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ORIGINAL PAPER

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Suicide attempts and impulsivity

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Abstract Impulsivity in suicidal behavior can describe the attempt (state) or the attempter (trait). There are no studies simultaneously measuring attempt impulsivity and attempter impulsivity in representative samples of suicide attempts. A one-year study of 278 suicide attempts in a general hospital tested the continuous versus dichotomous relationship between attempter impulsivity (Barratt Impulsiveness Scale) and attempt impulsivity (low scores in the planning subscale of Beck's Suicidal Intent Scale). Attempter impulsivity was not a good predictor of attempt impulsivity independently of how both dimensions were measured (continuous or dichotomous ways). Impulsive attempts were associated with low lethality and lack of depression. Opportunities for prevention of suicide attempts in major depression and some personality traits may exist but require attentive monitoring of suicidal ideation and intent.

Key words suicide · suicide attempts · impulsivity · personality disorder · major depression

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Introduction

Some psychiatric disorders are associated with impulsivity (Moeller et al. 2001). Impulsivity is also an important component of suicidal behavior (Mann et al. 1999). The relationship between impulsive behavior and suicide attempts can be thought of as having two dimensions: a suicide attempt can be impulsive or not and the suicide attempter can have impulsive traits or not. These two dimensions may not completely overlap or be equivalent and may have different relationship with lethality, another of the major dimensions of suicidal behavior (Baca-Garcia et al. 2001).

Impulsivity as a personality trait can be measured with the Barratt Impulsiveness Scale (Patton et al. 1995). This scale measures three dimensions: cognitive (not focusing on the task at hand), motor (acting on the spur of the moment) and non-planning impulsiveness (not planning and thinking carefully).

Impulsivity during the suicide attempt has been traditionally operationalized by others (Brown et al. 1991; Suominen et al. 1997) and by us (Baca-Garcia et al. 2001) using two items of Beck's Suicidal Intent Scale (SIS) (Beck et al. 1974): active preparation for the attempt (item 6) and degree of premeditation (item 15). Obviously, a dimension that uses two items provides a somewhat limited definition of the attempt impulsivity with a score of 0 for most impulsive attempts and a 4 for the most planned. More recently, using factor analyses of the SIS, we have found two main dimensions in the SIS: expected lethality and planning (Diaz et al. 2003). Planning (the sum of items 1, 2, 3, 5, 6, 7, 8 and 15) appears to be the opposite dimension of impulsivity. Thus, this SIS factor including 8 SIS items (the two 'classical' items and another 6 items) has not been studied as a measure of lack of impulsivity but provides a richer definition, with a 0 for most impulsive attempts and a 16 for the most carefully planned attempts.

Another conceptual issue is that impulsivity in general can be considered a continuous measure or a dis-

crete classification (high levels of impulsivity are present or not) (Moeller et al. 2001). A discrete classification is typical of the clinical approach, in which physicians tend to classify continuous behaviors in normal or abnormal levels. Clinicians tend to simplify the complex clinical reality by disregarding low levels of that behavior. If one uses impulsive trait personality as example, clinicians would disregard low levels of impulsive traits by considering them irrelevant or within normal limits. Clinicians would only focus on the most obvious cases of impulsive traits by classifying a patient as "impulsive" or as "abnormally impulsive".

A computer assisted review of the literature revealed no studies simultaneously measuring attempt impulsivity (state) and attempter impulsivity (trait) in representative samples of suicide attempts. Some published suicide studies have focused on impulsivity in patients with borderline personality disorder (Brodsky et al. 1997; Soloff et al. 2000). This study of 278 suicide attempts tests a new definition of attempt impulsivity (the sum of 8 SIS items) in continuous and discrete ways and assesses its relationship to attempter impulsivity, lethality and other clinical predictors such as psychiatric diagnoses.

Method

This general hospital provides medical coverage for all suicide attempters in a catchment area covering a population of 500,000 people. During a one-year period (Feb. 1, 1999–Jan. 31, 2000), there were 278 suicide attempts (242 different attempters) presenting to the emergency room. A suicide attempt was defined as a self-destructive behavior with the intent to end one's life, independent of resulting damage (O'Carroll et al. 1996). After hearing a complete description of the study, subjects provided written informed consent. Refusing patients did not significantly differ in demographics from consenting patients. Of 278 attempts, 189 (68 %) attempts were in females and 32 % in males. The mean age was 37.3 (15.3 SD). Forty eight percent of the suicide attempters (116/242) presented with a first time attempt.

The Mini International Neuropsychiatric Interview was used to establish the Axis I DSM-IV diagnoses (Sheehan et al. 1998). The International Personality Disorders Examination (IPDE) was used to screen for personality disorder traits (World Health Organization 1996).

Scales

Initially, attempt impulsivity was operationalized using the traditional definition of the sum of SIS items 6 (active preparation) and 15 (degree of premeditation) (Baca-Garcia et al. 2001; Brown et al. 1991; Suominen et al. 1997) which ranges from 0 to 4. Following the indications of a reviewer, we decided to use a new untested definition, the Planning subscale or sum of 8 SIS items which ranges from 0 to 16. The planning subscale includes items 6 and 15, and another six items: 1 (isolation), 2 (timing), 3 (precautions), 5 (final acts), 7 (note) and 8 (communication) (Diaz et al. 2003). The traditional and the new definitions were highly correlated (Spearman Rho = 0.72, $p < 0.001$). As the new definition appears to provide a more thorough and rich measure of attempt impulsivity, the article results will focus on this new way of measuring attempt impulsivity. To make a dichotomous classification of impulsive versus not impulsive attempts, the 25th percentile (a score of 6) of the planning subscale was used to classify attempts as impulsive (76 %) or not impulsive (24 %). The reasons to select so many attempts as impulsive are that suicide attempts tend to be impulsive behaviors. Similarly, 77 % of the attempters had impulsive traits and 23 % did not have them (see next paragraph).

Attempter impulsivity was measured by the total score of the Barratt Impulsiveness Scale (Oquendo et al. 2001; Patton et al. 1995). The BIS-11 contains 30 self-report items scored between 0 to 4 (range of total score 0–120). This scale has three sub-scales: cognitive (mean 16.4 SD 5.0), motor (mean 20.2 SD 7.5) and non-planning impulsiveness (mean 22.6 SD 8.0). In this sample, the mean total score was 59.3 (SD 15.9). We have also studied as controls, 223 blood donors (99 women and 124 men) from the same hospital, without personal history of psychiatric disorders (or personal or familial history of suicide attempts) (Baca-Garcia et al. 2004). As impulsivity traits are influenced by gender, receiver-operating characteristic (ROC) analysis (Greiner et al. 2000) was used to calculate the best cut-point to distinguish between controls and attempters in each gender. In females it was 46.5 (sensitivity = 75 % and specificity = 70 %), and in males it was 50.5 (sensitivity = 81 % and specificity = 78 %).

The Lethality Rating Scale rates the medical consequences of different suicide methods ranging between 0 (no consequences) and 8 (death) (Beck et al. 1974). A score > 2 suggests a "high lethality" attempt and indicates the need for major medical interventions to treat the patient. Attempts were classified as having high lethality (51 %) or low lethality (49 %).

Statistics

As described, both attempt and attempter impulsivity were investigated as continuous or dichotomous variables. Three statistical analyses used attempt impulsivity as the dependent variable. First, the continuous measure of attempt impulsivity was tested as the dependent variable and compared with other continuous variables including attempter impulsivity and lethality. Spearman correlations were calculated and partial correlations were used to adjust for other variables. Second, a dichotomous measure of attempt impulsivity was tested as the dependent variable, and mean attempter impulsivity and lethality were considered independent variables. T-tests for independent samples were calculated. And third, a dichotomous measure of attempt impulsivity was tested as the dependent variable, while other dichotomous variables such as high attempter impulsivity and lethality and psychiatric diagnoses were considered independent variables. For the univariate analyses of two dichotomous variables, cross tabulation analyses (chi square analysis) were used to test for significance. Odds ratios (OR) and 95 % confidence intervals (CI) estimated the association strength. Logistic regression, a multivariant analysis, was used to adjust for the effect of other independent variables. The Hosmer-Lemeshow goodness-of-fit test was employed to test the fitness of the logistic regression models ($p > 0.05$ indicates a good fit). Logistic regression is a particularly suitable alternative for these variables since it handles non-normal variables and dichotomous confounding variables better than multiple regression and ANOVA models.

Results

Descriptive results

The most frequent axis I diagnoses were major depression (51 % 141/278), alcohol abuse/dependence (21 % 42/278), drug abuse/dependence (14 % 34/278) and adjustment disorder (11 % 26/278).

Continuous attempt impulsivity and continuous independent variables

When attempt impulsivity was considered as a continuous variable and compared with attempter impulsivity

as a continuous variable, there was a very weak and not significant correlation between them ($r = 0.11$; $p = 0.62$). Correlations of attempt impulsivity with BIS-11 subscales were similarly low (cognitive subscale $r = 0.04$, $p = 0.57$; motor subscale $r = 0.15$; $p = 0.02$ and non-planning impulsiveness subscale $r = 0.07$; $p = 0.25$). Thus, the variance shared by impulsivity during the attempt and impulsivity as a personality trait was small (< 2 %). When the correlations were explored separately by gender, the correlations were slightly higher in males and some of them became significant (total, $r = 0.22$, $p = 0.05$; cognitive subscale $r = 0.09$, $p = 0.45$; motor subscale $r = 0.11$, $p = 0.32$; and non-planning impulsiveness subscale $r = 0.29$, $p = 0.01$). However, in males, the variance shared by attempter impulsivity and attempt impulsivity was still rather small (< 5 %). There was a significant and inverse relationship between attempt impulsivity and attempt lethality $r = -0.242$ $p < 0.001$.

Impulsive attempts and continuous independent variables

After dichotomizing impulsive and not-impulsive attempts, there was a non-significant difference ($t = 1.4$, $df = 252$, $p = 0.15$) between the means of the BIS total scale in impulsive suicide attempts (60.2, SD 16.0) and those without impulsive attempts (56.9 SD 15.2). There was a trend of more impulsive attempts associated with more motor impulsiveness ($t = 1.7$, $df = 252$, $p = 0.09$). The association with lethality continuous scores was significant and more obvious ($t = 3.6$; $df = 252$, $p = 0.001$); impulsive attempts (1.5 SD 1.4) had significantly lower levels of lethality than non-impulsive attempts (2.3 SD 1.5).

Impulsive attempts and dichotomous independent variables

Impulsive attempts were not associated with impulsive traits in attempters (OR = 1.1, CI 0.5–2.1, Fisher's exact text = 0.86). The final logistic regression model (Hosmer and Lemeshow test $\chi^2 = 0.08$, $df = 2$, $p = 0.96$) using attempt impulsivity as the dependent variable, indicated that impulsive attempts were associated with lack of major depression (OR = 0.25, CI 0.12–0.51; Wald $\chi^2 = 14.7$, $df = 1$, $p < 0.001$) and non-lethal attempts (OR = 0.45, CI 0.24–0.85; Wald $\chi^2 = 6.1$, $df = 1$, $p = 0.013$).

Discussion

A recent and comprehensive review of the literature suggests that a dimensional approach of impulsivity in psychiatric disorders may be more appropriate that a categorical approach (Moeller et al. 2001). In suicide attempts, the relationship between impulsive attempts and impulsive attempter had not been well explored. This study suggests that the categorical approach to impulsivity may be better to understand suicide attempts.

Continuous attempt impulsivity and continuous independent variables

Attempt impulsivity measured as a continuous variable appeared to share relatively low variance with attempter impulsivity. There was a significant but small and inverse relationship between attempt impulsivity and lethality. It is interesting that we found similar results in a prior study (Baca-Garcia et al. 2001) although different measures of attempt impulsivity (two SIS items) and lethality (assessed by the medical treatment) were used. In summary, even when using different definitions, it is possible to conclude that more impulsive attempts tend to be less lethal. However, attempter impulsivity was not significantly associated with lethality ($r = -0.10$, $p = 0.10$).

Impulsive attempts and continuous independent variables

As in the prior analysis, attempt impulsivity and lethality continued to be inversely related but attempter impulsivity was not significantly associated with lethality ($t = 1.6$, $df = 237$, $p = 0.11$). Impulsive attempters had lethality scores of 1.6 (SD 1.4) versus non-impulsive attempters with scores of 2.1 (SD 1.8). In this set of analysis, impulsive attempts were not associated with more impulsive traits.

Impulsive attempts and dichotomous independent variables

The dichotomous classification of attempts into impulsive and non-impulsive also appeared to elucidate the relationship with psychiatric disorders. Impulsive attempts were associated with lack of depression and low attempt lethality.

Comparison between classifications of impulsive attempts

Throughout this article, following the recommendation of the reviewer, a new definition of impulsive attempts was used by including 8 SIS items. This new definition appears to have better face validity than the prior definition used by others and us, that only includes two SIS items. We expected impulsive attempts to be associated with impulsive attempters but that was not the case (OR = 1.1, CI 0.5–2.1, Fisher's exact text = 0.86). When we tested the old definition of impulsive attempt, using 2 SIS items, this old definition was not significantly associated with attempter traits (OR = 1.6, CI 0.9–1.8,

Fisher's exact text = 0.14). In the logistic regression model of attempt impulsivity using this 2-item definition, impulsive attempts were associated with lack of depression (OR = 0.27, CI 0.15–0.47; Wald $\chi^2 = 21.2$, df = 1, $p < 0.001$), non-lethal attempts (OR = 0.58, CI 0.33–0.99; Wald $\chi^2 = 3.9$, df = 1, $p < 0.047$) and borderline personality traits (OR = 1.7, CI 0.94–3.0; Wald $\chi^2 = 3.2$, df = 1, $p = 0.075$). In summary, although new studies are needed, the shorter definition of attempt impulsivity using 2 items may be more closely associated with personality traits in attempters than the new definition using 8 SIS items.

Inverse association between impulsive attempts and lethal attempts

In all analyses, we replicated our prior findings that impulsivity and lethality are inversely associated during attempt (Baca-Garcia et al. 2001), suggesting that impulsive attempts tend to be less lethal. The same conclusion can be obtained by using continuous or dichotomous analyses. None of the three possible analyses between impulsivity traits in the attempter and lethality were significant suggesting that there is no relationship between these two dimensions.

Comparison with prior studies

There are no prior studies simultaneously measuring attempt impulsivity (state) and attempter impulsivity (trait) in representative samples of suicide attempts. One study used impulsivity trait and state measures in 50 depressive inpatients. In this study, Corruble et al. (1999) found that in both attempters and non-suicide attempters, state and trait impulsivity measures decreased with time either as a consequence of diminution of depressive symptomatology or of the milieu effect during hospitalization.

Prior studies using other types of samples had reported findings compatible with ours. Soloff et al. (2000) compared inpatients with major depressive episodes and borderline personality disorders. A retrospective assessment of the most recent attempt suggested that patients with major depression reported significantly higher level of planning. In 350 attempters, Williams et al. (1980) also found that non-impulsive attempts tend to be associated with depressive patients. In our study, compared to other diagnoses, major depression was associated with less impulsive suicide attempts.

We did not find any literature on personality disorders in general and the relationship between suicide attempts and the impulsivity of the attempt. However, Soloff et al. (2000) reported that in patients with history of suicide attempts, borderline patients had higher scores in the BIS-11 compared with depressive patients.

In summary, attempt impulsivity appeared to be inversely associated with attempt lethality as in our prior study (Baca-Garcia et al. 2001). Opportunities for prevention of suicide attempts in major depression and some personality disorders may exist but require attentive monitoring of suicidal ideation and intent. Impulsivity is a potential treatment target to reduce impulsive suicide attempts in borderline patients (Brodsky et al. 1997).

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