Personality differences in early versus late suicide attempters

Ute Lewitzka¹*, Sebastian Denzin², Cathrin Sauer¹, Michael Bauer¹ and Burkhard Jabs³

Abstract

Background: Suicidality is an individual behaviour caused by a complex framework of internal and external factors. The predictive values of personality traits for a suicide attempt have been demonstrated, especially in conjunction with Cloninger’s TCI and impulsivity. Two issues remain unsolved, namely whether these traits alter over time after a suicide attempt, and how they may be influenced by depressive symptoms.

Methods: We studied two patient cohorts: one sample of 81 patients after a suicide attempt no longer than 3 months previously (SA early) and another sample of 32 patients whose attempt had taken place more than 6 months previously (SA late). We carried out structured interviews with these subjects addressing diagnosis (MINI), suicidality (Scale for suicide ideation), depression (HAMD-17), temperament and character inventory (TCI), and impulsivity (BIS-10). Data analysis was done using SPSS 16.0.

Results: Our two groups did not differ significantly in sociodemographics or suicidality. However, patients in the SA early group were significantly more depressed (p < 0.001), and scored lower in reward dependence (p < 0.001) and persistence (p = 0.005) but higher in harm avoidance (p < 0.001); they did not differ significantly in impulsivity (p > 0.01). Reward dependence, persistence, and harm avoidance remained significantly different between the two groups after controlling for depressive symptoms.

Conclusions: Our findings suggest that some personality traits vary after a suicide attempt. Further investigations are necessary to verify our results, ideally in longitudinal studies with larger, carefully-described cohorts. It would be also clinically important to investigate the influence of therapeutic strategies on the variability of personality traits and their impact on suicidal behavior.

Key words: Personality, Suicide attempt, Temperament and character Inventory, Impulsivity

Background

Suicidality is a complex phenomenon associated with substantial individual and societal burden [1]. Suicide is one of the top 20 leading causes of death globally for all ages. Nearly a million people die every year from suicide [2]. There are estimates that 58,000 people kill themselves within the European Union and about 10,000 people die by suicide in Germany [3]. What is of most worrying is the high proportion of suicides in younger age groups in relation to other causes of death. For example, among individuals aged 15 to 39 years, suicide is the second leading cause of death after accidents [4]. However, the current number of suicide attempts in this age range remains unclear. It is estimated that suicide attempts occur 10 to 20 times more often than suicides [5]. Suicidality is caused by multiple factors, one of the most common being psychiatric disease [6]. Epidemiological research reveals that approximately 90% of individuals who kill themselves suffered from a psychiatric disorder at the time of death [7].

Over the past decade, several working groups have focused on psychopathological and neurobiological risk factors for suicide. A suicide attempt in the past, male sex, older age, comorbidity, and anomalies in the serotonergic system are well-known and established predictors for suicides, especially in patients with mood disorders [6, 8–12]. Factors considered risk factors for suicide attempts are psychiatric diseases, age below

* Correspondence: ute.lewitzka@uniklinikum-dresden.de

¹Department of Psychiatry and Psychotherapy, University Hospital Carl Gustav Carus, Technische Universität Dresden, Fetscherstr. 74, D-01307 Dresden, Germany

Full list of author information is available at the end of the article

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25 years, female sex, severe physical disease, suicide attempts in the past, stressful life events, loneliness, lower socio-economic income, and different stages of individual development [13–16].

Personality and temperamental traits have also been a focus of research, as they may facilitate the early identification of suicidal risk. Studies on personality and suicidality have examined traits that increase the risk of attempted suicide such as anger, impulsivity, aggression, and anxiety [17] and especially the two factors harm avoidance and novelty seeking [18] of the Temperament and Character Inventory (TCI, [19]). Among younger individuals, impulsive-aggressive traits have been shown to be especially closely associated with a higher risk of suicide [20]. The study of personality traits is challenging, as there are many different measurements used involving various methodological limitations, and the findings regarding the stability of personality have been inconsistent.

There is also wide variability in the measurement tools used to assess personality traits, temperament, and suicidality.

Another important factor is the stability of personality markers and temperament on the one hand, and their influence on suicidality on the other.

A study by McCrae and Costa [21] demonstrated that personality traits appear to be stable around age 30. Additionally, in their meta-analysis of 152 prospective studies, Roberts and DelVecchio [22] demonstrated that beyond age 50, personality traits are stable. Other studies have shown that the long-term consistency of personality traits diminishes as we age [23]. Determining the stability of personality traits such as impulsivity would be particularly key to improving the clinical assessment of the risk of suicide attempts.

To the best of our knowledge, no study before now has addressed the long-time-stability of TCI factors. The longest interval of a re-test in a representative group (normal population) was 12 months [24]; it exhibited highly stable factors. Studies in different languages have shown a range of moderate reliability coefficients 0.45 to 0.93 [25–32]. According to studies by Richter et al. [25], Borman et al. [33] and Boz et al. [34], we assume that factors like self-directedness or harm-avoidance may influence the variability of TCI in people with mental disorders. It is not well known whether this variability is also observed in healthy controls and whether it is caused by therapeutic strategies or the illness itself.

There are few studies to date that have investigated the association between changes in impulsivity and the time of a suicide attempt. Corruble et al. [35, 36] investigated 36 suicide attempters who were depressed and detected a significant drop in overall impulsivity as measured by the Barratt Impulsivity Scale (BIS, [37]), as well as a decrease in 3 subscales 4 weeks after the suicide attempt. Similarly, another study of 39 suicide attempters [38] found lower impulsivity scores immediately after the attempt and 13.5 days later. In contrast, Jallade et al. [39] reported stable impulsivity scores (as measured by the BIS) in a group of 26 suicide attempters on the day of the suicide attempt compared to a week later.

Another variable to consider is how depressive symptoms lead to changes in personality traits. Several studies have similarly examined the association between depressive symptoms and personality traits measured by the TCI that yielded convergent results. That is, personality traits as measured by the TCI were stable even during a change in depressiveness; only the specific subscale harm avoidance was significantly influenced by depressive symptoms [40–44]. The findings from studies investigating specifically an association between impulsivity and depressive symptoms are more heterogeneous, with some studies demonstrating a negative association between impulsivity and depression (e.g., [45, 46]) while others describe a positive association (e.g., [36, 47, 48]).

The present study aimed to investigate the extent to which the time interval after a suicide attempt influences personality traits in patients who attempt suicide. We expected to find that the personality traits of patients whose suicide attempt was recent will differ from those whose attempt took place more than 6 months prior and that differences in personality traits are independent from the severity of depressive symptoms.

Methods
Participants and recruitment
Due to our design, we compared two different patient groups but not applying pre- versus post-suicide attempt measures on an individual basis. Patients with a recent suicide attempt occurring less than 3 months before their participation in this study (SA early) were recruited from five centers (Luebeck, Dresden, Berlin, Bonn, Nuremberg) participating in “The German Research Network on Depression” [49]. Patients recruited from these centers had participated in a randomised double-blind placebo controlled-trial conducted to investigate the anti-suicidal effect of lithium in patients with affective disorders (a lithium-intervention study). That study’s methods and results are described elsewhere [50, 51]. Our second patient group consisted of patients whose suicide attempt had occurred more than 6 months before their participation in this study (SA late); they were recruited from the outpatients department in Dresden, Germany. Both patient groups were recruited during the same time period. A complete description of the study was provided to participants and written informed consent was obtained. The study protocol
was approved by the local research ethic boards at all participating centres.

**Inclusion and exclusion criteria**

Table 1 provides a detailed overview of our inclusion and exclusion criteria. Briefly, patients were included in the study if they met DSM-IV criteria for an affective spectrum disorder and had attempted suicide within the past 3 months, or before the 6 months prior to participating in this study (Table 1).

**Clinical and personality assessment**

Detailed information of the patient’s psychiatric history and sociodemographics were obtained by trained psychiatrists using the patient’s interview material from previous studies (SA early, SA late) as well as all additional information from their charts (SA late). Clinical information was obtained using the Mini-International Neuropsychiatric Interview [52], the Hamilton Rating Scale for Depression [53], and the Scale for Suicide Ideation [54]. The Temperament and Character Inventory [55] and Barratt Impulsivity Scale [56] were used to assess personality and temperamental traits (Table 2).

All diagnostic and treatment information were reviewed by a panel of experienced psychiatrists within a consensus procedure. To ensure a high level of inter-rater reliability, periodical training sessions with all involved psychiatrists were conducted.

**Statistics**

Analyses were conducted using SPSS 16.0 for Windows (SPSS Inc., Chicago IL, USA). Group differences were evaluated using chi-square (in case of categorical variables) and Mann–Whitney U-test (in case of continuous variables) for independent samples. The level of significance was set to \( p = 0.05 \) (two-sided). Multivariate analysis of covariance was applied to examine group differences in TCI and BIS scales and the influence of depression (HAM-D) on personality traits by including the HAM-D total score as covariate.

**Results**

**Sociodemographic factors**

The present analysis included 81 participants from the SA early group and 32 from the SA late group (Tables 3 and 4). Sociodemographics and affective diagnoses did not differ significantly between early and late SA groups (please see Tables 3 and 4). The time interval between the interview and suicide attempt was on average (median) 26 days (SA early) versus 700 days (SA late).

**Clinical features**

Suicidal ideation was low and was not significantly different between early and late SA groups (\( p = 0.66 \)). Specifically, patients from the SA early group revealed mean suicidality values of 5.95 (±7.69), whereas patients from the SA late group had mean values of 4.78 (±6.38), reflecting a low level of suicidal ideation in both groups.

Depressive symptoms (HAM-D overall score) differed significantly between groups. Specifically, patients from the SA early group had mean values of 14.1 (±6.95); those from the SA late group had mean values of 7.25 (±4.91, \( p < 0.001 \)), respectively. Therefore, the HAMD total score was included as a covariate in the analysis of covariance.

**Personality traits measured with TCI**

Patients with a recent suicide attempt (SA early) were more pessimistic and more fearful (harm avoidance), more withdrawn, and more independent (reward dependence), as well as more inactive and more aimless (persistence) than patients in the SA late group. The two groups were most significantly differentiated by the dimensions of harm avoidance and reward dependence (\( p < 0.001 \)) (Table 5).

**Impulsivity**

Patients in the SA early group were in the mean more impulsive in terms of attentional impulsiveness as well as...
as their overall BIS scores than the SA late group patients (please see Table 6). The SA early group scored significantly higher than the SA late group in only the TCI subscale for impulsivity (NS2) (please see Table 5). The differences in BIS overall scores and BIS subscales were not significant (Table 6).

We detected a low correlation between the TCI subscale for impulsivity (NS2) and BIS overall score (Pearson coefficient \( r = 0.232; \ p = 0.013; n = 114 \)) (Table 7).

### Discussion

This study examined sociodemographic, clinical, and personality factors among patients with affective spectrum disorders who had suffered a recent or past suicide attempt. Both patient groups were similar in sociodemographic and clinical variables. Despite the difference in the timing after the suicide attempt, the groups did not differ significantly in suicidal ideation.

#### TCI

Patients whose suicide attempt occurred 6 and more months and no longer than 5 years from their time of interview demonstrated significant differences in personality traits from patients whose suicide attempt was more recent (<3 months). There is strong evidence that higher levels of harm avoidance are associated with a higher risk for suicide attempts (e.g., [14, 57–61]). Specifically: in our study, our SA late group patients were lower in harm avoidance and higher in reward dependence and persistence, thus supporting our hypothesis. According to Cloninger's theory, people high in reward dependence are warm, sentimental, pleasant, sociable, sensitive, and socially dependent. People high in persistence are eager, hard workers, ambitious, and more perfectionists. Harm avoidance includes four special aspects (subscals) described as anticipatory worry (HA 1), fear of uncertainty (HA 2), shyness with strangers (HA 3) and fatigability and asthenia (HA 4). Our findings

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**Table 2** Overview clinical and behavioural assessment

| Scale | Reference | Measure | Items | Remarks |
|-------|-----------|---------|-------|---------|
| MINI  | Sheehan et al., 1998 | 15 major adult Axis I diagnostic categories, 1 Axis II disorder and suicidality according ICD 10 and DSM IV | Semi-structured interview |
| HAM-D21 | Hamilton 1969 | Depressive symptoms | 21 items, 5 point scale rating from 0 to 4 overall score: >23: very severe; 19–22: severe, 14–18: moderate, 8–13: mild, 0–7: no depression | Multiple choice questionnaire expert rating |
| SSI | Beck et al., 1979 | Suicidal ideation; 3 dimensions: active suicidal desire, specific plans for suicide, passive suicidal desire | 19-items; 3 point scale rating from 0 to 2; range of score: 0–38, higher scores indicate greater suicidal ideation | Semi-structured interview |
| TCI | Cloninger et al. 1994 | 7 dimensions: temperament (Novelty seeking, Harm Avoidance, Reward Dependence, Persistence) and character traits (Self-directedness, Cooperativeness, Self-transcendence) | Each of the dimension has a varying number of subscales, e.g.; Novelty seeking (NS): Exploratory excitability (NS1), Impulsiveness (NS2), Extravagance (NS3), Disorderliness (NS4), | Self-questionnaire in total 240 yes/no items |
| BIS | Barratt 1965 | Impulsivity; 3 dimensions: non-planning, motor impulsiveness, attentional impulsiveness | 30-items; 4 point rating from 1 to 4 Overall score reflects the intensity of impulsiveness | Self-rating scale evaluation of lasting personality-markers |

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**Table 3** Clinical variables

| Diagnoses N (%) | SA early (N = 81) | SA late (N = 32) | \( p \) | \( \chi^2 \)  |
|-----------------|------------------|-----------------|--------|---------|
| Major depression | 58 (71.6)        | 19 (59.4)       | 0.37   | 5.402   |
| Dysthymia       | 5 (6.2)          | 0               |        |        |
| Adjustment Disorder | 18 (22.2) | 8 (25)         |        |        |
| Personality disorder | 0            | 1 (3.1)         |        |        |
| No psychiatric diagnoses | 0                | 4 (12.5)        |        |        |

Abbreviations: SA suicide attempt

\( df \) degrees of freedom; \( p = .05 \) (two-sided) in Chi-square
### Table 4: Sociodemographic variables

| Sociodemographic variables                  | SA early (N = 81) | SA late (N = 32) | p    | U = 1205.0; Z = −0.675; effect size $r = 0.06$ (r = $Z/\sqrt{N}$) | Chi$^2 = 0.001$; effect size $w = 0$ df = 1 |
|---------------------------------------------|-------------------|------------------|------|------------------------------------------------------------------|-----------------------------------------------|
| Age mean ± SD                               | 39.4 ± 13.5       | 41.9 ± 13.9      | 0.5  |                                                                  |                                               |
| Sex (female/male) N (%)                     | 51/31 (62.3/37.8) | 20/12 (62.5/37.5)| 0.98 | Chi$^2 = 0.01$                                                   |                                               |
| Marital status N (%):                        |                   |                  | 0.53 |                                                                  |                                               |
| Single                                      | 31 (37.8)         | 11 (34.4)        |      | Chi$^2 = 2.23$                                                   |                                               |
| Married                                     | 26 (31.7)         | 7 (21.9)         |      | effect size $w = 0.15$                                           |                                               |
| Divorced                                    | 21 (25.6)         | 11 (34.4)        |      | df = 3                                                           |                                               |
| Widowed                                     | 4 (4.9)           | 3 (9.4)          |      |                                                                  |                                               |
| Highest qualification N (%):                |                   |                  | 0.13 | Chi$^2 = 4.101$                                                   |                                               |
| Secondary general school                    | 28 (34.1)         | 5 (15.6)         |      | effect size $w = 0.25$                                           |                                               |
| Intermediate secondary school               | 35 (42.7)         | 16 (50)          |      | df = 2                                                           |                                               |
| Grammar school                              | 19 (23.2)         | 11 (34.4)        |      |                                                                  |                                               |
| Occupational status N (%):                  |                   |                  | 0.11 | Chi$^2 = 10.32$                                                   |                                               |
| Employed                                    |                   |                  |      | effect size $w = 0.31$                                           |                                               |
| Full-time                                   | 36 (43.9)         | 13 (40.6)        |      | df = 6                                                           |                                               |
| Part-time                                   | 9 (11.0)          | 1 (3.1)          |      |                                                                  |                                               |
| Unemployed                                  | 13 (15.9)         | 9 (28.1)         |      |                                                                  |                                               |
| Homemaker                                   | 3 (3.7)           | 0                |      |                                                                  |                                               |
| In apprenticeship                           | 15 (18.3)         | 3 (9.4)          |      |                                                                  |                                               |
| Invalidity pension                          | 3 (3.7)           | 1 (3.1)          |      |                                                                  |                                               |
| Retirement                                  | 3 (3.7)           | 5 (15.6)         |      |                                                                  |                                               |
| Living situation N (%):                     |                   |                  | 0.37 | Chi$^2 = 3.2$                                                    |                                               |
| Alone                                       | 33 (40.2)         | 14 (43.8)        |      | effect size $w = 0.19$                                           |                                               |
| With both parents                           | 9 (11.0)          | 1 (3.1)          |      | df = 3                                                           |                                               |
| With husband/wife/common-law               | 37 (45.1)         | 17 (53.1)        |      |                                                                  |                                               |
| With other person                           | 3 (3.7)           | 0                |      |                                                                  |                                               |

**Abbreviations**: SA suicide attempt, $df$: degrees of freedom; $p = .05$ (two-sided) in Chi-square

### Table 5: Multivariate analysis of variance of TCI scales

| Dependent variable   | SA early (mean ± SD) | SA late (mean ± SD) | F(2,111) | p    | Partielles Eta-Quadrat | Cohen’s d |
|----------------------|----------------------|---------------------|----------|------|------------------------|-----------|
| Novelty seeking      | 19.26 ± 4.3          | 19.84 ± 5.4         | 0.19     | 0.830| 0.003                  | 0.125     |
| Harm avoidance       | 18.94 ± 3.2          | 12.55 ± 4.3         | 22.13    | <0.001| 0.285                  | 1.806     |
| Reward dependence    | 12.5 ± 2.5           | 14.81 ± 3.5         | 7.71     | 0.001| 0.122                  | 0.821     |
| Persistence          | 3.38 ± 1.4           | 4.41 ± 1.8          | 5.37     | 0.006| 0.088                  | 0.677     |
| Self-directedness    | 22.43 ± 5.2          | 24.38 ± 4.2         | 1.75     | 0.179| 0.031                  | 0.394     |
| Cooperativeness      | 22.36 ± 3.3          | 21.22 ± 3.6         | 1.74     | 0.181| 0.030                  | 0.337     |
| Self-transcendence   | 11.15 ± 5            | 11.16 ± 4.3         | 0.05     | 0.954| 0.001                  | 0.002     |
| Subscale impulsivity | 5.92 ± 1.91          | 4.21 ± 2.85         | 7.35     | 0.001| 0.117                  | 0.774     |

**Abbreviations**: SA suicide attempt, SD standard deviation, $p$: significance of corrected model with groups as factor and HAMD17 as covariate, group as factor: $F(7, 105) = 9.427$; Pillai’s trace $= 0.386$; Wilk’s lambda $= 0.614$; $p < 0.001$ HAMD17 as covariate: $F(7, 105) = 1.120$; Pillai’s trace $= 0.069$; Wilk’s lambda $= 0.936$; $p = 0.356$ $d.f$: degrees of freedom = 2
sufficient validity [37]. One may assume that results for two-sided correlations of TCI scales and BIS to HAM-D17 (reward dependence) as well as more inactive and aimless (persistence) than patients who attempted suicide a longer time ago. These three dimensions seem to be state-dependent, which supports several aethiopathogenesis models (e.g., crisis model, latent trait model) of suicidal behavior (e.g., [62, 63]).

Impulsivity
Patients whose suicide attempt was recent were not significantly higher in BIS impulsivity, but they were higher in TCI-impulsivity (NS2) than patients whose suicide attempt was further in the past. A low correlation between the BIS and TCI subscales may refer to low validity of TCI subscales [25]. There is more convincing evidence of the BIS sufficient validity [37]. One may assume that results based on BIS are more meaningful. Our results suggest that impulsivity is stable as a trait [64], a finding that stands in contrast to the few studies revealing lower impulsivity in conjunction with time after suicide attempt [35, 36, 65].

Depression
Patients whose suicide attempt was recent presented significantly higher levels of depressive symptoms, an observation consistent with many other reports indicating that most patients remain depressed following a suicide attempt. The patient's mood usually improves after a therapeutic intervention [38, 66].

In this analysis, depressive symptoms displayed no influence on the relationship between personality traits and the interval from suicide attempt. Harm avoidance was significantly associated with depressive symptoms, consistent with previous reports and expected, as many behaviours of harm avoidance overlap with symptoms of depression [40, 44].

On the other hand, longitudinal studies investigating TCI variability show relatively high stability for the dimension harm avoidance [24, 33, 34] inconsistent with our findings. However, those studies did not take suicidality or depressive symptoms into account.

Our findings suggest that depression was not the only parameter that varied in the cohort further from their suicidal event [67]. Javdani et al. [68] recently demonstrated that several personality traits (including impulsivity) were stronger predictors of suicide attempts than depressive symptoms. Their study also demonstrated that depressive symptoms only predict general suicide risk (i.e., ideation and plans), but not suicidal behaviors. This is an important finding for clinicians when identifying and evaluating suicide risk. In addition to depressive symptoms, personality factors should also be monitored.

As some of these personality traits appear to vary over time and may indicate a higher suicide risk, it is worthwhile investigating potential interventional strategies

| Table 6 Multivariate analysis of variance of BIS scales |
|-----------------------------------------------|
| Dependent variable  | SA early (mean ± SD) | SA late (mean ± SD) |
|--------------------|----------------------|---------------------|
| BIS "Non-Planning" | 24.02 ± 4.52         | 22.97 ± 3.51        |
| BIS "Motor Impulsiveness" | 23.46 ± 5.13       | 21.38 ± 4.61        |
| BIS "Attentional Impulsiveness" | 28.13 ± 4.89       | 25.91 ± 3.56        |
| BIS Overall Score  | 75.62 ± 11.3         | 70.25 ± 9.25        |

**Abbreviations:** SA suicide attempt, SD standard deviation, group as factor: F(4, 108) = 0.766; Pillai's trace = 0.028; Wilk's lambda = 0.972; p = 0.550
HAMD17 as covariate: F(4, 108) = 1.186; Pillai's trace = 0.042; Wilk's lambda = 0.958; p = 0.321

s suggest that patients whose suicide attempt was more recent are more pessimistic, fearful (harm avoidance), withdrawn (reward dependence), less demanding and more inactive (persistence) than patients whose suicide attempt was less recent.

Lower levels of harm avoidance and higher levels of reward dependence and persistence may be protective, but further research is needed to confirm this, as these assessments were conducted after a suicide attempt. The variability identified in the reward dependence and persistence dimensions are in line with findings from Richter et al. [25], who also described these dimensions as being moderately stable.

**TCI and suicide attempts**
There is strong evidence that a higher level of harm avoidance is associated with a higher risk for suicide attempts (see above). However, many of those studies are limited by small patient cohorts and cross-sectional designs (e.g., [58, 59]).

Our investigation shows that patients whose suicide attempt was recent are more pessimistic, more fearful (harm avoidance), more withdrawn and independent

| Table 7 Correlations of TCI scales and BIS to HAM-D17 (N = 114) |
|-------------------|-------------------|-------------------|
| Scale             | Pearson's correlation coefficient | p for two-sided significance |
| Novelty seeking   | 0.073             | 0.514             |
| Harm avoidance    | 0.451             | 0.023             |
| Reward dependence | 0.058             | 0.607             |
| Persistence       | 0.108             | 0.333             |
| Self-directedness | 0.156             | 0.16              |
| Cooperativeness   | 0.149             | 0.183             |
| Self-transcendence| -0.006            | 0.956             |
| TCI subscale (impulsivity) | 0.057       | 0.546             |
| BIS overall score | 0.14              | 0.136             |
| BIS "Non-Planning"| 0.003             | 0.975             |
| BIS "Motor Impulsiveness" | 0.144        | 0.127             |
| BIS "Attentional Impulsiveness" | 0.173        | 0.066             |
incorporating these traits. For example, it may be useful to emphasize specific protective traits such as cognitive impulsivity, harm avoidance, persistence, and reward dependency.

**Strengths and limitations**

The main limitation of the present study is its cross-sectional design, which makes some of our interpretations difficult. Our study design did not allow us to identify when and which personality factors changed over time (such as harm avoidance and impulsivity, reward dependence, and persistence). In addition, we did not include a healthy control group. Some patient-cohort differences may have influenced our findings. For example, the SA late group patients were only recruited from one centre in Dresden, whereas patients from the other group were recruited from 5 different centres. Moreover, we had no data on psychiatric comorbidities or lifetime suicidality, or substance abuse available for comparison. However, these groups were sociodemographically similar. The SA early group contained both inpatients and outpatients, and many of them were on medication and/or undergoing psychotherapy, factors that could have influenced the clinical variables under investigation.

Future research should identify when specific traits change and investigate other influencing factors. Positive aspects of our study are that we employed a wide range of standardised, valid, and reliable measurement tools and had diagnoses confirmed by psychiatrists rather than only trained raters.

**Conclusions**

Suicidality is caused by a complex framework of internal and external factors. In this study we have identified specific personality traits that could help to deepen our knowledge about the development of suicidality. Our findings suggest that two groups whose interval to their suicide attempt varies also differ in some personality traits. If future studies suggest that several personality traits are changeable over time, these factors could be useful tools when assessing suicidal risk and considering therapeutic strategies.

In the light of these findings we recommend that clinicians pay close attention to specific personality traits such as pessimism, fearfulness, withdrawn behaviour, and fatigability (harm avoidance), but also to aspects of persistence and reward dependence when conducting assessments on suicidal patients.

Although assessment tools are helpful, we would like to emphasise the clinical importance of a reliable and trustworthy relationship with the patient experiencing a suicidal crisis. Future studies should also investigate a larger group of patients longitudinally. It would also be clinically relevant to investigate the influence of therapeutic strategies on the variability of personality traits and their impact on suicidal behavior.

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**Availability of data and materials**

All relevant data are within the manuscript.

**Authors’ contributions**

UL carried out the research and prepared the manuscript. SD contributed significantly in the acquisition of data and provided guidance on the analysis. MB helped to draft the manuscript. BJ made substantial contributions to conception and design as well as in drafting the manuscript. CS was involved in drafting the manuscript and revising it critically for important intellectual and statistical content. All authors gave their final approval of the version to be published.

**Competing interests**

The authors declare that they have no competing interests.

**Consent for publication**

Not applicable.

**Ethical approval and consent to participate**

The study protocol was approved by the local research ethic boards at all participating centres from the SA early group (Luebeck, Dresden, Berlin, Bonn, Nuremberg) as well as by the Ethics Review board, Dresden, Germany for the SA late group. The whole study follows the Helsinki declaration. Written informed consent was obtained from all participants.

**Author details**

1Department of Psychiatry and Psychotherapy, University Hospital Carl Gustav Carus, Technische Universität Dresden, Fetscherstr. 74, D-01307 Dresden, Germany. 2Technische Universität Dresden, Dresden, Germany. 3Psychiatric Department of the Municipal Hospital Dresden-Neustadt, Dresden, Germany.

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**References**

1. WHO. http://www.who.int/mental_health/prevention/en/. 2014. Accessed 27 Jan 2015.
2. WHO 2011. http://www.who.int/mental_health/prevention/suicide/ suicideprevent/en/. 2014. Accessed 27 Jan 2015.
3. Federal Statistical Office. https://www.destatis.de/DE/PresseService/Presse/ Pressemitteilungen/2014/11/PO14_421_232.html. 2014. Accessed 27 Jan 2015.
4. WHO. Preventing suicide: a global imperative. 2014. http://www.who.int/mental_ health/suicide-prevention/world_report_2014/en/. Accessed 27 Jan 2015.
5. AFSP American Foundation for Suicide Prevention. https://afsp.org/about/ suicide/suicide-statistics/. Accessed 8 Aug 2016.
6. Lee B, Kim YK. Potential peripheral biological predictors of suicidal behaviour in major depressive disorder. Prog Neuropsychopharmacol Biol Psychiatry. 2013:35:842–7.
7. WHO. http://www.who.int/mental_health/evidence/en/prevention_of_mental_disorders_sr.pdf. 2004. Accessed 30 Nov 2010.
8. Davis AT, Schrader C. The prediction of suicide. Med J Aust. 1990;153(9):552–4.
9. Oquendo MA, Mann JJ. The biology of impulsivity and suicidality. Psychiatr Clin North Am. 2000;23(1):11–25.
10. Schneider B, Philipp M, Müller MJ. Psychopathological predictors of suicide in patients with major depression during a 5-year follow-up. Eur Psychiatry. 2001;16(5):283–8.
11. Beghi M, Rosenbaum JF. Risk factors for fatal and nonfatal repetition of suicide attempt: a critical appraisal. Curr Opin Psychiatry. 2010;23(4):349–55.

12. Fairweather-Schmidt AK, Anstey KJ, Salim A, Rodgers B. Baseline factors predict of serious suicidality at follow up: findings focussing on age and gender from a community-based study. BMC Psychiatry. 2010;10:641.

13. Oquendo MA, Galfalvy H, Russo S, Ellis B, Grunebaum MF, Burke A, Mann JJ. Prospective study of clinical predictors of suicidal act after a major depressive episode in patients with major depressive disorder or bipolar disorder. Am J Psychiatry. 2004;161:1433–41.

14. Gruca RA, Przybeck TR, Cloninger CR. Personality as a mediator of demographic risk factors for suicide attempts in a community sample. Compr Psychiatry. 2005;46:214–22.

15. Hegel U, Fichter MM. Suizidales Verhalten und Suizid. Verhaltenstherapie. 2005;15:4–5.

16. Nordentoft M. Prevention of suicide and attempted suicide in Denmark. Epidemiological studies of suicide and intervention studies in selected risk groups. Dan Med Bull. 2007;54:306–69.

17. Giegling I, Olgiati P, Hartmann AM, Calati R, Möller HJ, Rujescu D, Cerletti A. Personality and attempted suicide. Analysis of anger, aggression and impulsivity. J Psychiatr Res. 2009;43(6):1252–71.

18. Brezo J, Paris J, Turecki G. Personality traits as correlates of suicidal ideation, suicide attempts and suicide completions: a systematic review. Acta Psychiatr Scand. 2006;113:180–206.

19. Cloninger CR, Bayon C, Svrakic DM. Measurement of temperament and character in mood disorders: a model of fundamental states as personality types. J Affect Disord. 1998;51:21–32.

20. McGiarr A, Turecki G. The relationship of impulsive aggressiveness to suicidality and other depression-linked behaviors. Curr Psychiatry Rep. 2007;9:460–6.

21. McCrae RR, Costa P. Personality in adulthood: New York: Guilford Press; 1990.

22. Roberts BW, Delvecchio WF. The rank-order consistency of personality traits from childhood to old age, a quantitative review of longitudinal studies. Psychol Bull. 2000;126:23–5.

23. Ardelt M. Still stable after all these years? Personality stability theory revisited. Soc Psychol Q. 2005;68:392–405.

24. Cloninger CR, Svrakic S, Przybeck T. Can personality assessment predict future depression? A twelve-month follow-up of 651 subjects. J Affect Disord. 2002;52:39–44.

25. Richter J, Eismann M, Richter G. Zur deutschsprachigen Version des Psychopathological Personality Scales (MMPI-2 PSY-5) und der deutschsprichigen Version des Temperament- und Charakter-Inventars. Z Klin Psychol Psychother. 1999;28:117–26.

26. Pellecilo A, Mallet L, Baleyte JM, Michel G, Cloninger CR, Allaire JF, Jouvent R. The Temperament and Character Inventory-Revised (TCI-R): psychometric characteristics of the French version. Acta Psychiatr Scand. 2003;112:126–33.

27. Fossati A, Cloninger CR, Villa D, Borroni S, Grazoli F, Garrolli L, Battaglia M, Maffei C. Reliability and validity of the Italian version of the temperament and character inventory-revised in an outpatient sample. Compr Psychiatry. 2007;48:380–7.

28. Takeuchi M, Miyaoka H, Tomoda A, Suzuki M, Lu X, Kitamura T. Validity and reliability of the Japanese version of the temperament and character inventory: a study of university and college students. Compr Psychiatry. 2011;52:109–17.

29. Sung SM, Kim JH, Yang E, Abrams KY, Lyoo IK. Reliability and validity of the Korean version of the temperament and character inventory. Compr Psychiatry. 2002;43(3):335–43.

30. Parker G, Cheah YC, Parker K. Properties of the temperament and character inventory in a Chinese sample. Acta Psychiatr Scand. 2003;108:367–73.

31. Gutierrez-Zotes JA, Correas MJ, Valero J, Peña J, Labad A. Psychometric properties of the abbreviated Spanish version of TCI-R (TCI-140) and its relationship with the Psychopathological Personality Scales (MMPI-2 PSY-5) in patients. Actas Esp Psiquiatr. 2005;33:231–7.

32. Preis P, Remschmidt H. Depressive disorders in childhood and adolescence. Z Kinder Jugendpsychiatr Psychother. 2007;35:385–96.

33. Hornman PO, Zilberman ML, Tavares H, Suris AM, Di-Guebaly N, Foster B. Personality changes in women recovering from substance-related dependence. J Addict Dis. 2006;25:59–66.

34. Boz C, Gazigolu S, Auronayoglu V, Hacoglu C. Effect of serotonergic antidepressant therapy on temperament and character scales in patients with chronic tension-type headache. Psychiatry Clin Neurosci. 2007;61:534–42.
59. Engström C, Brändström S, Sigvardsson S, Cloninger R, Nylander PO. Bipolar disorder: I. Temperament and character. J Affect Disord. 2004;82:131–4.
60. Calati R, Giegling I, Rujescu D, Hartmann AM, Möller HJ, De Ronchi D, Serretti A. Temperament and character of suicide attempters. J Psychiatr Res. 2008;42:938–45.
61. Conrad R, Walz F, Geiser F, Imbierowicz K, Liedtke R, Wegener I. Temperament and character personality profile in relation to suicidal ideation and suicide attempts in major depressed patients. Psychiatry Res. 2009;170:212–7.
62. Cullberg J. Krisen und Krisentherapie. Psychiatr Prax. 1978;5:25–34.
63. Fawcett J. Treating impulsivity and anxiety in the suicidal patient. Ann N Y Acad Sci. 2001;952:94–102.
64. Fawcett J. Treating impulsivity and anxiety in the suicidal patient. Ann N Y Acad Sci. 2001;952:94–102.
65. Lewitzka et al. BMC Psychiatry (2016) 16:282