The Mediating Effect of Psychache on the Relationship Between Psychological Strains and Suicidal Behaviors Among Chinese Hui and Han Medical Students

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Abstract
Psychological strain is associated with suicidal behavior; however, the way that psychological strain leads to suicidal behavior remains unclear. The current study examines the mediation effect of psychache on the relationship between psychological strain and suicidal behavior among Chinese Hui and Han medical students. A total of 1,696 enrolled medical students (974 Han and 722 Hui) were administered the Psychological Strain Scale (PSS), the Suicide Behavior Questionnaire-Revised (SBQ-R) scale, and the Psychache Scale. There were significant differences in the PSS between different ethnic groups. Correlation analysis showed that both psychological strain and psychache were positively correlated with suicidal behaviors, and the two predictive variables were also positively correlated. The mediation effect test procedure showed that the direct and indirect effects (mediator effect) of psychological strain on suicidal behaviors were significant. The findings indicate that psychological strain partially induced psychache in both two ethnicity groups, leading to suicidal behavior in Chinese medical college students.

Keywords
psychological strain, psychache, suicidal behavior, mediating effect, ethnic

Introduction
Suicide has become a global social problem that cannot be ignored. As of 2015, an estimated 788,000 people had died of suicide, accounting for nearly 1.5% of the global death toll and making suicide one of the top 20 causes of death (World Health Organization [WHO], 2017). Data from other countries show that suicide rates are also high in India, especially among college students (Muttathu et al., 2013). China’s latest figures show 4.31 suicides per 100,000 urban residents (Sha et al., 2018). Among the causes of death for Chinese college students, suicide dropped from third place in 1990 to fourth place in 2016 (Xu et al., 2018). China’s suicide rate is significantly lower than the average. However, some potential uptrends cannot be ignored (Parry, 2014). For example, an increasing number of studies show that medical students are at high risk of suicidal ideation (SI; Rotenstein et al., 2016; Sugawara et al., 2014). Medical students report higher rates of SI than do students of other majors in China (Zang et al., 2016); this is also the case for students in the United States (Dyrbye et al., 2008). Compared with the general population, heavy medical courses put more pressure on medical students (Castaldelli-Maia et al., 2019). In addition, this trend may be related to the attitude of medical students toward the suicide of patients and whether medical students can identify their own psychological problems in time and receive counseling and treatment (Carla & Patrizia, 2018). Special training is needed to improve diagnostic skills and competency in SI assessment, especially for medical students (Palmieri et al., 2008). SI is the early psychological activity of suicide attempts and suicides, with one in five people attempting suicide before completing suicidal behavior (Chang et al., 2011; Deisenhammer et al., 2009). Therefore, it is necessary to assess suicidal danger as a link to and component of suicide prevention (Xiao, 2001). In particular, it is important to detect the influencing factors of SI and maintain mental health among medical students.

Many medical students experience distress during medical school. Medical students must go to the hospital for practice and training, and this training process and environment contribute to the deterioration of mental health in developing physicians (Brazeau et al., 2014). Edwin

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Shneidman proposed the concept of psychache in 1953. He defined psychache as “hurt, anguish, soreness, aching, psychological pain in the psyche, the mind.” Psychache is a necessary condition for suicide to occur (Shneidman, 1993) and a core factor of suicide susceptibility (Verrocchio et al., 2016). When the perception of pain is unbearable, the cognitive level is lowered to the point that suicide is seen as the only way to block the unbearable flow of consciousness (Shneidman, 1984). Studies have consistently related psychache to suicide risk (Maser et al., 2019). Medical students experience considerable psychache due to various pressures in the training process, but they are reluctant to seek help despite their health care needs. Medical students both domestically and abroad experience substantial psychache. However, the concept of psychache has rarely been used to describe psychological distress and assess suicide risk in Chinese medical students. It is necessary to determine in a timely fashion whether medical students are experiencing psychache and to adopt interventions to prevent suicide.

Research shows that psychological strains (such as differential values strain and relative deprivation strain) are risk factors of suicide and significantly and positively affect SI (J. Zhang & Zhao, 2017). The conceptualization of the strain theory of suicide is derived from and built on the previous work of Durkheim (1951), Merton (1957), Agnew (2006), and (J. Zhang & Lyu, 2014) and has been tested in the Chinese population (J. Zhang et al., 2013b). Psychological strain can predict mental illness and suicidal behavior in both rural and urban youth (Sun et al., 2015) as well as among stomach cancer patients and Chinese Americans. The extreme solution in an acute and excruciating moment of psychological strain is suicide (J. Zhang et al., 2013a; X. Zhang et al., 2017b). A single stress is not a strain. A strain consists of at least two forces, or two stresses, that push a person in different directions (J. Zhang & Lyu, 2014). Four types of strain can predict suicide: (a) differential values occur when two conflicting social values compete in an individual’s life and are equally important, (b) aspiration versus reality means that an individual has impossible aspirations, (c) relative deprivation occurs when a person compares himself or herself negatively with others, and (d) deficient coping refers to the lack of ability to face crises in life (J. Zhang et al., 2011).

It is remarkable that suicide-related psychological variables are associated with SI only through psychache (Montemarano et al., 2018). In the relation between psychological strain and suicide, psychache may be a mediator. Some studies have examined the mediating effect of psychache on the relationship between risk factors (such as depression and hopelessness) and suicidal behavior (Sun et al., 2015; J. Zhang et al., 2009). However, the mediating effect of psychache on the relationship between psychological strain and suicide has rarely been examined within the medical college students. In addition, psychache is more common in minority medical students because their ethnicity adversely affects their medical school experience (Dyrbye et al., 2007). Furthermore, previous studies indicate that suicide rates tend to be lowest in Muslim countries, and in the Muslim communities, the Islam belief as a coping of life stress was inversely associated with suicide behaviors (Koenig, 2012). However, no study had examined the psychological strain theory among minority ethnicity population (like Hui in this study) in mainland China. In the path from psychological strain to suicidal behavior, strain may be moderated by social factors such as social integration and psychological factors such as personality traits (J. Zhang & Zhao, 2017).

Based on these theories, the present study hypothesized the following: (a) psychache mediates the relationships between psychological strain and suicide in Chinese medical students and (b) the cultural differences between Chinese Hui (most of them believe Islam) and Chinese Han (most of them have no religion affiliation) students affect SI through the difference in psychological strain and psychache. This study suggests three innovations to research on this issue: (a) psychological factors play an important role in suicidal behavior, but the mediating pathways through which psychological strain affects suicidal behavior are not sufficiently clear; (b) the suicide rate of medical students is increasing daily globally, but no studies have explored this relationship in Chinese medical students; and (c) the addition of ethnic medical students to the mediating effect of psychache between psychological strain and suicide extends previous studies on this relationship. When individuals, especially medical students, experience various types of pressure, psychological strain may increase the risk of suicide through psychache. This study offers directions for future work in this area and suggests ways to prevent suicide among medical students.

**Method**

**Participants and Procedure**

Data were collected from a medical student sample selected from Ningxia Medical University, which has 8,880 full-time students. A cluster sampling approach was undertaken to select the sample. Students registered in the same class (usually 35–45 students) were defined as a cluster. Then, 48 classes (n = 2,000) were selected from the school of clinical medicine, the school of nursing, and the school of public health. And 1,696 participants who finished the full questionnaires were included in the final data analysis. The sample for this study consisted of 643 males (37.9%) and 1,053 females (62.1%), including Chinese Han (57.4%) and Chinese Hui (42.6%) students. The average age of the total participants was 21.7 years with standard deviation 2.4 (ranged from 18 to 30 years).

A questionnaire survey was conducted during November 14 to 24, 2017. A research team was responsible to distribute
the questionnaires to students in university classrooms and to collect the questionnaires back at that time. The anonymity of the respondents and the confidentiality of the collected information were ensured for academic research, and we promised to follow the principle of voluntary participation. All participants were asked to provide a written consent form, and this study was approved by the Institutional Review Board of Ningxia Medical University (No. 2017-171).

Measures

Sociodemographic information was measured by a self-report questionnaire, which included grade, gender, ethnicity, number of siblings, self-rated physical condition (“1 = very bad,” “2 = bad,” “3 = normal,” “4 = good,” and “5 = very good”), family economic status, and religious affiliation. Ethnicity was categorized as “1 = Han” and “2 = minority.”

The Psychological Strain Scale (PSS) was developed in both English and Chinese. The original PSS was validated in a sample of the Chinese population; it has been tested, and its reliability and validity have been demonstrated (X. Zhang et al., 2012). The Cronbach’s alpha coefficient of the total PSS was .94 in the current study. The PSS comprises four scales for value strain, aspiration strain, deprivation strain, and coping strain, each with 10 items. Each of the 40 items had five options, including 1 = never; not me at all; 2 = rarely, not me; 3 = maybe, not sure; 4 = often, like me; and 5 = yes, strongly agree. The higher the total PSS score, the greater the strain (J. Zhang & Zhao, 2017).

The Psychache Scale (Holden et al., 2001) is a 13-item self-report scale to measure the degree of psychache using a 5-point scale of “1 = very bad,” “2 = bad,” “3 = normal,” “4 = good,” and “5 = very good”). Family economic status, and religious affiliation. Ethnicity was categorized as “1 = Han” and “2 = minority.”

The Suicide Behavior Questionnaire-Revised (SBQ-R) is a four-item scale to assess different suicide behaviors: lifetime SI and suicide attempts, the frequency of SI over the past 12 months, threats of suicide attempt, and self-reported likelihood of suicidal behavior in the future (Osman et al., 2001). The total score ranges from 3 to 18, with a higher score indicating a higher risk of suicide and a positive cutoff score of 7. Coefficient alpha reliabilities for the SBQ-R items were .80 (Aloba et al., 2017) and .72 in the current study.

Statistical Analysis

The Statistical Package for Social Sciences (SPSS) version 23 was used for statistical analysis. Cronbach’s alpha coefficients were used to evaluate the validity. A t test was used to examine differences in age, PPS scores, SBQ-R scores, and psychache scores between Chinese Han and Chinese Hui students. A chi-square test was applied to examine the differences in gender, one-child families, and economic status between the two groups of students. Linear regression and correlations were used to analyze the relationships among variables. The mediation analyses were performed using PROCESS (Hayes & Preacher, 2013). PROCESS estimates the direct effect and bias-corrected confidence intervals (CIs). A direct effect was considered not significant when the CI included zero. In this case, it is a full mediation effect. Structural equation modeling (SEM) analyses were used to explore the full mediating role of psychache in Hui students between deprivation strain and suicide behavior.

Results

As Table 1 shows, among the final 1,696 participants, there were significant differences in economic status ($t$/$\chi^2$ = 3.87, $p < .001$), PSS total scores ($t$/$\chi^2$ = 2.49, $p = .013$), and SBQ-R scores ($t$/$\chi^2$ = 1.19, $p = .046$) between the Chinese Han sample and the Chinese Hui sample. Chinese Hui students had higher psychological strain scores than Chinese Han students. Total PSS and the three dimensions were significant (total PSS, $p = .013$; value strain, $p = .006$; aspiration strain, $p = .036$; deprivation strain, $p = .002$). However, Chinese Hui students had a lower SBQ-R score than Chinese Han students. Other factors were insignificant, such as age, gender, one-child family, coping strain, and psychache ($p > .05$).

Table 2 shows the correlations for the key variables in Chinese medical students. The results of correlation and regression analysis showed that psychological strain, psychache, and SI were significantly positively correlated ($p < .01$).

Table 3 shows the mediating effect of psychache on the relationship between psychological strain and suicidal behavior in Chinese medical students, Chinese Han and Chinese Hui. The independent variable ($X$) is psychological strain, the mediating variable ($M$) is psychache, and the dependent variable ($Y$) is suicidal behavior. In total, $a$, $b$, $c$, and $c’$ were all statistically significant in the equation and could be used to describe the relationship among the variables. The indirect effect ($ab$) of psychological strain on SI by the mediating effect of psychache was significant ($p < .05$, 95% CI = [0.014, 0.094]); the direct effect ($c’$) was significant ($p < .05$, 95% CI = [0.005, 0.085]), except that the effect of deprivation strain on SI was not significant ($p = .138$, 95% CI = [−0.007, 0.047]) in Chinese Hui.

Psychache partially mediated the effect between psychological strain and suicidal behavior in Chinese medical students, with mean effects of 0.641 (value strain), 0.688 (aspiration strain), 0.731 (deprivation strain), 0.637 (coping strain), and 0.623 (total PSS) in total sample. The mean effect was 0.665 in Han students, with the value strain,
Table 1. Demographic and Psychopathological Characteristics of the Sample by Ethnicity.

| Variable                  | Total (n = 1,696) | Han (n = 974) | Hui (n = 722) | t/χ² | p value |
|---------------------------|-------------------|---------------|---------------|------|---------|
| Age, M ± SD               | 21.7 ± 2.4        | 21.0 ± 1.5    | 22.8 ± 3.1    | 1.52 | .129    |
| Gender, n (%)             |                   |               |               |      |         |
| Male                      | 643 (37.9)        | 363 (37.3)    | 280 (38.8)    | .63  | .526    |
| Female                    | 1,053 (62.1)      | 611 (62.7)    | 442 (61.2)    |      |         |
| One-child family, n (%)   |                   |               |               | 1.13 | .259    |
| Yes                       | 283 (16.7)        | 237 (24.3)    | 46 (6.4)      |      |         |
| No                        | 1,412 (83.3)      | 737 (75.7)    | 675 (93.5)    |      |         |
| Economic, n (%)           |                   |               |               | 3.87 | <.001   |
| Bad                       | 374 (22.0)        | 188 (19.4)    | 186 (25.8)    |      |         |
| Normal                    | 1,188 (70.00)     | 693 (71.1)    | 495 (68.5)    |      |         |
| PSS, M ± SD               | 94.00 ± 21.68     | 92.87 ± 21.82 | 95.53 ± 21.42 | 2.49 | .013    |
| Value, M ± SD             | 24.90 ± 6.47      | 24.52 ± 6.32  | 24.25 ± 7.09  | 2.74 | .006    |
| Aspiration, M ± SD        | 23.84 ± 7.07      | 23.52 ± 7.03  | 24.25 ± 7.09  | 2.09 | .036    |
| Deprivation, M ± SD       | 22.65 ± 6.31      | 22.23 ± 6.27  | 22.32 ± 6.32  | 3.17 | .002    |
| Coping, M ± SD            | 22.62 ± 6.52      | 22.58 ± 6.66  | 22.66 ± 6.33  | 0.23 | .812    |
| Psychache, M ± SD         | 22.60 ± 8.83      | 22.62 ± 8.82  | 22.57 ± 8.84  | 0.12 | .903    |
| SBQ-R, M ± SD             | 4.51 ± 2.37       | 4.61 ± 2.39   | 4.38 ± 2.33   | 1.99 | .046    |

Note. PSS = Psychological Strain Scale; SBQ-R = Suicide Behavior Questionnaire-Revised.

Table 2. The Correlation Matrix Among the Predicted Variables.

| Variables | 1       | 2       | 3       | 4       | 5       | 6       |
|-----------|---------|---------|---------|---------|---------|---------|
| 1.Value   | 1       |         |         |         |         |         |
| 2.Aspiration | .605*  | 1       |         |         |         |         |
| 3.Deprivation | .471*  | .664*   | 1       |         |         |         |
| 4.Coping  | .559*   | .568*   | .518*   | 1       |         |         |
| 5.Psychache | .431*  | .448*   | .405*   | .521*   | 1       |         |
| 6.SBQ-R   | .271*   | .249*   | .209*   | .302*   | .423*   | 1       |

Note. SBQ-R = Suicide Behavior Questionnaire-Revised.
*p < .01.

Table 3. The Mediation Effect of Psychache on the Relationship Between Psychological Strains.

| Path                                | Model 1 | Model 2 | Model 3 |
|-------------------------------------|---------|---------|---------|
|                                     | Estimate | Lower   | Upper   | Estimate | Lower   | Upper   | Effect M |
| Value strain → psychache            | Total   | 0.066** | 0.054   | 0.080   | 0.037** | 0.020   | 0.055   | 0.103** | 0.087 | 0.120 | 0.641 |
|                                     | Han     | 0.074** | 0.057   | 0.094   | 0.039** | 0.016   | 0.062   | 0.113** | 0.091 | 0.136 | .655 |
|                                     | Hui     | 0.056** | 0.039   | 0.078   | 0.039** | 0.013   | 0.065   | 0.095** | 0.070 | 0.120 | .589 |
| Aspiration strain → psychache       | Total   | 0.063** | 0.052   | 0.077   | 0.029** | 0.013   | 0.045   | 0.092** | 0.076 | 0.107 | .688 |
|                                     | Han     | 0.068** | 0.052   | 0.085   | 0.026*  | 0.005   | 0.046   | 0.093** | 0.073 | 0.114 | .731 |
|                                     | Hui     | 0.056** | 0.039   | 0.075   | 0.036** | 0.011   | 0.061   | 0.092** | 0.069 | 0.115 | .609 |
| Deprivation strain → psychache      | Total   | 0.065** | 0.053   | 0.041   | 0.024** | 0.007   | 0.041   | 0.088** | 0.071 | 0.106 | .731 |
|                                     | Han     | 0.071** | 0.056   | 0.089   | 0.030** | 0.007   | 0.053   | 0.101** | 0.078 | 0.124 | .703 |
|                                     | Hui     | 0.056** | 0.039   | 0.074   | 0.020   | -0.007  | 0.047   | 0.076** | 0.050 | 0.103 | 1.000 |
| Coping strain → psychache           | Total   | 0.074** | 0.060   | 0.090   | 0.042** | 0.024   | 0.060   | 0.116** | 0.100 | 0.132 | .637 |
|                                     | Han     | 0.084** | 0.065   | 0.106   | 0.031*  | 0.007   | 0.054   | 0.115** | 0.093 | 0.136 | .730 |
|                                     | Hui     | 0.061** | 0.043   | 0.082   | 0.057** | 0.029   | 0.085   | 0.118** | 0.093 | 0.144 | .517 |
| Psychological strain → psychache    | Total   | 0.023** | 0.019   | 0.029   | 0.014** | 0.008   | 0.019   | 0.037** | 0.032 | 0.042 | .623 |
|                                     | Han     | 0.025** | 0.020   | 0.032   | 0.013** | 0.006   | 0.045   | 0.038** | 0.032 | 0.045 | .658 |
|                                     | Hui     | 0.020** | 0.014   | 0.027   | 0.016** | 0.008   | 0.025   | 0.036** | 0.029 | 0.044 | .556 |

Note. Model 1 = indirect effect (ab); Model 2 = direct effect (c'); Model 3 = total effect (c); Effect M = ab/c.
*p < .05. **p < .01.
aspiration strain, deprivation strain, and coping strain were 0.655, 0.727, 0.707, and 0.732, respectively. The effect of the other independent variable on the dependent variable was not completely achieved through the mediating effect of psychache.

However, the mediating effect of psychache between deprivation strain and suicidal behavior was achieved among Hui students. The path model is shown in Figure 1 and includes the total effect (a) and complete mediation model (b). Based on the results, the model fit was acceptable: $\chi^2 (df) = 2.1 (1), p = .146$, goodness of fit index (GFI) = 0.998, root mean square error of approximation (RMSEA) = 0.039, Tucker–Lewis index (TLI) = 0.987, comparative fit index (CFI) = 0.996, $\chi^2 / df = 2.1$. The effect of the other independent variable on the dependent variable was not completely achieved through the mediating effect of psychache. The mean effect was 0.547 in Hui students; value strain, aspiration strain, and coping strain were 0.586, 0.607, and 0.517, respectively.

**Discussion**

This study explored the mediating effect of psychache between psychological strain and suicidal behavior among Chinese medical students, including Chinese Hui and Chinese Han people. All the proposed hypotheses were supported. First, the findings showed that there was a difference between Chinese Han and Chinese Hui medical students’ scores on the SBQ-R. Chinese Hui had lower scores on the SBQ-R. Chinese Hui must follow Islam, whereas Chinese Han people do not have to believe in religion. Most Chinese Han people have no religion or take Confucian culture as the mainstream culture, and many religions coexist, such as Buddhism and Taoism. Therefore, different national cultures exist among Chinese Hui and Chinese Han people. The findings are in line with previous studies that reported that the suicide rates of individuals with religious beliefs were lower than those without (Breault, 1986; Stack, 1983) and that religion protects against SI (Rasic et al., 2011), suggesting that certain traditional cultures have a buffer effect on psychache (Fan et al., 2009; Stack, 2000a). Therefore, ethnic differences may dilute the effect of psychache on SI.

There was a difference between Chinese Han and Chinese Hui medical students’ scores in psychological strain (including value strain, aspiration strain, and deprivation strain). The significant effect corroborates the impact of ethnicity on psychological strain. There are four types of strains, and each strain consists of at least two conflicting social facts. Value strain involves a conflict of two or more values; this study found that Hui students had higher PSS scores. As an element of culture and as a social-cultural phenomenon, religion is a source of change, difference, and contrast in various places (Khaki, 2020). Hui students believe in Islam because of their family environment and have their own traditional culture and living habits. On one hand, they abide by the rules of Islam, which, as the traditional culture of their ethnic region, influences their family education and living habits (Guo & Fang, 2013); on the other hand, they adapt to the Confucian culture together with their Chinese Han classmates. In addition, conflict between Muslim cultural values and modern cultural values occurs when Chinese Hui choose a medical profession (Calizaya-Gallegos et al., 2019). Hui students experience strain when these two conflicting values are equally important in their daily life.

Value strain, aspiration strain, and deprivation strain may not play equally important roles in SI. Aspiration strain is mainly a sense of the gap between reality and hopes. Hui students’ higher scores may be linked to religious belief. In other studies, aspiration strain has been found to be related to love-partner selection, job choice, and gender (J. Zhang et al., 2009), but this relationship is unclear. Deprivation strain occurs when people from similar backgrounds lead better lives, as evidenced by income inequality and distribution inequality. Chinese Hui students obtained higher scores in this area. Research shows a
Psychache played a full mediating role between deprivation strain and suicidal behavior in Hui students. This may not be entirely related to ethnicity. Some people believe that a deprivation response is caused by economic risk factors, which are a better explanation for suicide (Stack, 2000b). According to our research, improving individuals’ economic level can effectively reduce the risk of suicide by reducing deprivation strain to reduce the level of psychache. In addition, high self-esteem increases the sense of psychological imbalance and cannot be easily mediated; thus, individuals undergo so much psychological pain that they attempt suicide. Alternatively, when deprivation strain occurs, it increases life stress and the mediating effect of psychache.

Practical Significance

Our findings have some implications. Suicidal behavior can begin with psychological strain, which suggests a way to prevent and intervene in suicide. A study found that SI and suicidal behavior can be prevented or reduced by reducing or avoiding psychological strain (J. Zhang et al., 2017a). Psychache is caused by the interweaving of various psychological strains. Due to the poor coping ability of medical students, they often develop cognitive conflicts, which lead to suicidal thoughts. Measures should be taken to buffer the psychache caused by psychological strain. First, schools can organize campaigns to teach students to espouse correct values and determine their direction to strengthen their beliefs. Second, students can establish achievable learning and living goals instead of blindly comparing themselves with others. Students should accept their differences and failures, be aware of the distance between aspiration and reality, and keep trying. Third, excellent coping skills and a wide range of social support mechanisms can give a person the strength to face a variety of crises and negative situations.

Limitations

The current study has several limitations. First, the data applied in this study were not entirely representative of different ethnic minorities in China. The influence of ethnicity on psychological strain and suicidal behavior requires further study. Second, the variables included in the regression model did not include all the potential predictors (e.g., family history of suicide or previous mental health status), which may lead to an overestimation of the mediating effect of psychache. Finally, the cross-sectional design is not able to infer a causal association between psychache and suicidal behavior.

Conclusion

The mediating effect of psychache is significant and partial in the relationship between psychological strain and suicidal behavior. In Hui students, the mediating effect of psychache between psychological strain and suicidal behavior is complete.
Declaration of Conflicting Interests
The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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