is a controversial one. Wojnar et al. examined a population of alcohol-dependent subjects who had attempted suicide and found that patients with impulsive attempts had higher levels of behavioral impulsivity than patients with planned suicidal acts (Wojnar et al., 2008). Instead Witte et al. reported that patients who had made a suicide attempt without prior planning were less impulsive than those who had planned their attempt (Witte et al., 2008). We found that impulsive and planned suicide attempts were characterized by comparable levels of aggression and impulsivity in attempters’ personalities. Prior to ours, three other studies failed to demonstrate a correlation between impulsive suicide attempt and attempter's impulsive aggression (Baca-Garcia et al., 2005; Nakagawa et al., 2008; Wyder and De Leo, 2007). Conversely Simon et al. reported a greater prevalence of impulsive attempts in suicidal patients with a higher frequency of physical fights (Simon et al., 2001). Conner et al. analysed a sample in treatment for alcoholism and demonstrated that impulsive suicide attempts were more likely to be carried out by subjects with higher levels of alcohol-related aggression (Conner et al., 2006). In this study anger turned inward was associated with impulsive suicide attempt. It is worth noting that anger has been shown to correlate with repetition of suicide attempt in adolescent attempters (Goldston et al., 1996). Taken together these findings could indicate that a subgroup of suicide attempters with high levels of anger expression may be more likely to act out impulsively, which would result in repeated suicidal behaviors. On the other hand, high anger expression has been related to a better performance in decision making tasks in suicide attempters (Jollant et al., 2005). Moreover we are aware of a previous study that revealed a positive correlation between self-anger and planning of suicidal behavior (Brown et al., 1991). Therefore the influence of anger on decision making process and planning of attempts in suicidal subjects is still to be elucidated. A confounding factor is SD. We found that lower SD was associated with impulsive suicide attempt. Controlling for SD abolished the association between anger turned inward and impulsive attempt. This emphasizes an inverse correlation between SD and anger as suggested in previous studies (Abbate-Daga et al., 2007; Martinotti et al., 2008).

4.4. Predictors of violent suicide methods

Violent methods were more common among males, as consistently reported in the literature (Beautrais, 2002; Groholt et al., 1999; Raja and Azzoni, 2004; Rancans et al., 2001; Voros et al., 2004). Aggression and impulsivity did not correlate with suicide methods. This is in contrast with Swann et al., who reported that impulsivity was highest in subjects with the most medically severe suicide attempts (Swann et al., 2005). However medical severity and violence of methods, although highly interrelated, are not completely overlapping. In Dumais et al. violent method was associated with a higher level of lifetime aggression and a higher level of impulsivity (Dumais et al., 2005b). This study analysed a sample of suicide completers who were different from our attempters. In van Heeringen et al. there was a tendency of increased NS in violent suicide attempters (van Heeringen et al., 2000). Conversely Soloff et al. differentiated high- and low-lethality borderline
personality disorder attempters by various demographic and clinical variables but not by impulsive and aggressive personality traits (Soloff et al., 2005). This is in line with our results and limits the impact of aggressive-impulsive dimension on the choice of method to attempt suicide. We analysed interactions between anger components and found that lower levels of state anger and higher trait anger (angry temperament) predicted the use of violent methods to attempt suicide. Similarly Seidlitz et al. reported that lower levels of anger predicted higher intent to die and higher lethality of methods in older suicide attempters (Seidlitz et al., 2001); instead in Held et al. a high score of trait anger predicted the choice of violent methods in suicide attempt (Held et al., 1998).

5. Conclusions

Our results emphasize the independent contribution of temperament traits impulsivity and HA to self-aggression, which appears to be a distinct component of aggression construct. These findings could explain the connection between temperament dimensions and suicidality but further research is needed. Some limitations of this study should be acknowledged. The sample was recruited in a specialized research centre. These patients might suffer from more severe mental disorders than those attending secondary care facilities. Distinction between violent and non-violent suicide methods was not based on a structured interview. In the original sample reported by Calati et al. (2008), patients with mood disorder and no history of suicide attempt were not evaluated with anger and aggression scales, thus they could not provide information for the present study. This is a strong limitation, considering how difficult it appears to disentangle the personality profile of suicide attempters from their psychopathology (Calati et al., 2008). Gender and age, which were shown to moderate personality traits of anger (Brezó et al., 2006) as well as temperament and character dimensions (Brändström et al., 2001; Miettunen et al., 2007), were controlled for in our analysis and this fact could be considered a strength. A further strength was to operationalize impulsivity in two different ways as a personality trait and a characteristic of attempted suicide.

Anger-related personality traits may have some effects on characteristics of suicide attempt such as premeditation and choice of violent methods. In particular inwardly directed anger was shown to interact with SD. Adding personality traits to demographic and clinical variables improves the forecast of impulsive and violent suicide attempt, although not enough for clinical intervention. Even if we found little differences between impulsive and premeditated suicide attempts from the point of view of personality correlates, it is nevertheless meaningful for clinical intervention to identify those individuals who are more likely to attempt suicide impulsively, as a dysfunctional response to negative circumstances.

Contributors

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Conflict of interest

None declared.


Mann JJ, Brent DA, Arango V. The neurobiology and genetics of suicide and attempted suicide: a focus on the serotonergic system. Neuropsychopharmacology 2001;24:467–77.


