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Anxious temperament as a risk factor of suicide attempt

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Abstract

Objective: Suicide has been reported to be associated with cyclothymic, irritable, depressive and anxious temperaments. In contrast, hyperthymic temperament has been reported to be protective against suicide. In the present study, we hypothesized that Japanese patients with suicide attempt may have higher scores of cyclothymic, irritable, depressive, and anxious temperaments but lower scores of hyperthymic temperament than non-suicidal patients. In order to examine this hypothesis, we investigated Japanese patients of a university emergency center.

Methods: The association of temperament and suicide attempt was investigated in 116 patients referred to a university emergency center for intoxication or injury. Of them, 35 patients of suspected suicide attempt were categorized as 18 patients who intended to die with attempted suicide and suffered from self-inflicted but not fatal injury (Suicide Attempt II), 4 patients whose intention to die were undetermined although they suffered from self-inflicted injury (Undetermined Suicide-Related Behavior II), and 13 patients who had no intention to die although they suffered from self-inflicted injury (Self-Harm II). Logistic regression analyses and multiple regression analyses were used to identify factors associated with the present suicide attempt and the number of suicide attempts, respectively.

Results: Anxious temperament scores were significantly and directly associated with Suicide Attempt II group whereas irritable temperament scores were associated with Self-Harm II group.

Conclusion: The present findings suggest that those with anxious temperament may have more suicide attempts than those with other temperaments, indicating anxious temperament as a risk factor of suicide attempt.

1. Introduction

Suicide is an unresolved and serious problem. Japan has been ranked as having the fifth highest suicide rate in the world [1]. In Japan, the annual number of suicide deaths exceeded 30,000 during the period from 1998 to 2011, and then slowly declined to 27,000 [2,3]. The crude suicide rate was 21.4 per 100,000 in 2013 [2,3]. Previously, we attempted to make a model in which suicide rate in 2008 was longitudinally and comprehensively predicted by potential risk factors recorded one year before (2007) which included personal and interpersonal factors, medical factors, economic factors, climate factors, alcoholic factors, and ω-3 fatty-acid factors [4]. As a result, in males, elderly population rate and complete unemployment rate were associated with completed suicide significantly and directly whereas marriage rate and annual postal savings per person were associated with completed suicide significantly and conversely [4]. Also in females, complete unemployment rate was associated with completed suicide significantly and directly whereas annual mean temperature was associated with completed suicide significantly and conversely.

In addition, temperament, which is biologically determined, has been considered to be associated with suicidality [5]. Suicide attempt has been reported to be associated with cyclothymic temperament [6–10], irritable temperament [5,8,10], depressive temperament [5,8,10], and anxious temperament [5] in psychiatric patients. Conversely,

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hyperthymic temperament has been reported to be protective against suicidality [11,12]. Moreover, Pompili et al. [13] investigated the significant others of 18 completed suicides in order to provide an assessment of temperaments, hopelessness, depression and the suicide risk of their loved ones. The data were compared with data from 244 psychiatric patients of whom 83 had attempted suicide in the previous month. As a result, completed suicides had lower scores of cyclothymic and anxious temperaments than mood disorder patients with a recent suicide attempt.

In the present study, we hypothesized that Japanese patients with suicide attempt may have higher scores of cyclothymic, irritable, depressive, and anxious temperaments but lower scores of hyperthymic temperament than non-suicidal patients. In order to examine this hypothesis, we investigated Japanese patients of a university emergency center.

2. Material and methods

2.1. Subjects

As shown in Fig. 1, 3078 patients were consecutively referred to the Advanced Trauma, Emergency and Critical Care Center, Oita University Faculty of Medicine from April 1, 2013 to August 31, 2015. The 116 live patients were suffering from intoxication or injury which level was mild to very serious, were 20 years old or over, had no serious consciousness disturbance, and gave written informed consent to the present study, which was approved by a university ethical committee. There were 35 patients who had suspected attempted suicide (suspected suicide attempt group) and 81 patients who had not attempted suicide (control group). Their psychiatric diagnoses were made by psychiatrists using DSM-IV-TR, where a structured interview was not performed but the patients' psychiatric symptoms were carefully examined and their psychiatric histories were collected from the patients and their family in order to appropriately diagnose axis I and II disorders. Their demographic data were shown in Table 1.

2.2. Assessment of suicide

Intention to die was directly asked to the 35 patients who suffered from suspected attempted suicide. According to Silverman et al.'s revised nomenclature for the study of suicide and suicidal behaviors [14], we categorized the 35 patients of suspected suicide attempt group as 18 patients who intended to die with attempted suicide and suffered from self-inflicted but not fatal injury (Suicide Attempt II), 4 patients whose intention to die were undetermined although they suffered from self-inflicted injury (Undetermined Suicide-Related Behavior II), and 13 patients who had no intention to die although they suffered from self-inflicted injury (Self-Harm II).

2.3. Assessment of temperament and depressive state

At the time point when the patients recovered from intoxication or injury and their mental state became stable, which was determined by individual doctors of the center, they were asked to complete the Japanese version of the Temperament Evaluation of Memphis, Pisa, Paris and San Diego-auto questionnaire version (TEMPS-A), which is a

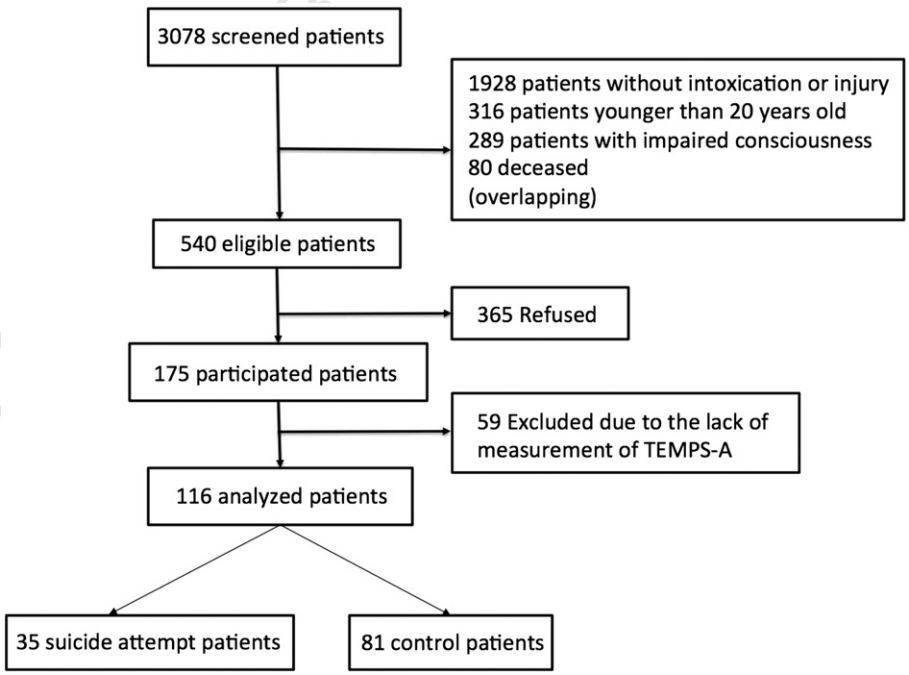

Fig. 1. Flow chart of the screened patients to the analyzed patients.

t1.1 Table 1
t1.2 Patient demographic data and TEMPS-A scores.

t1.3 Variables	Suspected suicide attempt group	Control group	t	p
t1.4 N	35	81		
t1.5 Gender				
t1.6 Male:female	17:18	57:24	$\chi^2 = 5.0$	0.025
t1.7 Age	42.5 ± 15.3	51.1 ± 19.3	2.6	0.012
t1.8 Psychiatric diagnoses				
t1.9 Depression	8	2		
t1.10 Bipolar disorder	6	0	88.3	0.001
t1.11 Schizophrenia	9	0		
t1.12 Borderline personality disorder	2	0		
t1.13 Sleep disorder	1	1		
t1.14 Others	6	1		
t1.15 None	3	77		
t1.16 Depressive state				
t1.17 Beck rating scale	27.0 ± 14.1	7.8 ± 8.1	−7.3	0.001
t1.18 Hamilton rating scale	16.8 ± 8.3	2.8 ± 3.3	−9.2	0.001
t1.19 TEMPS-A				
t1.20 Depressive	11.5 ± 4.3	7.8 ± 3.1	−4.6	0.001
t1.21 Cyclothymic	10.4 ± 5.5	5.2 ± 3.9	−5.1	0.001
t1.22 Hyperthymic	5.7 ± 4.2	7.6 ± 4.8	2.1	0.041
t1.23 Irritable	5.6 ± 5.0	2.8 ± 3.1	−3.1	0.003
t1.24 Anxious	12.0 ± 6.4	4.9 ± 4.5	−5.9	0.001

t1.25 TEMPS-A: Temperament Evaluation of Memphis, Pisa, Paris and San Diego-auto questionnaire version. Each value was expressed as mean ± SD.
The suicide attempt group had significantly less male patients and a significantly younger general age than the control group. Moreover, the suicide attempt group had significantly more psychiatric diagnoses and significantly higher depressive scores than the control group. As for TEMPS-A scores, the suicide attempt group had significantly higher scores of depressive, cyclothymic, irritable, and anxious temperament. Conversely, the control group had significantly higher t1.26 scores of hyperthymic temperament.

110-item true–false questionnaire measuring the 5 temperament dimensions: depressive, cyclothymic, hyperthymic, irritable and anxious [15]. TEMPS-A was translated into Japanese and the reliability and validity of the Japanese version have been previously established [16,17]. Moreover, their depressive state was measured using Beck rating scale [18] and Hamilton rating scale [19]. All patients suffered from physical symptoms due to intoxication or injury but not to depressive state. Therefore, modified Hamilton rating scale scores which deleted the cores of physical symptoms were used in this study.

2.4. Statistical analyses

First, demographic continuous data including Beck, Hamilton and TEMPS-A scores of patients who had and had not suspected attempted suicide were compared by unpaired t-test. Demographic categorical data were compared by χ^2 test. Furthermore, we compared these data between 18 patients of Suicide Attempt II group, 4 patients of Undetermined Suicide-Related Behavior II group, and 13 patients of Self-Harm II group.

Secondly, logistic regression analysis was used to identify factors associated with the present suspected suicide attempt (as a cross-sectional course), using the presence of the suspected suicide attempt as a dependent factor, and age, gender, and the 5 temperaments as independent factors. Also, similar analyses were applied to 18 patients of Suicide Attempt II group and 13 patients of Self-Harm II group.

Thirdly, as the final model, multiple regression analysis was used to identify factors associated with the number of suspected suicide attempts (as a longitudinal course), including the present suicide attempt and the past attempt history, using age, gender, and the 5 temperaments, scores of depressive state measured by Beck rating scale and Hamilton rating scale, and the presence of psychiatric diagnoses as independent factors because suspected suicide attempt might have been associated with psychiatric diseases and post-suicidal depressive reaction could have affected the TEMPS-A temperament scores [20]. Also, similar analyses were applied to 18 patients of Suicide Attempt II group and 13 patients of Self-Harm II group.

Although the present suspected suicide attempt was clearly confirmed, past history of suspected suicide attempt depended on the memory of the individual patients. To avoid overestimation, the upper limit was set at 3 times (i.e., if the total number of suspected suicide, including the present and past suspected suicide attempts, is 3 or more, then the number of suspected suicide attempts is expressed as 3).

3. Results

3.1. Demographic data including TEMPS-A scores

As shown in Table 1, the suspected suicide attempt group had significantly less male patients and a significantly younger general age than the control group. Moreover, the suspected suicide attempt group had significantly more

psychiatric diagnoses and significantly higher depressive scores than the control group. As for TEMPS-A scores, the suspected suicide attempt group had significantly higher scores of depressive, cyclothymic, irritable, and anxious temperaments. Conversely, the control group had significantly higher scores of hyperthymic temperament.

As shown in Table 2, Suicide attempt II group had the highest depressive scores and both Self-Harm II group and Suicide attempt II group had significantly higher depressive scores than the control group. Moreover, both Self-Harm II group and Suicide attempt II group had significantly higher scores of depressive, cyclothymic and anxious temperaments than the control group. Self-Harm II group had significantly higher scores of irritable temperament than the control group.

3.2. Logistic regression analysis

As shown in Table 3, anxious temperament was significantly and directly associated with the present suicide attempt, whereas an inverse pattern was observed for hyperthymic temperament in total 116 patients.

When the patients were limited to the control group patients vs. Suicide Attempt II group patients (N = 99) and to the control group patients vs. Self-Harm II patients (N = 94), anxious temperament was significantly and directly associated with the present suicide attempt.

3.3. Multiple regression analysis

As shown in Table 4, anxious temperament and the presence of psychiatric diagnoses were significantly and directly associated with the number of suicide attempts in total 116 patients.

Moreover, as variables selected for 99 patients (control group vs. Suicide Attempt II group), anxious temperament scores, the presence of psychiatric diagnoses, and Hamilton depression scale scores were significantly and directly associated with the number of suicide attempts. Also, as variables selected for 94 patients (control group patients vs. Self-Harm II patients), irritable temperament scores and the presence of psychiatric diagnoses were significantly and directly associated with the number of suicide attempts.

Table 3
Logistic regression analysis (Wald) for the presence of the present suicide attempt.

Variables selected for total 116 patients				
	B (S.E.)	Wald	p	Exp(B)
Anxious temperament	0.219 (0.044)	24.4	0.001	1.2
Hyperthymic temperament	−0.121 (0.060)	4.0	0.045	0.9
Variables selected for 99 patients (control group plus Suicide Attempt II group)				
	B (S.E.)	Wald	p	Exp(B)
Anxious temperament	0.268 (0.060)	20.0	0.001	1.3
Variables selected for 94 patients (control group patients plus Self-Harm II patients)				
	B (S.E.)	Wald	p	Exp(B)
Anxious temperament	0.227 (0.058)	15.1	0.001	1.3

B: coefficient, S.E.: standard error, Wald: Wald chi-square value, Exp(B): exponentiation of the B coefficient, which is an odds ratio.
Age, gender, depressive temperament, cyclothymic temperament, and irritable temperament were excluded from this model. Anxious temperament was significantly and directly associated with the present suicide attempt, whereas an inverse pattern was observed for hyperthymic temperament in total 116 patients. When the patients were limited to the control group patients vs. Suicide Attempt II group patients and to the control group patients vs. Self-Harm II patients, anxious temperament was significantly and directly associated with the present suicide attempt.

4. Discussion

In the 35 suspected suicide attempt group, the unpaired t-test showed that depressive, cyclothymic, irritable, and

Table 2
Control and three subgroups of the suspected suicide attempt group.

Variables	Control[a] (N = 81)	Self-Harm II[b] (N = 13)	Undetermined Suicide-Related Behavior II[c] (N = 4)	Suicide Attempt II[d] (N = 18)	F	p	Post-hoc (Bonfferoni test)
Age	51.1 ± 19.3	42.4 ± 12.0	28.8 ± 7.3	45.6 ± 17.3	2.8	0.044	
Gender	M = 57, F = 24	M = 5, F = 8	M = 1. F = 3	M = 11, F = 7	χ^2 = 7.8	0.051	
Beck	7.8 ± 8.1	24.2 ± 14.1	13.3 ± 10.8	31.8 ± 12.7	33.9	0.001	a < b,d; c < d
Hamilton	2.8 ± 3.3	13.6 ± 4.2	12.8 ± 7.5	20.3 ± 9.6	53.9	0.001	a < b,c,d; b < d
TEMPS-A							
Depressive	7.8 ± 3.1	11.7 ± 4.8	8.0 ± 2.9	12.1 ± 4.0	10.6	0.001	a < b,d
Cyclothymic	5.2 ± 3.9	10.2 ± 6.3	8.8 ± 6.4	10.9 ± 4.9	11.4	0.001	a < b,d
Hyperthymic	7.6 ± 4.8	7.0 ± 4.7	1.8 ± 1.7	5.6 ± 3.8	2.8	0.043	
Irritable	2.8 ± 3.1	7.7 ± 6.1	2.3 ± 2.1	4.8 ± 4.1	7.6	0.001	a < b
Anxious	4.9 ± 4.5	13.0 ± 7.1	4.3 ± 2.6	13.0 ± 5.4	20.2	0.001	a < b.d; c < b,d

The suspected suicide attempt group was categorized as Self-Harm II group who had no intention to die although they suffered from self-inflicted injury, Undetermined Suicide-Related Behavior II group whose intention to die was undetermined although they suffered from self-inflicted injury, and Suicide Attempt II group who intended to die with attempted suicide and suffered from self-inflicted but not fatal injury. Suicide attempt II group had the highest depressive scores and both Self-Harm II group and Suicide attempt II group had significantly higher depressive scores than the control group. Moreover, both Self-Harm II group and Suicide attempt II group had significantly higher scores of depressive, cyclothymic and anxious temperaments than the control group. Self-Harm II group had significantly higher scores of irritable temperament than the control group.

Table 4
The final model: multiple regression analysis (stepwise) of the number of suicide attempts.

	B (S.E.)	β	p
Variables selected for total 116 patients			
Anxious temperament	0.030 (0.013)	0.204	0.020
Presence of psychiatric diagnoses	1.21 (0.17)	0.617	0.001
$F = 54.0$, $p = 0.001$, adjusted $R^2 = 0.549$			
Variables Selected for 99 patients (Control group plus Suicide Attempt II group)			
Anxious temperament	0.032 (0.013)	0.240	0.018
Presence of psychiatric diagnoses	0.578 (0.207)	0.318	0.007
Hamilton	0.027 (0.010)	0.315	0.006
$F = 28.9$, $p = 0.001$, adjusted $R^2 = 0.538$			
Variables Selected for 94 patients (Control group patients plus Self-Harm II patients)			
Irritable temperament	0.045 (0.016)	0.264	0.007
Presence of psychiatric diagnoses	1.052 (0.168)	0.590	0.001
$F = 43.0$, $p = 0.001$, adjusted $R^2 = 0.560$			

B: coefficient, S.E.: standard error, β: standardized coefficients.
As variables selected for total 116 patients, age, gender, the other 4 temperaments, Beck and Hamilton rating scores were excluded from the final model. Anxious temperament scores and the presence of psychiatric diagnoses were significantly and directly associated with the number of suicide attempts. Moreover, as variables selected for 99 patients (control group vs. Suicide Attempt II group), anxious temperament scores, the presence of psychiatric diagnoses, and Hamilton depression scale scores were significantly and directly associated with the number of suicide attempts. Also, as variables selected for 94 patients (control group patients vs. Self-Harm II patients), irritable temperament scores and he presence of psychiatric diagnoses were significantly and directly associated with the number of suicide attempts.

anxious temperaments were significantly and directly associated with suicide attempt, whereas hyperthymic temperament was significantly and inversely associated with suicide attempt. Even after correction for multiple testing (Bonfferoni's correction, $p < 0.005$), the suspected suicide attempt group still had significantly different scores in all affective temperaments except hyperthymic temperament (See p values in Table 1). Moreover, logistic regression analysis showed that anxious temperament was significantly and directly associated with the present suicide attempt (as a cross-sectional course), whereas an inverse pattern was observed for hyperthymic temperament. Finally, multiple regression analysis revealed that only anxious temperament was significantly and directly associated with the number of suspected suicide attempts (as a longitudinal course) although the presence of psychiatric diagnoses had more powerful impact as shown in Table 4. These findings apparently suggest that suspected suicide attempt group may be associated with anxious temperament. Nonetheless, considering that this group consisted of Suicide Attempt II group who intended to die, Undetermined Suicide-Related Behavior II group who was unable to admit positively to the intent to die and their self-inflicted behavior was controlled by delusion, cognitive impairment and so on, and Self-Harm II group who injured themselves without suicidal intent such as gestures [14], it seems impossible to determine the association of temperament with the suspected suicide group as a whole.

Alternatively, Suicide Attempt II group had significantly higher scores of depressive, cyclothymic, and anxious temperaments than the control group (Table 2). Moreover, in the 99 patients including the control group and Suicide Attempt II group, logistic regression analysis showed that only anxious temperament scores were significantly and directly associated with the present suicide attempt (Table 3) and multiple regression analysis revealed that anxious temperament scores, the presence of psychiatric diagnoses, and Hamilton depression rating scale sores were significantly and directly associated with the present suicide attempt (Table 4). These findings suggest that suicide attempt with intention to die may be associated with anxious temperament and that those with anxious temperament may have more suicide attempts than those with other temperaments. These are in line with the previous findings investigating suicide attempters [5], but not suicide completers [13].

One of interpretation of the findings for anxious temperament of suicide attempters, it should be noted that not only does the stigmatization of mental illness prevent people from seeking treatment, which in turn exposes them to a greater risk of suicide, but also suicide can appear to be the best solution for a stigmatized individual [21]. A recent multiple regression analysis [22] showed that the most significant factor connected to self-stigma was harm avoidance measured by Temperament and Character Inventory-Revised Version. Considering the similarity between harm avoidance and anxious temperament, it seems plausible that those with anxious temperament may be associated with self-stigma and thereby they may refuse to seek or continue psychiatric treatment and at last they are prone to suicide attempt. Also in Japan, the adjusted odds ratio of suicidal ideation was 2.09 (95% CI: 1.49–2.94) among participants feeling ashamed for seeking help, compared to those not feeling ashamed [3].

On the other hand, Self-Harm II group had significantly higher scores of depressive, cyclothymic, irritable and anxious temperament than the control group (Table 2). Moreover, in the 94 patients including the control group and Self-Harm II group, logistic regression analysis showed that only anxious temperament scores were significantly and directly associated with the present suicide attempt (Table 3) but multiple regression analysis revealed that irritable temperament scores and the presence of psychiatric diagnoses were significantly and directly associated with the present suicide attempt (Table 4). Therefore, Self-Harm II group may be associated with irritable temperament rather than anxious temperament.

As for other temperament, our regression model showed the lack of association between cyclothymic temperament and suicide attempt, although several researchers have reported the association of cyclothymic temperament and suicide attempt [6–10]. In addition, the model showed the lack of association between hyperthymic temperament and

suicide attempt. Several researchers also did not find such association [5,8,10], whereas others have found protective effects of hyperthymic temperament [11,12,23]. Overall, our hypothesis that Japanese patients with suicide attempt may have higher scores of cyclothymic, irritable, depressive, and anxious temperaments but lower scores of hyperthymic temperament than non-suicidal patients were partially supported. Particularly, anxious temperament may be associated with suicide attempt whereas irritable temperament may be associated with self-ham.

One limitation of the present study is that the number of patients was small and was a small portion of the screened patients. As such, the present findings should be interpreted with caution. Nonetheless, the strength is that we collected data on suicide attempt patients rather than patients with suicide ideation measured by questionnaire, and that we investigated not only the present suicide attempt but also the number of suicide attempts, emphasizing the reliability of the present findings. Another limitation is that post-suicidal depressive reaction might have affected the results even if the rating was performed at the time point of recovery and the results were adjusted using depressive rating scale scores.

In conclusion, the present findings suggest that those with anxious temperament may have more suicide attempts than those with other temperaments, indicating anxious temperament as a risk factor of suicide attempt.

Conflict of Interest

None.

Funding source

None.

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