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# Temperament and character personality profile and affective temperaments in self-poisoning nonlethal suicide attempters

Amir Rezaei Ardani<sup>a</sup>, Bahram Naghibzadeh<sup>a,\*</sup>, Farhad Farid Hosseini<sup>a</sup>, Zahra Asadpour<sup>a</sup>,  
**Fatemeh Khabazianzadeh<sup>b</sup>**

<sup>a</sup> *Psychiatry and Behavioural Sciences Research Centre, Mashhad University of Medical Sciences, Mashhad, Razavi Khorasan, Iran*

<sup>b</sup> *Atherosclerosis and Coronary Artery Research Centre, Birjand University of Medical Sciences, Birjand, Iran*

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## ABSTRACT

Involvement of personality traits in susceptibility to suicidal behaviour has attracted considerable research interest over the past decades. This study was motivated by reports that emotionality may play a potentially confounding role in the association between the personality profile and suicidal behaviour. We assessed the association between personality traits, as measured using the Temperament and Character Inventory (TCI), and suicidal behaviour, while controlling for the effects of Affective Temperaments, measured using the Temperament Evaluation of the Memphis, Pisa, Paris and San Diego auto-questionnaire (TEMPS-A) in a sample of 140 consecutive self-poisoning nonlethal suicide (SNS) attempters admitted to the Emergency Toxicology Clinic, comparing them with a sample of 140 age and sex matched healthy controls. After controlling for Affective Temperaments, the temperament dimension of Novelty Seeking (NS) and the character dimensions of Self-directedness and Self-transcendence remained significantly associated with SNS attempts. NS, in particular, was most consistently and uniquely associated with suicidal behaviour. The present study conveys the difficulty in disentangling the personality profile of SNS attempters from their emotionality. We conclude that the risk associated with certain personality traits is often entirely mediated by Affective Temperaments and few dimensions independently contribute to the risk of self-poisoning nonlethal suicidal behaviour.

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## 1. Introduction

Failed suicide attempts are considered to be 10–40 times higher than completed suicide attempts (Bertolote et al., 2006; National Center for Injury Prevention and Control, 2014; World Health Organization, 2014). It is estimated that between 9 and 36 million people attempt suicide every year (Bertolote et al., 2006).

Suicidal behaviour, especially the preferred method of suicide, varies considerably between different population groups (Ajdacic-Gross et al., 2008; World Health Organization, 2014). Many factors, including the social acceptability and availability of the method, contribute to the characteristics of suicidal behaviour (Ajdacic-Gross et al., 2008). Apart from societal factors, gender seems to be one of the key factors influencing the choice of suicide method. Generally, women tend to choose less violent and less lethal methods of suicide, like poisoning (Ajdacic-Gross et al., 2008; Hawton and van Heeringen, 2009). According to the United States' National Centre for Injury Prevention and Control (NCIPC),

poisoning was the second most common cause of nonfatal, non-accidental injury in 2012 and the second leading method of suicide in the United States for women (National Centre for Injury Prevention and Control, 2014).

Numerous factors increase the risk of suicide and self-harm (O'Connor and Nock, 2014). The risk of completed suicide among suicide attempters is several times higher than in the general population (Hawton and Fagg, 1988). Any attempt might lead to more serious future suicide attempts: in fact, it has been estimated that up to 15% of attempters will eventually die by suicide (Christiansen and Jensen, 2007; Suominen et al., 2004). The risk is highest during the first few years, especially in the first six months: almost 2% of individuals who attempt suicide die within one year (Hawton and Fagg, 1988; Owens et al., 2002). Although suicide attempts are considered as a psychiatric emergency, only a minority of people suffering from psychiatric disorders commit suicide (Hawton, 2014). More specific markers of suicidal behaviour therefore need to be identified (O'Connor and Nock, 2014).

Many features of suicidal behaviour seem to be consistent across different countries (O'Connor and Nock, 2014). A recent review considers personality and individual differences, along

\* Corresponding author.

E-mail address: [naghibzadehb2@mums.ac.ir](mailto:naghibzadehb2@mums.ac.ir) (B. Naghibzadeh).

with cognitive factors, social aspects and negative life events, as key contributors to suicidal behaviour (O'Connor and Nock, 2014).

Personality, defined as “the dynamic organization within the individual of those psychophysical systems that determine his unique adjustments to his environment” (Allport, 1937), comprises both predisposing and protective factors for suicidal behaviour (Brezo et al., 2006). Personality has been described using various models in recent decades. Cloninger's model of personality, which is based on a comprehensive psychobiological theory of personality (Cloninger, 1986) consists of four temperaments – Novelty Seeking (NS), Harm Avoidance (HA), Reward Dependence (RD) and Persistence (P) – and three characters – Self-Directedness (SD), Cooperativeness (CO) and Self-Transcendence (ST) (Cloninger, 1994a). Temperaments, defined as “the automatic associative responses to emotional stimuli that determine habits and moods” (Cloninger et al., 1993), are considered to be modestly stable throughout an individual's lifespan (Cloninger, 2003). On the other hand, characters, defined as “the self-aware concepts that influence our voluntary intentions and attitudes” (Cloninger et al., 1993), tend to constantly develop as an individual's insight matures owing to experience throughout his/her life (Cloninger, 2003).

Personality traits have been attractive targets for research in suicidality. Both HA and NS (from the temperament dimension) have been repeatedly shown to be associated with suicidal behaviour. van Heeringen et al. (2003), Becerra et al. (2005) and Grucza et al. (2005) found that individuals with suicidal behaviour had higher HA scores. On the other hand, there have been some discrepancies regarding whether NS is a protective or a predisposing factor (Brezo et al., 2006; Calati et al., 2008). Low SD and high ST (from the character dimension) have also been associated with suicidal behaviour, though less consistently (Brezo et al., 2006; Calati et al., 2008). These great research efforts notwithstanding, the relationship between personality and suicidal behaviour still remains a controversial field of study with many unresolved dilemmas (Hawton, 2014).

The effect of mood disorders on suicidal behaviours is widely discussed in the literature. More than two-thirds of suicide attempters are suffering from (mostly untreated) major depressive episodes at the time of their suicidal behaviour (Gonda et al., 2007) and lifetime risk of suicide in people suffering from mood disorders is fifteen times higher than in the general population (Harris and Barraclough, 1997).

In an Italian–German collaboration, Calati et al. (2008) compared the temperament and character profiles of 190 suicide attempters with 1148 healthy individuals and found that the suicide attempters scored higher in HA and lower in SD and CO. Interestingly, they failed to show any significant difference in personality traits between the suicide attempters and a group of 223 patients suffering from mood disorders without any history of suicidal behaviour. They concluded that the differences found in the temperament and character of suicide attempters might be due to the effect of mood disorders on the personality profile. Furthermore, Pawlak et al. (2013) compared 198 bipolar suicide attempters with 297 bipolar patients without any history of suicidal behaviour and, consistent with the findings of Calati et al. (2008), found no association between temperament and character profiles and suicidal behaviour. Although personality traits, particularly NS/impulsivity, seem to be correlated with the transition to the act of suicide, previous studies have failed to discriminate these personality traits between patients with or without history of a mood disorder.

The recently re-emerged spectrum concept of bipolarity, which is based on the theories of Kraepelin and Kretschmer (Cassano et al., 2004), suggests that trait-related affective temperament types, Depressive (D), Cyclothymic (C), Hyperthymic (H),

Irritable (I) and Anxious (A), are subclinical manifestations and frequently the antecedents of the major mood disorders (Akiskal and Akiskal, 2005; Cassano et al., 2004). Hyperthymic temperament is proposed as a protective factor against suicidal behaviour, and other affective temperaments are found to be predisposing factors for suicidal behaviour (Pompili et al., 2008; Rihmer et al., 2009). Affective temperaments have proven to be effective in predicting symptom formation and suicidal behaviours in acute mood episodes in the long run (Akiskal et al., 2005).

Regarding the findings of Calati et al. (2008) and Pawlak et al. (2013), which suggested a confounding role for mood disorders in the personality profile of suicide attempters, we set out to investigate the longer term risk factors of suicidal behaviours by studying affective temperaments in addition to temperament and character personality profiles in a sample of Iranian self-poisoning nonlethal suicide attempters and compared them with healthy individuals. Our main aim was to recognize whether there is an association between personality profile and nonviolent suicide attempts independent of affective temperaments or, contrarily, whether the association should always be acknowledged in the context of the effect of emotionality on the attempters' behaviours.

## 2. Methods and materials

This was a cross-sectional case-control study conducted in the Emam Reza Medical Centre in Mashhad, the second largest city in Iran. The Emergency Toxicology Clinic of the Emam Reza Medical Centre is one of only three specialised toxicology treatment centres in Iran and the main referral centre for toxicology emergencies for Northeast Iran, with more than 10,000 referrals each year (Afshari et al., 2004).

### 2.1. Subjects

#### 2.1.1. Suicide attempters

During February–March 2012, 140 of 181 consecutive participants who had deliberately attempted nonviolent suicide by ingestion of more than the prescribed amount of medication (Hawton and Catalan, 1987) and consented to participate in the study were selected through a consecutive (non-probability) sampling method. These patients were observed and/or treated in the emergency room and were discharged after at most twelve hours, suggesting that their level of toxicity was mild. In order to reduce the effect of poisoning or concomitant abuse in the self-assessment of personality, patients' were asked to fill the questionnaire in the last stages of their stay, when they are recognized dischargeable until their family/accompanies clear the administrative discharge procedure and they are able to leave the hospital. Patients who were suffering from any chronic disease, had a mental disorder due to a general medical condition or had been diagnosed with dementia, mental retardation or any substance dependence disorder were excluded from the study.

#### 2.1.2. Healthy controls

A group of 140 sex, age, marital status and education frequency-matched controls without any prior history of psychiatric disorders and especially with no lifetime history of suicidal behaviour were selected. These healthy controls were recruited either from a high school (14–17 years of age), university (18–24 years), or from visitors to a book fair (> 25 years).

Written informed consent was obtained from all participants and their parents/legal guardians (for individuals under 18 years old) after a detailed and extensive description of the study. The study was approved by the Ethics Committee of MUMS and was carried out in accordance with the ethical standards laid down in

the 2008 Declaration of Helsinki.

## 2.2. Instruments

The Temperament and Character Inventory (TCI) is a reliable and well-validated self-report measure for assessment of the basic dimensions of the Cloninger psychobiological model of personality. The TCI distinguishes between temperament and character dimensions. The four temperament dimensions are Novelty Seeking, Harm Avoidance, Reward Dependence and Persistence. The three character dimensions are Self-Directedness, Cooperativeness and Self-Transcendence (Cloninger, 1994a; Cloninger et al., 1993). The 125-item TCI with a true-false Likert-type scale has been translated into Farsi and consequently validated in a large sample of Iranians by Kaviani (2009) and Kaviani and Pour-naseh (2005).

HA denotes the individual's heritable bias in behavioural inhibition or cessation when facing potentially dangerous stimuli and anticipating negative effects. NS relates to a heritable bias in exploratory behaviours and activation in response to novel stimuli, danger or punishment. RD concerns the heritable bias in the maintenance or continuation of ongoing behaviours. Finally, P characterizes perseverance despite frustration and fatigue (Cloninger, 1994b, 2003; Cloninger et al., 1993). SD expresses the individual's developmental competence towards accepting responsibility, purposefulness, resourcefulness, self-acceptance and maturity. CO denotes social skills related to empathy with and acceptance of others. Finally, ST is related to the aptitude towards acceptance and identification with nature (Cloninger, 1994a, 2003; Cloninger et al., 1993).

Akiskal's Temperament Evaluation of the Memphis, Pisa, Paris, and San Diego Autoquestionnaire (TEMPS-A) is a well-validated self-report 110-item measure of the affective temperaments which uses Likert-type "yes" (score 1) and "no" (score 0) answers. TEMPS classifies the affective temperaments into depressive (D), cyclothymic (C), hyperthymic (H), irritable (I), and anxious (A) subscales, which are considered to be subclinical manifestations and often precursors of full-blown mood disorders. Affective temperaments are fairly stable throughout an individual's life and TEMPS-A is not affected by current mood state. TEMPS-A has been proved useful in determining affective temperaments in both healthy individuals and psychiatric patients (Akiskal et al., 2005; Akiskal and Akiskal, 2005; Shamsi et al., 2014).

## 2.3. Statistical analysis

An independent-samples *t*-test was used to compare the mean scores of TCI and TEMPS-A variables between the two aforementioned groups. Point-biserial correlation was implemented to assess the strength of the relationship between TCI variables and

suicidal behaviour. Fifth-order partial correlation enabled us to quantify the relationship while controlling for the effect of TEMPS-A variables. Mediation analysis was implemented to eliminate the role of TEMPS-A variables in governing the relationship between TCI variables and suicide attempts. Hayes's PROCESS tool was employed to calculate the mediation effects (Hayes, 2013). Forced-entry binary logistic regression was used to determine the impact of each TCI and TEMPS-A variable to predict membership of each individual subject in one of the two categories, i.e. suicide attempter or healthy control.

Bootstrapping with 2000 bootstrap samples was performed in each of the procedures as a robust method to increase the reliability and accuracy of the implemented models. Bootstrapped bias corrected and accelerated 95% confidence intervals (BCaCI) are stated. To control for familywise error rate, statistical significance was conservatively adjusted at the  $p \leq 0.007$  level (0.05 divided by 7 TCI factors according to Bonferroni correction). All analyses were carried out with Version 22.0 of IBM SPSS Statistics for Windows (IBM Corporation, Armonk, NY).

## 3. Results

### 3.1. Socio-demographic characteristics

Of 140 self-poisoning nonlethal suicide attempters, 114 (81.4%) were female and 26 (18.5%) were male (F/M Ratio: 4.38). Their mean age was  $20.65 \pm 4.36$  years, ranging from 14 to 35 years. The majority of cases were single (60.7%), whereas 35.7% were married and 3.6% divorced. Most of our cases (48.6%) held a high school diploma, followed by 28.3% who held a Bachelor's or equivalent degree, and 13.8% who were high school students. The results obtained in patients were compared with the control group ones.

### 3.2. Comparison of the mean scores

Independent-samples *t*-tests indicated that regarding temperament profiles, on average, nonviolent suicide attempters had significantly higher scores in NS, HA and P. Higher NS was the most prominent feature, with a medium to large effect size ( $r=0.42$ , Cohen's  $d=0.92$ ,  $\pi=0.78$ ). The difference in RD was not statistically significant. As regards character profiles, on average, self-poisoning nonlethal suicide attempters had significantly lower scores in SD and C and higher scores in ST. Lower SD was the most noticeable feature, with a medium to large effect size ( $r=0.49$ , Cohen's  $d=1.12$ ; Table 1).

### 3.3. Correlation and partial correlation

Point-biserial correlation indicated that with the exception of

**Table 1**  
Comparison of temperament and character profiles of nonviolent suicide attempters and healthy controls.

		NS	HA	RD	P	SD	C	ST
<b>Mean</b>	Cases	10.80 ± 2.91	10.69 ± 3.42	8.79 ± 2.30	3.16 ± 0.97	9.14 ± 3.63	16.56 ± 3.17	8.25 ± 2.90
	Controls	7.93 ± 3.29	8.39 ± 2.77	8.58 ± 2.45	2.72 ± 1.44	13.62 ± 4.26	18.18 ± 3.10	6.54 ± 3.25
<b>Mean difference</b>		-2.85	-2.39	-0.21	-0.49	4.47	1.65	-1.83
<b>Standard error of difference</b>		0.39	0.40	0.30	0.15	0.50	0.38	0.38
<b>BCaCI</b>		-3.63	-3.24	-0.80	-0.80	3.50	0.95	-2.55
		-2.05	-1.60	0.35	-0.18	5.42	2.35	-1.11
<b>Significance</b>		< 0.0001	< 0.0001	0.48	0.001	< 0.0001	< 0.0001	< 0.0001
<b>t</b>		-7.31	-6.07	-0.71	-3.21	8.88	4.33	-4.72
<b>Degrees of freedom</b>		252.77	231.28	253	230.55	252.62	253	253
<b>Effect size (r)</b>		0.42	0.37	0.04	0.21	0.49	0.26	0.28
<b>Cohen's d</b>		-0.92	-0.80	-0.1	-0.42	1.12	0.54	-0.59

BCaCI: Bias Corrected and Accelerated Bootstrapped 95% Confidence Interval.

**Table 2**  
Correlation between TCI variables and suicide attempt with and without controlling for TEMPS-A profiles.

TCI	NS	HA	RD	P	SD	C	ST
$r_{pb}$	0.42	0.35	0.04	0.18	-0.49	-0.25	0.27
<b>BCaCI</b>	0.31	0.24	-0.08	0.07	-0.57	-0.38	0.16
	0.52	0.47	0.16	0.31	-0.39	-0.15	0.40
<b>Significance</b>	< 0.0001	< 0.0001	0.47	0.003	< 0.0001	< 0.0001	< 0.0001
$r_p$	0.28	0.07	-0.04	0.06	-0.21	-0.11	0.20
<b>BCaCI</b>	0.16	-0.07	-0.16	-0.06	-0.34	-0.23	0.08
	0.40	0.21	0.08	0.20	-0.07	0.00	0.33
<b>Significance</b>	< 0.0001	0.29	0.57	0.32	< 0.001	0.07	0.001

$r_{pb}$ : point-biserial correlation coefficient,  $r_p$ : fifth-order partial correlation coefficient, BCaCI: Bias Corrected and Accelerated Bootstrapped 95% Confidence Interval.

**Table 3**  
Unstandardized total and mediated effects of TCI variables on suicide commitment, along with significant mediators according to Sobel test.

	Total effect		Mediated effect		Significant mediator [p value]
	b [BCaCI]	p	b [BCaCI]	p	
<b>NS</b>	0.28 [0.19, 0.37]	< 0.0001	0.25 [0.13, 0.37]	< 0.0001	D [0.002] A [ $< 0.001$ ]
<b>HA</b>	0.25 [0.16, 0.35]	< 0.0001	0.10 [-0.02, 0.23]	0.11	D [ $< 0.001$ ] A [ $< 0.001$ ]
<b>P</b>	0.32 [0.11, 0.53]	0.002	0.16 [-0.12, 0.45]	0.25	A [0.004]
<b>SD</b>	-0.27 [-0.35, -0.19]	< 0.0001	-0.14 [-0.23, -0.05]	0.002	D [ $< 0.001$ ] A [ $< 0.001$ ]
<b>C</b>	-0.18 [-0.27, -0.09]	0.0001	-0.12 [-0.23, -0.005]	0.04	A [0.001]
<b>ST</b>	0.19 [0.10, 0.27]	< 0.0001	0.18 [0.07, 0.3]	0.001	A [0.004]

b: Regression coefficient, BCaCI: Bias Corrected and Accelerated Bootstrapped 95% Confidence Interval.

RD, all TCI scores were related to suicidal behaviour. A fifth-order partial correlation was run with TEMPS-A scores as control variables which enabled us to look at the relationship between TCI scores and suicide attempt while holding the effects of TEMPS-A variables constant. NS, SD and ST remained significantly correlated to suicidal behaviour and HA, P and CO were rendered insignificant (Table 2).

3.4. Regression and mediation

TCI scores (except for RD, which was not significantly different in the two groups) were re-evaluated for their association with nonviolent suicide attempts while including TEMPS-A scores in each model as potential mediators. A series of binary logistic regression analyses were conducted, each containing an individual TCI factor as a predictor variable in addition to the mentioned TEMPS-A factors as mediator variables and suicide attempt as an outcome variable. HA, P and CO were no longer significant when TEMPS-A scales were included in the model. Although the effect of NS, SD and ST was attenuated by the inclusion of TEMPS-A scores, it remained statistically significant. Normal theory tests for specific indirect effects (Sobel tests) demonstrated that, in all tested TCI variables, depression and anxiety scores, among all affective temperaments, played a role as significant mediators (Table 3).

Finally, a forced-entry binary logistic regression analysis was conducted to predict nonviolent suicide attempts for our 280 participants using TCI dimensions and TEMPS subscales together as predictors. A test of the full model against a constant only model was statistically significant, indicating that the predictors as

**Table 4**  
Coefficients of the model predicting suicide attempt.

Variables in the equation	b [BCaCI]	Significance	Odds ratio [BCaCI]
NS	0.22 [0.01, 0.40]	0.0001	1.25 [1.11, 1.40]
ST	0.19 [0.06, 0.35]	0.001	1.21 [1.07, 1.35]
D	0.34 [0.19, 0.55]	< 0.0001	1.40 [1.22, 1.62]
A	0.16 [0.08, 0.26]	< 0.0001	1.17 [1.08, 1.26]

b: Regression coefficient, BCaCI: Bias Corrected and Accelerated Bootstrapped 95% Confidence Interval.

a set reliably distinguished between attempters and healthy controls ( $\chi^2 = 166.13, p < 0.0001$  with  $df = 12$ ). Nagelkerke's  $R^2$  of 0.64 indicated a moderately strong relationship between prediction and grouping. Prediction success overall was 83.5% (84.3% for suicide attempters and 82.8% for healthy controls). The Wald criterion demonstrated that NS, ST, D and A made a significant contribution to prediction ( $p = 0.002, 0.007, < 0.0001, 0.006$  respectively). Consequently, another logistic regression using only NS, ST, D and A as predictors was conducted. Yet again, a test of the full model against a constant only model was statistically significant ( $\chi^2 = 155.24, p < 0.0001$  with  $df = 4$ ). Nagelkerke's  $R^2$  of 0.61 indicated a moderately strong relationship between prediction and grouping. Prediction success overall was 82.4% (81.1% for suicide attempters and 83.6% for healthy controls: Table 4).

4. Discussion

Suicide is preventable, and suicide prevention merits high priority in public health (World Health Organization, 2014). Although a great body of research exists on the neurobiology of suicide (van Heeringen and Mann, 2014), more lethal forms have always attracted the most attention (Hawton, 2014). Abnormalities in the serotonin system have been emphasized in the more lethal forms of suicidal behaviours (van Heeringen and Mann, 2014). On the other hand, based on a large study of suicidal behaviour in 17 countries, lifetime prevalence of nonlethal suicide attempts is 2.7% (Nock et al., 2008): therefore, they deserve as much attention as other forms of suicide attempts.

Unplanned impulsive suicidal acts are estimated to account for 20–30% of all suicides carried out in industrialized countries and China (Ajdacic-Gross et al., 2008). Committing suicide by poisoning with drugs is more common in women, especially in women from Canada, the Nordic countries and the United Kingdom (Ajdacic-Gross et al., 2008). Self-poisoning with medications is the second or third most common means of suicide or suicide



attempts in the majority of European countries, especially in women (Hegerl and Wittenburg, 2009). Lethality is considerably lower (1.4% in one study) in poisoning (Shenassa et al., 2003; Spittal et al., 2012). Based on our results, nonviolent suicide attempters in the present study had the same socio-demographic pattern: the majority of suicide attempters were single females in late adolescence and early adulthood (Schmidtke et al., 1996; Welch, 2001).

Although self-poisoning nonlethal suicide attempters seem to have significantly higher scores in NS, HA, P and ST and lower scores in SD and CO, when the effects of TEMPS-A variables were held constant, NS, SD and ST remained significantly associated with suicidal behaviour. Alternatively, our results demonstrated that the depressive and anxious dimensions of affective temperaments played a role as significant mediators in all TCI variables. Prediction success for distinguishing between self-poisoning nonlethal suicide attempters and healthy participants using TCI and TEMPS-A scores was 83.5% and NS, ST, D and A made a significant contribution to prediction.

NS is defined as a tendency towards repeated exploratory activities in reaction to unfamiliar stimuli, impulsive decision making, extravagance when exposed to signals of reward, rapid loss of temper and active avoidance of frustration (Cloninger et al., 1993). Those with high scores in NS are described as exploratory, impulsive, extravagant and irritable and individuals with impulsive traits of personality score higher in NS (Cloninger, 1994b). In our study, NS was a landmark characteristic of self-poisoning nonlethal suicide attempters: it survived every adjustment for affective temperaments. Perroud et al. (2013) compared 1333 subjects with history of suicide attempts and 589 non-attempters and found that after adjusting for axis I diagnoses, the association between NS and suicide attempt was still significant in patients with bipolar disorder, but not for patients with major depression, schizophrenia and other diagnoses. Csorba et al. (2010) compared the TCI personality profiles of 39 adolescents suffering from major depression with a history of suicidal behaviour and 51 adolescents with “pure” major depression without any history of suicidal behaviour and found that the only significant difference was higher NS scores in suicidal patients. A higher score in NS is associated with higher counts of suicide attempts and younger age of first attempt (Becerra et al., 2005; Perroud et al., 2013). These findings are consistent with our results, which emphasized the importance of NS as the only temperament which is different in suicide attempters compared to normal individuals.

Individuals who score high in HA are described as pessimistic, fearful, shy and fatigable (Cloninger, 1994a). A great body of evidence shows that higher HA scores are associated with suicide risk (Conrad et al., 2009; Grucza et al., 2005; van Heeringen et al., 2003). In our study, the correlation between HA and nonviolent nonlethal suicide attempts was rendered non-significant after controlling for affective temperaments, which is consistent with Calati et al.'s (2008) findings.

The genetic and neurobiological basis of temperament has always attracted attention (Cloninger, 1994b; Cloninger and Cloninger, 2011). NS is assumed to be associated with dopaminergic and HA with serotonin pathways (Cloninger, 1994b; Costa et al., 2014; Gerra et al., 2000; Peirson et al., 1999). This might suggest that unlike violent suicide attempts and their correlation to serotonin pathways (Mann and Currier, 2010; van Heeringen et al., 2003), the dopaminergic system of the brain could possibly be the mediator of impulsivity as well as nonviolent suicide attempts. In other words, nonviolent suicide attempts might have a different neurobiological basis than successful more violent suicide attempts. Perroud et al. (2013) found that higher HA scores were associated with more severe and more lethal suicide attempts, which may clarify our results: we studied the least violent and less

lethal forms of the suicidal behaviour spectrum.

SD denotes personal responsibility, purposefulness, resourcefulness, self-acceptance and productivity in commencing and pursuing one's goals. Those who score lower in SD are described as blaming, aimless, inept, vain and deliberating. Low SD is the main finding in all personality disorders (Cloninger, 1994b, 2000; Svrakic et al., 2002). Our suicide attempters had significantly lower SD scores even after controlling for affective temperament scores, which is consistent with others (Becerra et al., 2005; Calati et al., 2008; Grucza et al., 2005; Perroud et al., 2013; van Heeringen et al., 2003).

Risk of immaturity is high in persons with high scores in NS and HA, who are described as explosive or sensitive (Cloninger, 1994b). Another indicator of overall maturity is the sum of scores in SD and CO, which was apparently lower in suicide attempters in our study. The specific combination of low SD and CO scores along with high ST scores, which indicates a struggle with identity, absence of empathy, and magical thinking, is termed “disorganized” by Cloninger (2004). This combination, which is most often associated with high NS and HA (Cloninger et al., 1998), may result in proneness to odd or unconventional thinking and behaviours related to distorted perceptions of reality and is strongly associated with suicidal behaviour (Bayon et al., 1996). Alternatively, high levels of CO and SD may have a protective effect against the tendencies associated with high ST (Smith et al., 2008).

Unfortunately, evidence about protecting factors against suicidal behaviour is scarce (O'Connor and Nock, 2014). Temperamental dimensions are, by definition, stable through an individual's lifetime; they do not change significantly with time, psychotherapy or pharmacotherapy (Cloninger, 2004). On the other hand, as Cloninger declares: “[A] crucial aspect of character development is the possibility of improvement in response to treatment. The hope of therapy is that treatment leads to fundamental improvement in personality, particularly in character” (Cloninger, 2004). The TCI is proven to be effective in guiding about responses to medications (especially antidepressants) and psychotherapy (such as cognitive-behavioural therapy). In fact, a patient's SD score at the beginning of therapy/treatment can predict the degree of improvement (Cloninger, 1994a; Cloninger and Cloninger, 2011). Certain cognitive-behavioural techniques may assist in learning self-directed behaviour. Other methods, such as psychoanalysis, transactional analysis and reality therapy, are also focused primarily on the development of self-directed behaviour (Beck et al., 2006; Gunderson and Gabbard, 2008; Kolb and Boyatzis, 2011; Watson and Tharp, 2013; Young, 1999).

One of the most effective ways of preventing impulsive suicidal behaviours is to limit access to the means of suicide (Nordentoft, 2007; World Health Organization, 2014; Yip et al., 2012). Hawton (2002) reported that the United Kingdom's 1998 legislation on the packaging of analgesics, which mandated simple changes like blister packaging instead of bottling and reducing the maximum size of packs, has led to a 43 percent decline in suicide deaths from paracetamol.

#### 4.1. Study strengths and limitations

To our knowledge, this is the first study which sought to assess the association between TCI factors and self-poisoning nonlethal suicide attempts while controlling for interrelations of affective temperaments. The analysis of temperament and character in combination with affective temperaments may provide further insight into the characteristics of nonviolent suicide attempters and could be used to develop hypotheses about “selective” and “indicated” (World Health Organization, 2014) preventative interventions.

As a result of the short stay of suicide attempters in the

emergency room, we were not able to conduct psychiatric life-history interviews and acquire detailed information about Axis I and II disorders. Our sample of self-poisoning nonlethal suicide attempters might have been composed of patients with a variety of psychiatric disorders. We cannot therefore completely assert whether the observed temperament and character associations could be attributed to suicidal risk or psychopathology. It might be possible that personality traits (especially lower SD) serve primarily as indicators for Axis I and II disorders in our study. Recurrent suicidal behaviour, gestures, or threats can be features of borderline personality disorder (BPD), which has the same TCI profile as our subjects: high NS and HA, low SD (Barnow et al., 2005; Joyce et al., 2003). Although poisoning is not the most popular method of non-suicidal self-injury (Gratz, 2001; Rodham et al., 2004), self-harm and nonviolent suicide attempts could have overlapped in our studied group. Even though, multiple studies have shown that there is not a significant difference in characteristics of suicide attempts between patients with and without a diagnosis of BPD regarding lethality and intent to die (Berk et al., 2007; Soloff et al., 2000). Moreover, non-suicidal self-injury is shown to be significantly associated with subsequent suicide attempts suggesting that these behaviours and their related psychology might lie on the same risk trajectory (Kerr et al., 2010; Wilkinson and Goodyer, 2011). In the literature, mood state is acknowledged to influence self-evaluations of personality (Fayyazi Bordbar et al., 2014): specifically, higher HA is reported to be state-dependant and associated with depression and susceptibility to depression (Farmer et al., 2003; Hirano et al., 2002). However, this might not be a limitation per se, because we controlled for affective temperaments, which are supposedly subclinical manifestations and often precursors of full-blown mood disorders. Moreover, HA was rendered insignificant in all of the analyses in which TEMPS-A scores were taken into account.

The cross-sectional nature of the study required assessment of the healthy controls' history of suicidal behaviour via questions integrated in the questionnaire booklet. Reporting on suicidal behaviours might have been influenced by the participants' recall ability or even by their willingness to disclose such data.

#### 4.2. Future works

Elaborate longitudinal studies of large, well-characterized samples are clearly required to elucidate the relationship between maladaptive personality traits and suicidal behaviour once lifetime Axis I and II diagnoses and potential longitudinal changes of temperament and character scores are accounted for.

#### Conflict of interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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