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Current suicidality and previous suicidal attempts in patients with schizophrenia are associated with different dimensions of temperament and character

Running title: Temperament, Character and Suicide Attempt

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Abstract

Suicide is a major public health problem and the leading cause of premature death in patients with schizophrenia. Information about the patient's personality is helpful for assessing the risk of suicide attempts and suicidal ideation. The sample consisted of 120 outpatients with a diagnosis of schizophrenia, 29 of whom had previously attempted suicide. We used the Temperament and Character Inventory to assess personality differences between patients who had previously attempted and had not previously attempted suicide and between patients who had and did not have current suicidal ideation. Current suicidal ideation was assessed using the 4-point severity scale, which is item 9 from the Beck Depression Inventory. The character dimension Self-transcendence was shown by logistic regression to be a predictor of lifetime suicide attempts. Low Self-directedness was shown to be a predictor of current suicidal ideation. To prevent suicidal behavior, it is important to better understand the personality traits associated with suicidal ideation and suicide attempts. Suicide attempts and suicidal ideation in schizophrenia may not represent the same phenomenon ranging on a single continuum. The importance of these results suggests that further study is needed.

Key words: schizophrenia, personality, psychobiological model, suicide attempt, suicidal ideation

1. Introduction

Suicide is a major public health problem which ranks among the top ten causes of death for individuals of all age groups in many countries (Diekstra, 1993). The rate of suicide attempts in schizophrenia is reported to be between 20- 40% (Meltzer, 1998; Kasckow et al., 2011) and it appears to be the leading cause of premature death in this population with a lifetime rate of 4.9% (Palmer et al., 2000).

Earlier studies of patients with schizophrenia have associated suicide risk with specific psychiatric symptoms (e.g., depressive symptoms, feeling of hopelessness, positive symptoms and negative symptoms) and such factors as awareness of illness, substance abuse, medication nonadherence and high family stress (Hawton et al., 2005; Pompili et al., 2009). On the other hand, personality is a broad concept involving both basic neurophysiological and potentially genetically determined traits (i.e. temperament) and developmental aspects (i.e. character) and interacts with psychopathologic as well as with psychosocial variables (Cloninger et al., 1993; Hori 2008; Smith et al., 2008). The association of personality with suicide risk in the population of psychiatric patients has been demonstrated (Calati et al., 2008; Giegling et al., 2009). In order to better understand and prevent suicide, it is important to get a deeper insight into personality traits which may be associated with suicidal ideation and suicidal behavior in patients with schizophrenia.

The psychobiological temperament and character model of personality is one of the widely used models. This model may be of special importance to this issue, because it attempts to describe the neurobiological structure underlying the pervasive attitudes of

the individuals towards their environment. The model comprises of four temperament (Novelty seeking, Harm avoidance, Reward dependence and Persistence) and three character dimensions (Self-directedness, Cooperativeness, Self-transcendence) (Cloninger et al., 1993). Previous studies, which included various diagnostic categories of patients, revealed mainly two temperamental traits which may predispose to suicide attempts: higher Novelty seeking (Gil, 2003; Grucza et al., 2003; Becerra et al., 2005), a dimension that implicates impulsivity, curiosity, attention seeking and proneness to risk taking behavior and higher Harm avoidance (van Heeringen et al., 2003; Becerra et al., 2005; Grucza et al., 2005; Calati et al., 2008), that reflects anxious persons prone to depression and pessimism. Studies also revealed character traits such as low Self-directedness (van Heeringen et al., 2003; Becerra et al., 2005; Grucza et al., 2005), low Cooperativeness (van Heeringen et al., 2003; Becerra et al., 2005; Calati et al., 2008) and high Self-transcendence (Bulik et al., 1999; Becerra et al., 2005) to be associated with suicidal behaviour. Low Self-directedness reflects lack of purpose, autonomy, reliability and self-acceptance, and low Cooperativeness is found in individuals low in social skills and capacity to cooperate. Both of these character dimensions reflect an immature personality. High Self-transcendence is associated with fragile ego-boundaries, idealism and magical thinking (Cloninger et al., 1993). However, samples consisting exclusively of patients with schizophrenia have not so far been analyzed to assess the relationship between personality dimensions and suicide attempts.

There are two views in the current research on suicidality. The one prevailing, is the continuity approach that considers suicidal ideation, suicide attempt and completed suicide to represent different aspects of the same psychopathological phenomenon

ranging on a single continuum and the alternative, dichotomy approach which states that various types of suicidal behavior and ideation underlie different psychological mechanisms and are associated with distinct populations and personality traits (Gil, 2005; Conrad et al., 2009). Specifically, a suicidal attempt is defined as a non-habitual behavior with the intent of ending one's life which was unsuccessful in causing death (Pompili et al., 2009), while suicidal ideation may be a manifestation of actual intention to die, but it may also reflect feelings of hopelessness, helplessness, or other forms of emotional distress (Gil, 2005).

Our aims were to, for the first time, assess the differences in temperament and character dimensions between suicide attempters and non attempters, as well as between suicide ideators and non-ideators within a group of schizophrenia patients. We also aimed to elucidate whether personality dimensions predicted previous suicidal attempts and suicidal ideation and whether suicide attempts and suicidal ideation among patients with schizophrenia were derived from the same personality dynamic.

2. Methods

2.1. Subjects

A hundred and twenty stable outpatients (58.3 % male) with a diagnosis of schizophrenia established using a structured clinical interview (Mini International Neuropsychiatric Interview) (Sheehan et al., 1998) were assessed over the course of 12 months. The patients were drawn from two psychiatric institutions: University Hospital Center Zagreb and Neuropsychiatric hospital “Dr. Ivan Barbot”. The mean age was 33.9 years S.D. 10.47 (range 19-64) and the mean duration of illness 7.8 years S.D. 7.29.

All participants gave written informed consent after receiving a comprehensive explanation of the nature of the study. The study was approved by ethics committees of the two institutions. Patients who fulfilled the DSM-IV criteria for mental retardation, organic brain disease, severe physical disorders, history of drug/alcohol dependence, and those with low comprehension skills were not enrolled. All patients were receiving antipsychotic medication. Twelve patients who fulfilled these criteria refused to participate. There were no differences in age and gender between patients included and those who refused to participate in the study. None of the assessed patients completed suicide in the course of the data collection, to the best of our knowledge.

2.2. Instruments

Lifetime suicide attempts were assessed during the psychiatric interview and were defined as any voluntary, harmful behavior with a suicidal intent. Current suicidal ideation was assessed using item 9 from the Beck Depression Inventory (BDI) (Beck et al., 1979) which has been previously used for this purpose (Valtonen et al., 2009). This item has the following alternative statements: 0=I do not have any thoughts of killing myself, 1=I have thoughts of killing myself, but I would not carry them out, 2=I would like to kill myself and 3=I would kill myself if I had the chance (Beck et al., 1979). As no patient chose statement "3", and just 3 patients chose statement "2" on BDI item 9, this variable was dichotomized. Those who scored "1" or "2" on item 9 of BDI were considered as the group of current suicidal ideators (22.5%) and those that scored "0" comprised the group of current non-ideators.

Personality was assessed using the Croatian adaptation of the Temperament and Character Inventory (TCI). The translation from the American original into Croatian was

carried out following the guidelines developed by WHO (World Health Organization) (Sartoruis and Kuiken, 1994). The TCI is a self-report questionnaire based on 240 items requiring a true/false answer. Only the main scores of the 4 temperament and 3 character dimensions of the TCI were reported in this study (examples of items are "I believe that miracles happen …" or "I enjoy getting revenge on people who hurt me"). The instrument was previously validated on a sample of 360 persons (Aukst Margetić et al., 2011). It showed good reliability with Cronbach's alpha coefficients of the dimensions Novelty seeking (0.66), Harm avoidance (0.79), Reward dependence (0.52), Persistence (0.47), Self-directedness (0.85), Cooperativeness (0.7) and Self-transcendence (0.81). The Cronbach's alpha of the Persistence scale was somewhat lower as it consists of 8 items, compared to at least 24 items in the other scales (Cloninger et al., 1993).

The Positive and Negative Syndrome Scale (PANSS) (Key et al., 1987) was administered to the patients with schizophrenia in order to evaluate the severity of general psychopathology, positive and negative symptoms. The instrument consists of 30 items, with each item rated on a seven-point severity scale. This is an interviewer-administered scale scored on the basis of a clinical interview lasting 30- 45 minutes. Its reliability and validity is well established (Kay et al., 1987), with Cronbach's alpha being 0.89 in the current study.

All interviews and clinical scales were conducted by an experienced research psychiatrist.

2.3. Statisics

Descriptive analysis included percentages, means and standard deviations as well as internal consistency coefficients. The Kolmogoroff-Smirnoff test was used for assessing

whether the distribution of variables was normal. Based on previous suicide attempts and current suicidal ideations patients were categorized into two groups respectively. The t-test and Mann-Whitney test were used for comparisons of continuous and the chi-square test for comparisons of categorical variables. The Bonfferoni correction was performed for multiple comparisons made with the t-test. Two logistic regressions were performed to determine whether temperament and character dimensions were predictors of lifetime suicide attempt, and of current suicidal ideation. In order to control for the influence of age, gender and psychopathology measured with PANSS, these variables were entered into the analysis in the first block. The temperament and character dimensions, as exploratory predictor variables, were entered into the second block. All analyses were done using the SPSS 16.0. For all analyses, the level of statistical significance was defined as p less than 0.05.

3. **Results**

Twenty nine of 120 (24.2%) patients attempted suicide (18 male).

The t-test, Mann-Whitney and chi-square test comparing patients that previously attempted and did not attempt suicide revealed that the groups differed significantly. With regard to personality dimensions, the Self-transcendence was higher in the group of previous suicide attempters. As far as characteristics of the illness are concerned, the group of previous suicide attempters had earlier age at onset, longer length of illness and higher number of hospitalizations. Means and S.D. of the variables for attempters and non-attempters, and analysis of results are shown in table 1.

As far as current suicidal ideations are concerned, the t-test, Mann-Whitney and chi-square test performed for group differences showed that the dimension of temperament Harm avoidance was significantly higher and character dimension Self-directedness was significantly lower in the current suicidal ideators group. With regard to characteristics of the illness, the groups of current ideators and non-ideators differed significantly in the number of hospitalizations. The group of current suicidal ideators had more previous hospitalizations. The results are presented in table 2.

Next, we assessed whether personality dimensions were predictors of lifetime suicide attempts and current suicidal ideation. The logistic regression with lifetime suicide attempt as dependent variable and personality dimensions as predictors was performed. Age, gender and PANSS scores were used as control variables in the first block. The analysis revealed that only the dimension Self-transcendence significantly predicted previous suicide attempt. Results are presented in table 3.

In order to assess whether personality dimensions were the predictors of current suicidal ideation, further investigation by logistic regression analysis, adjusted for age, gender and psychopathology measured with PANSS, and dimensions of personality (Table 4) showed that Self-directedness was the only significant predictor of current suicidal ideations.

4. Discussion

To the best of our knowledge, this is the first study examining the differences between dimensions of temperament and character in previous suicide attempters vs. non-

attempters and current suicidal ideators vs. non-ideators focusing on patients with schizophrenia.

After controlling for age, gender and psychopathology severity, known as factors that might be associated with personality dimensions (Cloninger et al., 1993), the difference between attempters and non-attempters applied only to the dimension Self-transcendence. Previous studies with suicide attempters, diagnosed otherwise, also described high scores on this dimension (Bulik et al., 1999; Becerra et al., 2005; Yumru et al., 2008), although it was not uniform finding (Perroud et al., 2010; Joyce et al., 2010). This dimension has been associated with intensity of positive symptoms on PANSS (Hori et al., 2008; Smith et al., 2008), as well as in this group of patients (Aukst-Margetić et al., 2011). Individuals scoring high on Self-transcendence can be characterized as spiritual, unpretentious, creative and humble (Cloninger et al., 1993). On the other hand, high Self-transcendence combined with low Self-directedness (the dimension that is typically low in patients with schizophrenia) (Smith et al., 2008; Ohi et al., 2012), may be linked to immaturity, fragile ego-boundaries and magical thinking (Cloninger et al., 1993; Svrakic and Cloninger, 2010). Psychopathological expression of fragile ego- boundaries might be reflected in phenomena of depersonalization and derealization that showed association with high Self-transcendence (Smith et al., 2008; Hori et al., 2008), and are also associated with proneness to suicidal attempt (Zikić et al., 2009).

Self-transcendence is supposed to be a serotonin-mediated dimension which has been associated with activity of the 5HT1A receptor (Borg et al., 2003; Lorenzi et al., 2005). The studies generally show the association of the serotonergic system, personality

features and suicidal behaviors (van Heeringen, 2003; Seretti et al., 2009), although such results are not uniformly confirmed, in the population of patients with schizophrenia (Chong et al., 2000).

The patients with current suicidal ideation differed from those without suicidal ideation in two personality dimensions. They had higher scores in the dimension Harm avoidance and lower scores in the dimension Self-directedness. Such findings have been described in many previous studies with patients suffering from depression (Corruble et al., 2002; Abrams et al., 2004; Calati et al., 2008). Although our patients were clinically stable, and low in suicidality scores, the presence of higher Harm avoidance in this group reflected the patients' proneness to anxiety, pessimism and depressive symptoms. In patients with schizophrenia, this dimension has been previously associated with the presence of affective symptoms (Strakowski et al., 1992).

High Harm Avoidance was described as the risk factor for suicide attempts in previous research in various groups of patients (Brezo et al., 2006), this association has not been confirmed so far in this study focusing exclusively on patients with schizophrenia. The majority of previous studies investigated individuals with a wide range of diagnoses associated with suicidality and compared them to normal controls (van Heeringen et al., 2003; Becerra et al., 2005; Grucza et al., 2005), which makes it difficult to control for the confounding effect of psychopathology on personality. Several studies stressed that suicide risk factors for schizophrenia patients differed from the rest of the population: impulsiveness and aggression did not show to be important, and fewer negative symptoms appeared to be relevant (McGrirr et al., 2006; Pompili et al., 2009). High suicidal ideation and behavior in patients with schizophrenia have been associated

with comorbidity states, prevailingly depression and addiction (Fenton, 2000; Howton et al., 2005). The risk factors in patients without such comorbidities have not been researched.

The dimension that also differed between suicidal ideators and non-ideators, and the one that predicted the presence of current suicidal ideation is low Self-directedness. This dimension reflects personality features such as responsibility, purposefulness, resourcefulness and self-acceptance (Cloninger et al., 1993). Self-directedness is typically low in patients with depression and in patients with schizophrenia (Abrams et al., 2004; Smith et al., 2008). Moreover, it is the most significant predictor of the patients' level of functioning (Eklund et al., 2004). Conrad et al. (2009) also stated that differences between patients with or without suicidal ideation are mainly reflected by differences between the character dimensions, as ideation mainly involves higher cognitive processes. Low Self-directedness is the main correlate of personality disorder presence (De la Rie et al., 1998), the diagnostic category most often associated with suicide attempts and ideation (Andover et al., 2005).

A dimension previously associated with suicidal behavior in general, Novelty seeking (Grucza et al., 2003; Gil et al., 2003; Becerra et al., 2005) did not show associations with previous suicidal attempt, nor with current suicidal ideation. Our results are in line with those of McGrirr et al. (2006) who showed that impulsivity, and proneness to risk taking behaviors were not predictors of suicide in schizophrenia and also with Gulliem et al., (2002) who showed no correlation between Novelty seeking and suicide attempts. Novelty seeking is a dopaminergically mediated temperamental dimension, conceptually related with impulsivity, attention seeking and proneness to risk

taking behaviors, which has been repeatedly correlated with addictive behaviors (van Ammers et al., 1997; Kim et al., 2007). As comorbidity with addiction is one of the known risk factors for suicide in schizophrenia (Howton et al., 2005), this was one of the exclusion criteria in our study and a possible reason for the negative results.

Longer duration of illness and larger number of hospitalizations are expected findings in the group of previous suicide attempters and have not been included in further analysis (Qin and Nordentoft, 2005; Levine et al., 2010).

Our results show that personality profiles for lifetime suicide attempt and current suicidal ideation in schizophrenia patients differ and that suicide attempt and suicidal ideation may not represent the same phenomenon ranging on a single continuum. Even though closely associated, different biological mechanisms may underlie these phenomena and may be linked to distinct patient populations and personality dimensions (Huang et al., 2000; Gil, 2005; Conrad et al., 2009; Smith et al., 2010). In comparison with previous research published by Gil (2005) and Conrad et al. (2009), based on a population of psychiatric patients in general and patients with major depression, there are different personality dimensions involved in the two phenomena in patients with schizophrenia. This implies not only a distinction between suicidal attempt and ideation, but also that there are specific characteristics of suicide in schizophrenia (Huang et al., 2000; Nakagawa et al., 2011).

Our study showed a suicide attempt rate of 24.2% which is not in line with previous results determined at the time of the first psychiatric hospitalization (Levine et al., 2010), Our results correspond to the data regarding lifetime prevalence of suicide attempts in chronic schizophrenic samples (Radomsky et al., 1999; Kasckow et al., 2011)

Limitations

We did not analyze attempts according to suicide attempt method or their other characteristics. This needs to be done in future research since suicide attempt method and its lethality may be associated with impulsivity (Zouk et al., 2006; Giegling et al., 2009) and accordingly could be associated with personality dimensions. We also did not examine the relationship between suicidal behavior and specific risk factors more proximal to a suicide attempt. In a retrospective assessment, reporting on suicide attempts may be influenced by recall ability to assess the significance of the past suicidal behavior or willingness to disclose such information. The use of a multiple item questionnaire to measure suicidal ideation may increase the reliability of this variable, although the item 9 of BDI has successfully been used to measure suicidal ideation (Valtonen et al., 2009). Including healthy comparisons group may give us more insight into the possible differences in personality dimensions between attempters, non-attempters and controls as well as ideators, non-ideators and controls.

Despite these caveats, the present study contributes to the ongoing debate in the field of suicidology regarding the continuity or dichotomy of suicidal phenomena in general (Gil, 2005) and the specificity of schizophrenia in this regard (Huang et al., 2000; Nakagawa et al., 2011). To prevent suicidal behavior, it is important to better understand which personality traits are associated with suicidal ideation and suicide attempts.

The importance of these results suggests that further study is needed.

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Table 1. Means and standard deviations of sociodemographic and clinical characteristics of previous suicide attempters and non-attempters, and group t-test, Mann-Whitney and chi-square tests comparisons. N=120

Suicide attempt	Yes (*n=29*)		No*(n=91)*			
	Mean	S.D.	Mean	S.D.	*t/U/chi*	*p*
Gender					0.639[a]	0.672
age	36.2	10.57	33.1	10.39	1085.500[b]	0.151
Age at onset	23.9	6.77	26.74	7.96	992.000[b]	**0.044**
Length of illness	12.2	7.83	6.4	6.55	682.500[b]	**0.0001**
Number of psychiatric hospitalizations	7.3	5.9	2.7	2.4	525.500[b]	**0.0001**
PANSS positive	12.2	4.55	13.6	4.49	-1.487	0.147
PANSS negative	17.1	5.02	18.3	5.17	-1.169	0.245
PANSS general	35.6	7.35	36.1	7.40	-0.267	0.790
NS	16.37	4.67	17.7	4.89	-1.315	0.191
HA	20.5	6.74	18.6	7.37	1.262	0.209
RD	14.3	2.56	13.1	3.25	1.764	0.080
P	3.5	2.21	3.7	1.78	-0.452	0.652
SD	24.5	8.18	25.7	8.11	-0.715	0.476
C	31.1	4.95	29.1	6.10	1.600	0.112
ST	18.5	5.83	15.3	6.88	2.240	**0.027**

Legend: SD- standard deviation; PANSS- Positive and Negative Symptom Scale; NS- novelty seeking; HA- harm avoidance; RD – reward dependence, P-persistence; SD- self-directedness, C-cooperativeness; ST- self-transcendence t- coefficient based on t-test; U –coefficient based on Mann –Whitney test marked with [b]; [a]- chi coefficient

Table 2. Means and standard deviations of sociodemographic and clinical characteristics of current suicidal ideators and non-ideators group, t-test, Mann-Whitney and chi-square tests comparisons. (n=120)

Suicide ideations	No (*n=93*)		Yes*(n=27)*			
	Mean	SD	Mean	SD	*t/U/chi*	*p*
gender					0.438[a]	0.508
age	33.2	10.44	36.3	10.38	-1.355[b]	0.178
Age at onset	25.8	7.80	26.6	7.70	-0.419[b]	0.676
Length of illness	7.3	7.26	9.6	7.24	-1.499[b]	0.137
Number of psychiatric hospitalizations	3.3	3.53	5.5	5.40	-2.460[b]	0.015
PANSS positive	13.3	4.52	13.1	4.63	0.326	0.745
PANSS negative	17.8	5.24	18.7	4.85	-0.757	0.451
PANSS general	35.1	7.42	38.9	6.43	-2.444	0.016
NS	17.4	4.86	17.1	4.88	0.360	0.719
HA	17.6	6.49	23.8	7.83	-4.106	**0.0001**
RD	13.2	3.29	14.1	2.46	-1.161	0.248
P	3.7	1.87	3.4	1.96	0.758	0.450
SD	27.1	7.74	19.8	6.74	4.444	**0.0001**
C	29.8	6.04	29.1	5.37	0.547	0.586
ST	16.1	6.81	16.2	6.71	-0.102	0.919

Legend: SD- standard deviation; PANSS- Positive and Negative Symptom Scale; NS- novelty seeking; HA- harm avoidance; RD – reward dependence, P-persistence; SD- self-directedness, C-cooperativeness; ST- self-transcendence; t- coefficient based on t-test; [a]- chi coefficient; U –coefficient based on Mann –Whitney test marked with [b]

Table 3. Logistic regression for personality dimensions on lifetime suicide attempt adjusted for gender, age and PANSS

	B	WALD	p	Exp(B)	C.I 95% for exp(B)
Gender	0.646	1.466	0.226	1.907	0.671-5.422
Age	0.015	0.471	0.493	1.015	0.972-1.061
PANSS	-0.039	3.369	0.066	0.962	0.922-1.003
NS	-0.097	2.952	0.086	0.908	0.8131.014
HA	0.014	0.093	0.760	1.014	0.928-1.107
RD	0.030	0.098	0.754	1.030	0.855-1.241
P	-0.154	1.141	0.285	0.858	0.647-1.137
SD	-0.032	0.625	0.429	0.968	0.894-1.049
C	0.051	0.758	0.384	1.052	0.938-1.180
ST	0.085	4.248	**0.039**	1.088	1.004-1.179

Legend: PANSS- Positive and negative symptom scale; NS- Novelty seeking, HA-Harm avoidance, RD- Reward dependence; P-Perzistence; SD- Self-directedness, C- Cooperativenes, ST- Self-transcendence

Table 4. Logistic regression for personality dimensions and current suicidal ideations adjusted for gender, age and PANSS

	B	Wald	p	Exp(b)	95% C.I. for Exp (B)
Gender	0.280	0.231	0.631	1.323	0.422-4.150
Age	0.016	0.426	0.514	1.017	0.968-1.068
PANSS	0.014	0.376	0.540	1.014	0.969-1,062
NS	-0.015	0.067	0.796	0.985	0.880-1.103
HA	0.080	2.647	0.104	1.083	0.984-1.192
RD	0.120	1.079	0.299	1.127	0.899-1.414
P	0.133	0.698	0.403	1.143	0.836-1.562
SD	-0.111	5.026	**0.025**	0.895	0.812-0.986
C	-0.010	0.032	0.859	0.990	0.884-1.108
ST	-0.061	2.044	0.153	0.941	0.865-1.023

Legend: PANSS- Positive and negative symptom scale; NS- Novelty seeking, HA-Harm avoidance, RD- Reward dependence; P-Perzistence; SD- Self-directedness, C- Cooperativenes, ST- Self-transcendence