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Reliability and Validity of the CES-D Scale in Two Special Adult Samples from Rural China

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1. Introduction

In China, suicide was responsible for about 287,000 deaths each year, and was the fifth most important cause of death not long ago [1]. In the past decade, suicide rate in China has been declined probably due to the tremendous economic growth in China [2, 3], and the trend different from the West arouses great interest in the Chinese mental health issue. Further, of the 1.37 billion population in China, about 70 percent live in rural areas [4], and about 93% of suicides in the nation happened in the rural areas [5–7]. The rural rate of suicide is about three times of Chinese urban rate [8, 9]. All these facts warrant our attention on Chinese rural mental health.

Depression, as a major diagnosis among all types of mental disorders that are prior to suicide [10–12], is an important variable for research. Depression has been conceptualized and operationalized in two ways in previous research: (1) as depressed mood (as evinced by a large number of depressive symptoms) and (2) as a psychiatric disorder that meets conventional diagnostic criteria (e.g. major depressive disorder) [13]. In a majority of studies which employ the method of the general population or community survey, the Center for Epidemiological Studies Depression scale (CES-D) [14] is the most commonly used to measure depressive symptomatology [13].

The CES-D is a self-report scale, and it covers affective, cognitive, behavioral, and somatic symptoms associated with depression. The CES-D was originally developed for assessing depression symptoms and was specifically designed for research use in the general and non-clinical populations [14]. Numerous studies have been documented for the good reliability and validity of the CES-D in both community and clinical samples. The scale has been used

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in research on children and adolescents [15–17], adult and elderly populations [18–20], the physically ill [21], and the mentally ill populations [22].

The CES-D Chinese versions have been used among various Chinese populations for hypothesis testing, such as overseas Chinese in the United States [23–25], Chinese in Hong Kong [26], and Chinese in mainland China [27–33]. In some other studies reliability and validity [23, 25, 29, 34, 35] of the CES-D have been tested among Chinese populations. They have demonstrated this scale could be applied in these Chinese.

However, few studies on the CES-D have been conducted using Chinese rural samples. People in rural areas account for about 54.3% of the Chinese total populations[36], and there is a great demand to study the rural mental health in China. It has been reported that the rate of suicide in Chinese rural people was three-times that of Chinese urban people[8, 28]. So introducing a widely spread method to screen and test the mental health in rural Chinese will be significant and beneficial not only for exploring the mental disorder status but also for the cross-culture comparison. Employing a large-scale rural population, the current study aimed to assess the psychometric properties of the CES-D applied in two rural Chinese samples with different demographic characteristics.

In Radloff's report (1977), a principal component factor analysis with Varimax rotation was used and obtained the four interpretable factors: (1) depressed affect — feeling blue, depressed, lonely, crying, and sad; (2) positive affect—feeling good, hopeful, happy, enjoying things; (3) somatic and retarded activity—bothered, loss of appetite, needing effort, poor sleep, trouble getting going; and (4) interpersonal —unfriendly, feel disliked. Following Radloff's original factor structure, a number of studies explored factor structure of the CES-D either by EFA (exploratory factor analysis) or by CFA (confirmatory factor analysis), or by both methods.

Investigators also examined the factor structure in Chinese, but the results varied in different groups. Ying [23] found the factor structure by EFA and CFA derived from Chinese Americans revealed three primary factors: positive affect, interpersonal problems, and depressive mood and somatic symptoms combined. With EFA, the three factors structure attained from the data of urban people in mainland Chinese is: somatic/retarded activity, interpersonal problems, and depressed affect [29]. A Chinese American student sample yielded a five factors solution [23]. A study in Chinese high school students suggested the 4-factor model showed the best fit than the 3-factor model_2-factor model and 1 factor model [37]. Using CFA in the Chinese data from Hong Kong, Cheung and Bagley reported 2 factors: affective and somatic symptoms, as well as interpersonal problems [26]. Another research from Hong Kong community adolescents demonstrated, using CFA, adequate fit both with Radloff's 4-factor structure and Yen et al's [35]3-factors structure including positive, somatic (mixing items from Radloff's somatic and depressed affect factors), and affective [34].

In a review of the above studies, most of the findings included the factor of “interpersonal problems,” while “somatic symptoms” and “depressive mood” were likely combined into one factor. Actually, the latter indicated that, for the factor structure of the CES-D in Chinese, the pivot of debates was somatization versus “psychologization” of distress in Chinese (e.g. Cheung, and Bagley[26]). The debate implied a cross-culture issue when a western scale introduced into non-western culture. Some researchers noted that Chinese patients have fewer complaints of emotional conflicts and tend to express their emotional disturbance through somatic symptoms [38, 39]. As early as last century, Kleinman, A., & Kleinman, J.[40] found that Chinese tend minimize the difference between depressive and somatic symptoms: they somatize depressive symptoms by voicing bodily complaints and

seeking medical help. Under this culture background, the factors of “depressed affect” and “somatic and retarded activity” in Radoff’s original structure model might be merged into one factor. Other studies suggested that compared with the factor structures found in American community samples, there is a closer link between depressive affect and somatic symptoms for the Chinese populations [23, 26, 34, 35].

In another study using general population in a urban area of China, Lin[29] reported Chinese in urban areas could present complaints of depressed mood according to the result of factor structure analysis (3-factor structure was found and included both somatic symptoms and depressed affect) [29]. In the present study, we hypothesized that Chinese in rural area were more likely somatize depressive mood than urban Chinese. Because rural Chinese were relatively more traditional and less educated with lower social economic status in China. It is noted that the annual per capita net income in rural population is 5,919 RMB, while that in urban population is 19,109 RMB [41]. They are also less exposed to psychiatric education than their urban counterparts [42]. All those rural factors have contributed to the somatization of mental symptoms among the rural people in China. As Kleinman reminded, after he analyzed the causes of the experience of depression being physical rather than psychological in Chinese society, Chinese Clinicians should pay special attention that “poverty and joblessness frequently intensify cultural issues” [43].

This current study tries to contribute to the current literature on the CES-D with Chinese rural and non-clinical samples. It is also our aim to make a preliminary attempt to find out special cultural relevance and interpretation when the scale was used in Chinese context.

2. Methods

2.1 Background of data collecting

Data for the current study were from a large project investigating suicide risk factors in the population of rural China. Here all of participants have rural household registration (rural *hukou*), which distinguished them from those with urban household registration (urban *hukou*). The project was a psychological autopsy study with a case-control design to investigate the environmental and other characteristics of rural young suicides (suicides occurring within last 6 months) and controls (aged 15–34 years) [44]. Psychological autopsy is one of the most valuable tools of research on completed suicide. The method involves collecting all available information on the deceased via structured interviews of family members, relatives or friends as well as attending health care personnel. Thus we are able to obtain information about the pathways to suicide, the characteristics of victims, and some common problems in preventing suicide that these life histories reveal (For Psychological autopsy, see[45]. Psychological autopsy method has been used in the West for suicide studies in the past 5 decades, and it has been carried out in mainland China and Taiwan [9, 46–48].

Three provinces in China were chosen for the study from October 2005 to June 2008. Liaoning is an industrial province located in Northeast China, Hunan an agricultural province in the Central South China, and Shandong a province with economic prosperity in both industry and agriculture that is located on the east coast of China mid-way between Liaoning and Hunan. Sixteen rural counties were randomly selected from the three provinces (6 from Liaoning, 5 from Hunan, and 5 from Shandong). (About sample criteria of PA in this project, including suicides and controls selection, see Zhang, Wiczorek et al. [44])

2.2 Subjects

Subjects of this study were informants in the Psychological Autopsy (PA) interviews, in which we interviewed two informants (a family member and a close friend) for each suicide and each control. In this study, we took advantage of the large sample of informants and accessed their responses to several other psychopathological measurements including the CES-D depression scale. The PA study had recruited 392 suicides and 416 living controls as target persons for study. We used the following four guidelines to recruit informants for each suicide and control: (1) suicide informants were recommended by the village head and the village doctor and then selected by the research team based on familiarity with the subject's life and circumstances, availability for and willingness to consent to in-person interviews, whereas control group informants were recommended by the controls themselves and then selected by the research team with similar principles. (2) Although target persons could be as young as 15 years of age, informants had to be aged ≥ 18 years. Characteristics of the informants for both suicides and controls were noted in a standardized fashion (i.e. most recent contact, number of contacts in the past month, frequency of contacts in the past year, number of years informant has known the target, relationships, and the informant's impression of their familiarity with target persons). (3) For both suicides and controls, the first informant was always a parent, spouse or another important family member, and the second informant was always a friend, co-worker or neighbor. (4) Wherever possible, we avoided recruiting husbands and in-laws of those female suicides associated with family disputes. Interviewing these people could result in very biased reports, if marital infidelity and family oppression were possible causes of suicide. Similarly, in selecting the male suicide informants and the control informants we tried to avoid this type of biased informant when family disputes were noted beforehand.

As for interviewing procedures, informants were first approached by the local health agency or the village administration by a personal visit. Upon their agreement by written informed consent, the interview was scheduled between two and six months after suicide incident. Interviews with informants regarding living controls were scheduled as soon as the control targets and their informants were identified. Each informant was interviewed separately by one trained interviewer, in a private place in a hospital/clinic or the informant's home. The average time for each interview was 2.5 h (About further detailed introduction, see[44]).

Each informant not only provided information on a suicide/control, he/she also provided information on themselves during the face to face interview, and we also interviewed the living controls themselves with the same protocols. In the current study we only analyzed the data provided by the informants themselves regardless of the information about the target persons (393 suicides and 416 controls). Two distinct samples were involved in the current study: (A) 786 suicide informants who had some close relationship with a suicide victim, (B) 832 community living control informants who had no relations with any of the suicides under study. The response rates were determined by the successful case control samples. Actually 100% of the suicides approached were successfully recruited and their family members and close friends were interviewed. For the community living control sample, only two out of the 418 selected individuals declined for the study, and the response rate for the control group was 99.5%. Both samples covered respondents with a wide range of age. Among the 1618 interviewees, 1606 had no missing data on the CES-D, 7 missed less than four items, and 5 missed five items or more (these 5 cases are all in suicide informants group). Using the convention set by Radloff[14] of including respondents who missed four items or fewer, our final sample for the study consists of a total of 1613 respondents: suicide informants group is 781, and control informants group is 832.

2.3 Measurement

Demographics—Education level of our subjects was recoded as education in years. Family annual income was obtained in Chinese currency RMB and converted to US dollars (US\$). Each US dollar was approximately equivalent to 6.62RMB during the period of research. Marital status was categorized into dichotomic variable: “married,” and “single, separated, divorced, or widowed.”

The CES-D Scale—The full version of the Center for Epidemiological Studies Depression Scale (CES-D) [14] was employed in the protocol. Subjects were asked to indicate the frequency of the symptoms using a 4-point scale: 0=less than a day, 1=1–2 days, 2=3–4 days, and 3=5–7 days against a time frame of the past week. The four positively formulated items (item 4, 8, 12 and 16) were recoded in reverse. The total score consists of a sum of all 20 items, ranging from 0 to 60. Radloff recommended a total the CES-D score of 16 or higher for indicating the likely presence of clinically significant depression [14].

Negative life event: Recent suicide by a family member or a close friend—The life stress literature shows that experiences of life events influence mental health, and life events items were often used to test concurrent validity of the CES-D scales [14, 25, 26, 29, 34, 49]. In this study, suicide informants were those experienced relatives or friends died by suicide in the past six months, while control informants has no experience like that recently. Therefore, the former sample can be viewed as the group experiencing a special negative (or undesirable) event, and the latter can be regarded as reference group. A hypothesis was the CES-D scores of suicide informants group should be significantly higher than those of control informants group.

SSI (the Scale for Suicidal Ideation)—The Scale for Suicide Ideation (SSI) [50] was employed as criterion scale for the CES-D. The SSI is a 19-item semi-structured interview that measures the current intensity of respondents' specific attitudes, behaviors, and plans to commit suicide on the day of the interview. Items assess suicidal risk factors such as the duration and frequency of ideation, sense of control over making an attempt, number of deterrents, and amount of actual preparation for a contemplated attempt. There are five screening items: three items assess the wish to live or the wish to die, and two items assess the desire to attempt suicide. Degree of suicide ideation is determined by the following guidelines: without suicide ideation, all five screening items are scored as 0; low suicide ideation, item 1 or item2 or item3 greater than 0, item 4 and item 5 are scored as 0; high suicide ideation, item 4 or item 5 greater than 0 [51]. The SSI is widely used in both research and clinical settings and its reliability and validity has been supported by previous studies among diverse populations including Chinese [50–54]. The study of Zhang and Brown (2007) indicated that the SSI had high internal reliability (Cronbach's alpha= 0.85), and the SSI was highly correlated with measures of trait anxiety, hopelessness, and favorable attitude towards suicide. These findings indicated that the SSI has excellent psychometric properties for measuring suicidal ideation in Chinese populations.

For the scales (CES-D and SSI) are originally in English, translation and back translation were practiced multiple times to minimize discrepancies between the English and Chinese measurements. The bilinguals on the research team met frequently for the disputed items in the translation until consensus was reached. Interviewers were trained professionals who were either faculty members or graduate students. Before the data collection began, each of them received systematic and intensive training in interviewing people with all of psychological measures.

2.4 Statistical Analyses

Cronbach's alpha, item-total correlations and inter-item correlations were calculated for the reliability of the CES-D. Some external variables were introduced to analyze the concurrent validity and criterion validity. For the former, the CES-D scores of suicide informants and control informants were compared, which is to explore the relation between negative life event and the CES-D. The correlation between total the CES-D score and SSI score was used to test the criterion validity of the scale. All analyses were two-tailed, with statistical significance determined by $P < 0.05$.

Confirmatory factor analysis (CFA) was conducted to determine the factor structures of CES-D among two distinct samples. Although some studies reported urban Chinese could presented with complaints of depressed mood (e.g. Lin's [29] 3-factor structure including both somatic activity and depressed affect), we supposed that rural Chinese is more likely somatize depressive mood than urban Chinese. Because rural Chinese were relatively more backward, poverty, educated lower levels, and lack of modernization so that they were less likely to precisely distinguish between somatic activity and depressed affect. Based on this prediction, this study supposed 3-factor structure was more likely fitful with rural Chinese (this structure was examined in some studies, e.g. Ying [23]). Thus, a 3-factor structure (Ying [23]) modes will be examined fit of CES-D for rural Chinese. The factors include: positive affect, interpersonal problems, as well as depressive mood and somatic symptoms combined. Using LISREL modeling, CFA was conducted to examine the fit in this 3-factor structure. The goodness of fit of the model was evaluated using the following indices to describe good fit: P value of χ^2 goodness-of-fit statistics is non-significant. Because this statistics is sensitive to sample size and non-normality, other fit indices can be used to evaluate model fit as supplement. We also used the root mean squared error of approximation (RMSEA) < 0.07 , comparative fit index (CFI) > 0.95 , normed fit index (NFI) > 0.9 , and goodness-of-fit index (GFI) > 0.90 . When comparing models, the Akaike's information criterion (AIC) and the consistent Akaike's information criterion (CAIC) were tested, as both of them can take parsimony into account (lower values indicate the model having the higher probability of replication) [55].

3. Results

3.1 Descriptive analysis

The characteristics of the two samples are shown in Table 1. There were significant differences among the two distinct samples in age, gender, education, and family annual income. Of the suicide informants, the mean age was 45.09 years, and 56.3% was male, while among control informants, the mean age was 35.21, and 58.8% was female. However, there was no significant difference in marital status. For both groups of informants, around 80% were married. Thus, two samples can be said to be over represented by the married people.

The suicide informants group's scores for the 20 the CES-D items ranged from 0 to 59 with the average of 13.92 (SD=14.69). Among control informants, the scores were from 0 to 48 with the average being 6.31 (SD=7.46). The scores of both groups are lower than cutoff score of 16.

In comparison with previously reported the CES-D mean scores of other Chinese and American samples (Table 2), our CES-D mean score of suicide informants was higher than the means reported by three studies in American, and also higher than the mean scores of Chinese before 2000. However, it was compatible with that of studies in Beijing [33]. As for control informants, the mean score was lower than that of all studies previously reported for either Chinese or American population.

3.2 Reliability

The reliability examination was accomplished with consistency tests. For suicide informants and control informants, the Cronbach's coefficients were 0.95 and 0.88 respectively (Table 3). The item-total correlation coefficients ranged from 0.39 (item 15) to 0.83 (item 6) for suicide informants, and from 0.34 (item 15) to 0.65 (item 6) for control informants. Comparing with the results of previous studies of Chinese (in urban china or in American) and American population, the reliability of the CES-D scale in rural china was slightly higher than those found in the other studies (Table 2), indicating the CES-D demonstrated good internal consistency in the rural Chinese samples.

3.3 Concurrent Validity

Concurrent validity of the CES-D scale was tested by "negative life events" naturally measured in the two samples. As shown in Table 4, after a partial correlation computed, "Group" showed significant correlations with the CES-D scores even though controlling for demographic variables (e.g. age, gender, marriage status, family annual income, and education years). The R value was -0.24 ($P<0.001$), which indicated that the CES-D score of suicide informants was significantly higher than that of the control informants group. Thus, as hypothesized, people experiencing negative life events (such as a suicide death in the family) had higher CES-D scores than those without the event.

3.4 Factorial structure of the CES-D

A 3-factor structure (Ying, 1988) modes would be examined fit of CES-D for target groups. The factors include: positive affect (feeling good, hopeful, happy, enjoying things), interpersonal problems (unfriendly, feel disliked), as well as depressive mood and somatic symptoms combined (bothered, poor appetite, blue, hard to concentrate, depressed, needing effort, failure, fearful, restless, talked less, lonely, crying spells, sad, couldn't get going).

Table 6 presents the goodness-of-fit indexes for 3-factor structure in the suicide informants and control informants, respectively. The fits of both groups were good for the 3-factor structure. The results of two CFAs show, for suicide informants group, this model fitted the data very well. As for control informants group, some indexes (RMSEA, GFI) fitted well while others is very close. Results indicated that, though good fit was showed in two groups, the 3-factors structure provided better fitness in suicide informants than control group. It suggested, the more risk of depression the Chinese group had, they had greater tendency to mix the depressive and somatic symptoms.

3.5 Criterion Validity

For the suicide informants group and the control informants group, the correlation coefficients between the CES-D score and the SSI score were 0.42 ($P<0.001$) and 0.15 ($P<0.001$) respectively. The CES-D mean scores were significantly different among three different degrees of suicide ideation groups in each distinct sample (suicide informants: $F=117.25$, $P<0.001$; control informants: $F=17.33$, $P<0.001$). Among the suicide informants, the CES-D mean score of high suicide ideation group was 35.65 (SD=15.59), the CES-D mean score of low suicide ideation group was 29.96 (SD=15.62), and the CES-D mean score of none suicide ideation group was 11.31 (SD=12.48). The corresponding figures for control informants were 12.25 (SD=9.64), 14.77 (SD=11.11) and 5.99 (SD=7.17) respectively. High suicide ideation group and low suicide ideation group have statistically significant high CES-D mean scores than none suicide ideation group in these two samples (suicide informants: $t=24.34$, $P<0.001$, $r=0.42$ [high vs. none]; $t=18.65$, $P<0.001$, $r=0.34$ [low vs. none]; control informants: $t=6.26$, $P=0.012$, $r=0.14$ [high vs. none]; $t=8.77$, $P=0.037$, $r=0.15$

[low vs. none]). There was no significant difference between high suicide ideation group and low suicide ideation group in each of the two distinct samples.

4. Discussion

In terms of psychometric properties of the CES-D, we found adequate internal reliability of the CES-D in the two rural samples in China, and it was even higher than that in other Chinese populations[25, 27, 29, 30, 33]. Tests of concurrent validity and criterion validity further confirmed utility of the scale for measuring the prevalence of depressive symptoms among these two rural Chinese samples.

The fit test of three-factor structure (positive affect, interpersonal problems, depressive mood and somatic symptoms combined) suggested, for rural Chinese, the ways of emotion expressions and self-explanation (here “depressed mood” as a representative) are still affected by Chinese folk culture, even though in the context of China's open-door policy and economic advancement. A number of studies have found that Asians tend to report less positive affect due to their Confucian cultural background [56], but in this present study, rural Chinese tend to express positive affect clearly. Furthermore, rural Chinese are inclined to mix depressive and somatic symptoms in daily discourse whatever with a subjective deliberately or unconscious intent. For Chinese, there are at least three key factors that cause this mixture.

The first is stigma of mental disorder. Although psychiatric stigma is a transcultural and global problem [57], a political campaign in modern Chinese history, Cultural Revolution, pushed this stigma so deeper that it was embedded in both ideological and even political dimension. Thus people refused to admit or speak out any emotion about mental disorder and even any other related emotions, while an alternative, or a trick was popular, which was to utilize somatic symptoms substitute for those of mental disorder [58].

The second factor is that the Chinese traditional medical conceptualization of illness is quite different from that of Western medicine and psychiatry [59]. The theory of Chinese traditional medicine (CTM) reflects the entire universal law in one complete, comprehensive system of related categories. For instance, in terms of Five-Element Theory in CTM, the five major Organ Systems (Liver/Gallbladder, Heart/Small Intestine, Spleen/Stomach, Lung/ Large Intestine, and Kidney/Urinary Bladder) are each related to a particular element and could be as basic causes for sickness. “*Shen*’ (kidney) controls the function of the cerebrum. Thus, ‘*shen-xu*’ causes a range of hypochondriac preoccupations including blurring of vision, cold sweats, and palpitations. The symptoms like dizziness, insomnia, fatigue and spermatorrhoea are caused by ‘*Shen-yang*’ (Positive element of the kidney)”[60]. Thus in CTM, emotional problems are diagnosed as the outcome of the whole internal organ systems working rather than regarding just as psychiatric or psychological disorders.

Finally, mostly of Chinese have poor knowledge of mental disorder, and also this kind of knowledge is unavailable in Chinese rural areas. So people have no expression skill to describe their depressed mood or other emotion about mental disorder, and then have to seek for other more conventional expression way. According to Kleinman, this is the process of “somatization” [40]. Ethnographic and clinical research has described Chinese tend to minimize the difference between depressive and somatic symptoms so as to avoid others’ rejection, and Chinese views of psycho-social distress as characterized by the “somatization” of illness complaints and the “underutilization” of mental health services [40, 61–63]. Furthermore, people in developing areas, because of their low incomes, may experience depression that is a reflection of socioeconomic problems rather than psychological problems, thus individual psychological distress is suppressed and viewed as

irrelevant [23, 64]. Thus, by factor structure analysis of the CES-D, current study showed again that “somatization” process still consisted in rural Chinese, which was what we hypothesized.

Another result worthy of attention is that, in all analyses, the suicide informants group had better reliability and validity scores than did the control informants group. The former could be at a higher risk of psychopathological symptoms, because they had recently experienced negative life event, and on the other hand there might be something of a subculture of suicide highly related to depression among the primary associations of suicides that contributes to suicide risk. Data showed the CES-D score of suicide informants (mean was 13.92) is significant higher than control informants group (mean was 6.31). This finding indicated the CES-D had the good applicability in depressive symptoms survey in rural China, and the CES-D might be an effective way to screen out risky group of depressed individuals.

This study focused on two unique samples in rural China, the proxy informants of recent suicides and the proxy informants of living controls. The CES-D, as one of the most popular measure of depression for non-clinical populations, has been tested as a good instrument for the screening in the two samples. However, this study is limited by its generalizability to general populations. Also, due to the limitation of the data, the psychometric properties of CES-D in urban Chinese were not examined, although the variance of CES-D in both rural and urban Chinese should be tested. It might be the topic in some future researches.

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Table 1

Demographic Characteristics of the Two Samples

Variables	Suicide informants (n=781)	Control informants (n =832)	F/ χ^2 , P
Age, mean± SD	45.09±12.89	35.21±12.97	F=234.65, P<0.001
Gender			
Male	56.32%	41.23%	$\chi^2=36.83$, P<0.001
Female	43.68%	58.77%	
Marital status			
Married	83.23%	79.74%	$\chi^2=3.33$, P>0.05
Single, Separated, divorced, widowed	16.77%	20.26%	
Education years, mean± SD	7.15±3.48	8.30±3.03	F=49.82, P<0.001
Family annual income(US\$), mean± SD	2240.00±2926.72	2552.01±2560.84	F=5.21, P<0.05

Table 2

Comparison of Studies on the CES-D (20 items) between the US and Chinese Samples

Population	Study	Mean of the CES-D	Reliability (Alpha)
<i>Chinese</i>			
Tianjin	(Lin et al., 1989)	10.30	0.77
Shanghai	(Lai, 1995)	11.80	0.79
Beijing	(Lai, and Lee, 2006)	11.83	0.82
Beijing		13.89	0.85
Dalian	(Zhang, Jia, et al., 2002a; Ingersoll, Norvilitis, et al., 2008)		0.90
San Francisco, Chinese Am.	(Ying, 1988)	11.55	0.77
San Francisco, Chinese Am.	(Rankin, Galbraith, et al. 1993)		0.92
US, Chinese Am. Women	(Li, and Hicks, 2010)	10.8	0.86
Hong Kong	(Lee, Stewart, et al, 2008)		0.90
<i>American</i>			
Kansas City	(Radloff, 1977)	9.25	0.85
Washington County		8.17	0.85
Albany	(Ensel & Woelfel, 1986)	8.6	0.89
New York, College Students	(Zhang & Norvilitis. 2002; Ingersoll, Norvilitis, et al., 2008)		0.89

Table 3

Reliabilities of the CES-D for suicide informants group and control informants group

	Suicide Informants (<i>n</i> =776)		Control Informants (<i>n</i> =828)	
	Corrected Item-Total Correlation ^b	Cronbach's Alpha if Item Deleted ^c	Corrected Item-Total Correlation ^b	Cronbach's Alpha if Item Deleted ^c
1. Bothered	0.68	0.95	0.57	0.87
2. Poor appetite	0.58	0.95	0.34	0.88
3. Blues	0.78	0.95	0.58	0.87
4. Just as good ^a	0.59	0.95	0.44	0.88
5. Hard to concentrate	0.67	0.95	0.45	0.88
6. Depressed	0.83	0.95	0.65	0.87
7. Everything an effort	0.74	0.95	0.53	0.87
8. Hopeful ^a	0.59	0.95	0.40	0.88
9. Failure	0.76	0.95	0.64	0.87
10. Fearful	0.46	0.95	0.48	0.88
11. Restless	0.69	0.95	0.37	0.88
12. Happy ^a	0.74	0.95	0.51	0.87
13. Talked less	0.70	0.95	0.50	0.87
14. Lonely	0.76	0.95	0.60	0.87
15. People unfriendly	0.39	0.95	0.34	0.88
16. Life meaningful ^a	0.67	0.95	0.49	0.87
17. Crying spells	0.75	0.95	0.47	0.88
18. Sad	0.83	0.94	0.62	0.87
19. People disliked me	0.45	0.95	0.47	0.88
20. Couldn't get going	0.80	0.94	0.63	0.87
Cronbach's Alpha	0.95		0.88	
Cronbach's Alpha Based on Standardized Items	0.95		0.89	

^aScores reversed^bThis is the correlation of the item designated with the summated score for all other items.^cThis represents the scale's Cronbach's alpha reliability coefficient for internal consistency if the individual item is removed from the scale. This value can be compared to the Alpha coefficient value at the bottom of the table to see if one wants to delete the item.

Table 4

Zero-order correlations between group and the CES-D scores after controlling Demographic variables

Control Variables	Group ^a
Age, Gender, marriage status, Family Annual Income, Education Years	CES-D ^b $r=-0.24, P<0.001(2\text{-tailed}), df=1595$

^aSuicide Informants=0, Control Informants=1.^bSum of the CES-D scores

Table 5

Goodness-of-fit indexes for two groups Confirmatory Factor Analysis

Group	df	χ^2	RMSEA(90% CI)	CFI	NFI	GFI	AIC	CAIC
Suicide Informants	167	732.56	0.065(0.060–0.070)	0.95	0.93	0.92	420.00	1615.86
Control Informants	167	647.96	0.060(0.055–0.065)	0.92	0.89	0.93	420.00	1615.86

Note. RMSEA(95% CI)= root mean squared error of approximation (95% confidence interval); CFI=comparative fit index; NFI= normed fit index; GFI= goodness-of-fit index; AIC= Akaike's information criterion; CAIC= consistent Akaike's information criterion.