



# Difference in Cognitive Flexibility between Passive and Active Suicidal Ideation in Patients with Depression

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## Abstract

**Purpose:** Previous studies have observed cognitive inflexibility in depressed patients may be associated with suicide risk, gaps exist in knowledge of cognitive flexibility in different gradations of suicidal ideation (SI). This study examined whether cognitive flexibility differed between depressed patients with passive and active SI.

**Methods:** Depressed patients currently experiencing a major depressive episode with either passive (n = 35) or active (n = 18) SI completed assessments of cognitive flexibility using perseverative errors of Wisconsin Card Sorting Test (WCST-PE). Multivariate logistic regression was used to estimate the odds ratio (OR) for cognitive flexibility (WCST-PE) between active and passive SI patients after adjustment for gender, age, diagnostic composition, and depression severity.

**Results:** Patients with active SI are associated with greater cognitive inflexibility compared to passive SI after adjusting for other covariates (OR: 1.26, 95% confidence interval: 1.01-1.58, p=0.04).

**Conclusions:** This study found that patients with active SI are associated with greater cognitive inflexibility than those with passive SI, which can provide insight into improved prevention.

## Keywords:

Cognitive flexibility, Passive suicidal ideation, Active suicide ideation, Depression severity

## Introduction

Suicide is a devastating event for the family, the community and the country, and has long-term effects on those left behind. Suicide is a public health problem in Taiwan, with suicide death rates rising from 7.4 per 100,000 in 1990 to 15.7 per 100,000 in 2015 (Taiwanese national mortality data file). Psychological autopsy studies of suicide have revealed a high prevalence of mental disorders among people who committed suicide in Taiwan [1]. The most common type of disorder has been depressive illness.

Depression is associated with suicide in a complex pathological process that can last from a few minutes to several months and follow a fluctuating path of intense negative feelings, rumination, hopelessness, suicidal ideation (SI, passive to active), then committing the suicidal act [2]. It is becoming increasingly clear that some people are vulnerable to suicidal behavior, making them more likely to engage in suicidal behavior if confronted with negative life events.

Depressed patients with suicidal thoughts see their coping options in terms of all or nothing

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of a miserable life in relation to death, with few intermediate possibilities between these raw choices, which may be due to cognitive inflexibility [3]. Cognitive inflexibility, defined as the inability to change decision-making behavior in response to external feedback and changing environmental circumstances [4]. People who are cognitively inflexible are unable to find effective solutions to stressful situations and the resulting sense of hopelessness increases the risk of suicidal behavior [5].

SI could be broken down into two forms: passive and active. Passive SI implies a desire to die, but without a specific plan to carry out death. Active SI implies an existing desire to die accompanied by a plan for how to carry out death [6]. When a depressed patient declares a passive SI, the active SI is invariably present. Although passive SI can leave time for interventions, the passive SI can suddenly become active. SI, active or passive, contains a dynamic mix of ambivalent thoughts and feelings along a continuum of gravity. This may reflect a continuous change in the patient's depression [7].

Although increasing work has observed cognitive inflexibility in depressed patients with suicidal ideation or attempt, there are gaps in knowledge of cognitive flexibility in different SI gradations [8]. The Wisconsin Card Sorting Test (WCST) is a well-known and validated task of cognitive flexibility and rule learning in a changing but unambiguous environment [9]. We question whether cognitive flexibility (WCST performance) differs between active and passive SI in patients with a current major depressive episode. Understanding the role of cognitive flexibility in different SI gradations would be an excellent opportunity to improve prevention.

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## Methods

### ■ Participants

The study group consisted of 53 patients who met the criteria of the Diagnostic and Statistical Manual of Mental Disorders IV (DSM-IV) for a current major depressive episode (either part of a major depressive disorder [n = 43] or the depressive phase of bipolar disorder [n = 10]). All patients were free of active psychosis, substance abuse or dependence, neurological problems, or other medical conditions that significantly complicate psychiatric symptoms as determined by clinical history and examination. They were recruited from a specialized Mood Disorders

Clinic at a large medical center in eastern Taiwan in 2016.

### ■ Measures

All patients presented passive [n=35] or active [n=18] SI evaluated via Beck Scale for Suicide Ideation (BSS) and a full semi-structured interview. All recruited patients had a Mini Mental State Examination (MMSE) score greater than 24. Their severity of depression was assessed using Beck Depression Inventory (BDI) and cognitive flexibility was assessed through the perseverative errors of WCST (WCST-PE).

### ■ Statistical analysis

The two groups (patients with passive or active SI) were first compared on demographic (gender and age) and clinical (diagnostic composition, BDI and WCST-PE scores) using chi-square tests, and two sample t-tests. We then used multivariate logistic regression to estimate the odds ratio (OR) for cognitive flexibility (WCST-PE) between active and passive SI patients after adjustment for gender, age, diagnostic composition, and BDI score. A p-value < 0.05 was considered as statistical significant.

### ■ Ethics statement

This study was approved by the Institutional Review Board of Tzu-Chi General Hospital (IRB103-102-A).

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## Results

As shown in **Table 1**, both groups (patients with passive or active SI) were comparable in terms of gender, age, diagnostic composition and cognitive inflexibility measurement (WCST-PE) (**Table 1**). The active SI group was associated with a higher depression severity (BDI) (44.6 vs. 33.2,  $p < 0.001$ ) compared to the passive SI group.

The results of the multivariate logistic regression are shown in **Table 2**. After controlling all the variables listed, patients with active SI are associated with greater cognitive inflexibility compared to passive SI (OR: 1.26, 95% confidence interval [CI]: 1.01-1.58,  $p=0.04$ ) (**Table 2**). The similar positive association is seen in the severity of depression (OR: 1.17, 95% CI: 1.06-1.29,  $p=0.002$ ).

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## Discussion

Although the results of the existing literature

**Table 1: Descriptive statistics for demographic and predictor variables between patients with passive and active SI.**

Variable	Passive SI (n=35)	Active SI (n=18)	p-value
Gender - n (%) <sup>‡</sup>			0.25
Female	24 (68.6)	15 (83.3)	
Male	11 (31.4)	3 (16.7)	
Age - mean (SD)*	44.8 (11.9)	41.2 (13.5)	0.32
Diagnosis - n (%) <sup>‡</sup>			0.05
Unipolar depression	31 (88.6)	12 (66.7)	
Bipolar depression	4 (11.4)	6 (33.3)	
BDI score - mean (SD)*	30.2 (11.4)	44.6 (9.9)	<0.001
WCST-PE - mean (SD)*	8.7 (3.42)	11.1 (6.0)	0.14

<sup>‡</sup> chi-square test; \*t test

Abbreviation: SI: suicide ideation; SD: standard deviation; BDI: Beck Depression Inventory; WCST-PE: Wisconsin Card Sorting Test - perseverative errors

**Table 2: Multivariate logistic regression adjusted covariates that associated with different type of SI.**

Variable	Active SI / Reference (Passive SI)		
	β estimate (SE)	Adjusted OR† (95% CI)	p-value
Gender	1.34 (1.09)	3.83 (0.46 - 32.16)	0.22
Age	-0.06 (0.04)	0.94 (0.87 - 1.02)	0.15
Diagnosis	0.15 (0.95)	1.16 (0.18 - 7.40)	0.88
BDI	0.16 (0.05)	1.17 (1.06 - 1.29)	0.002
WCST-PE	0.23 (0.12)	1.26 (1.01 - 1.58)	0.04

Adjusted OR† : adjusted odds ratio: mutually adjusted for gender, age, diagnosis, BDI and WCST-PE in multiple logistic regression

Abbreviation: SI: suicide ideation; SE: standard error; OR: odds ratio; CI: confidence interval; BDI: Beck Depression Inventory; WCST-PE: Wisconsin Card Sorting Test - perseverative errors

consistently support a link between cognitive inflexibility and suicide risk, fewer studies have investigated cognitive inflexibility in different gradations of suicidality (eg, suicidal ideation, aborted attempts, preparatory behavior) [8]. This study provided evidence for the first time that patients with active SI were associated with greater cognitive inflexibility than patients with passive SI after adjusting for gender, age, diagnostic composition, and depression severity.

In psychiatric practice, when a patient reports passive SI, the clinician may use it as an indicator of low suicide risk. The clinician may feel relieved and not complete suicide risk assessment and prevention. However, passive SI can become active quickly without warning [10]. This study found that patients with active SI are associated with greater cognitive inflexibility than those with passive SI, which can provide insight into improved prevention.

On the other hand, there was also literature suggesting that cognitive inflexibility might not be related to suicidality or could even be a protective factor, particularly in people with psychotic disorder or dementia [11,12]. Severe cognitive inflexibility may limit the ability to plan or make a suicide attempt. Otherwise, a non-linear relationship (for example,

suicidality increases in the context of mild cognitive inflexibility, but decreases in the context of stiffness) could possibly explain the diverging results [8]. Other studies comparing cognitive flexibility between different diagnostic samples and different gradations of suicidality are warranted to address this problem.

This study has two main limitations, including the cross-sectional nature of the data and the small sample size. Other large-scale studies with a cohort design are warranted to confirm our findings.

### Conclusion

After controlling for demographic covariates, diagnostic composition, and severity of depression, this study showed that greater cognitive inflexibility is associated with active SI versus passive SI. Interventions that address cognitive flexibility by pharmacological or non-pharmacological methods may reduce their shifting (passive to active SI) in depressive illness.

### Contributors

Yu-Chih Shen conceived the study and drafted the Introduction and Discussion of the manuscript.

Yi-Jyun Lai and Hsiang-Chi Tan designed the study and performed the psychologic testing. Wan-Chi Wu drafted Method and Results of the manuscript. Ling-Yi Wang performed the entire analysis. Chin-Ting Wang managed the literature searches. All authors have approved the final manuscript.

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### Acknowledgement

*This study is supported by Tzu-Chi General Hospital, Hualien, Taiwan (TCRD104-65).*

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### Role of funding source

The funding source has no further role in study design; in the collection, analysis and interpretation of data; in the writing of the report; and in the decision to submit the paper for publication.

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### Informed consent

Informed consent was obtained from all individual participants included in the study.

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### References

1. Cheng AT. Mental illness and suicide. A case-control study in east Taiwan. *Arch. Gen. Psychiatry* 52(7), 594-603 (1995).
2. Richard-Devantoy S, Gorwood P, Annweiler C, et al. Suicidal behaviours in affective disorders: a deficit of cognitive inhibition? *Can. J. Psychiatry* 57(4), 254-262 (2012).
3. Keilp JG, Sackeim HA, Brodsky BS, et al. Neuropsychological dysfunction in depressed suicide attempters. *Am. J. Psychiatry* 158(5), 735-741 (2001).
4. Schotte DE, Clum GA. Problem-solving skills in suicidal psychiatric patients. *J. Consult. Clin. Psychol* 55(1), 49-54 (1987).
5. Miranda R, Gallagher M, Bauchner B, et al. Cognitive inflexibility as a prospective predictor of suicidal ideation among young adults with a suicide attempt history. *Depress. Anxiety* 29(3), 180-186 (2012).
6. Barry LC, Wakefield DB, Trestman RL, et al. Active and passive suicidal ideation in older prisoners. *Crisis* 37(2), 88-94 (2016).
7. Isometsa ET, Lonnqvist JK. Suicide attempts preceding completed suicide. *Br. J. Psychiatry* 173, 531-535 (1998).
8. Bredemeier K, Miller IW. Executive function and suicidality: A systematic qualitative review. *Clin. Psychol. Rev* 40, 170-183 (2015).
9. Schmittmann VD, Visser I, Raijmakers ME. Multiple learning modes in the development of performance on a rule-based category-learning task. *Neuropsychologia* 44(11), 2079-2091 (2006).
10. Baca-Garcia E, Perez-Rodriguez MM, Oquendo MA, et al. Estimating risk for suicide attempt: are we asking the right questions? Passive suicidal ideation as a marker for suicidal behavior. *J. Affect. Disord* 134(1-3), 327-332 (2011).
11. Harris EC, Barraclough B. Suicide as an outcome for mental disorders. A meta-analysis. *Br. J. Psychiatry* 170, 205-228 (1997).
12. Haw C, Harwood D, Hawton K. Dementia and suicidal behavior: a review of the literature. *Int. Psychogeriatr* 21(3), 440-453 (2009).