

# Test of Reliability and Validity of Impulsiveness Scale Among Married Chinese

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**Introduction:** The Brief Barratt Impulsiveness Scale (BBIS) can be used in large scale rapid assessments and improves data quality while reducing subject response burden. It has been verified to have good reliability and cross-cultural consistency in multiple countries. However, there are no tests of impulsivity for the Chinese married population.

**Aim:** To investigate the applicability of the BBIS among the Chinese married population.

**Methods:** The BBIS was administered to 664 married middle-aged adults (sample 1) for item analysis and exploratory factor analysis (EFA), and to 758 married middle-aged adults (sample 2) for confirmatory factor analysis (CFA). At the same time, the trait anger scale (TAS), the quality marriage index (QMI) and the emotion reactivity scale (ERS) are selected as the calibration standards to test the correlation validity of the calibration standards.

**Results:** BBIS includes 8 items, which are composed of two dimensions of poor self-control and behavioral impulsivity; the two dimensions explained 68.10% of the total variance. CFA demonstrated that the fit index of the two-factor structure of the scale was good ( $\chi^2/df=2.315$ , RMSEA=0.042, RFI=0.971, CFI=0.989, NFI=0.982, IFI=0.990). The internal consistency reliability of each dimension and total scores were 0.824, 0.826 and 0.787, respectively. Total BBIS scores were significantly positively correlated with trait anger and emotional reactivity, and showed a significant negative correlation with marital quality. The Chinese version of BBIS had measurement equivalence between men and women.

**Conclusion:** The BBIS has good reliability and validity in the Chinese married population, and the measurement results can be compared across groups between different genders, which can be used as a suitable tool for impulse related research.

**Keywords:** Brief Barratt Impulsiveness Scale, reliability, validity, Chinese

## Introduction

In the Confucian classic *Classic of Rites*, it is believed that a junzi (man of virtue) should “consider the end of his words and examine the end of his actions”. In other words, a junzi must be careful with his words and actions, consider the consequences and not make rash decisions on impulse. Impulsiveness is not only a specific way of behaving in a social situation, but also a stable personality trait.<sup>1</sup> The impulsive trait has been defined as a negative, irrational and destructive personality trait.<sup>2</sup> Specifically speaking, the concept of impulsivity includes three aspects: first, reduced sensitivity to negative consequences; second, rapid, unplanned responses to external stimuli before full access to information; and third, failure to consider long-term consequences.<sup>3</sup> Impulsive traits are consistent across contexts, and individuals with high impulsive traits often have difficulty managing and controlling their thinking and behavior.<sup>4</sup>

Impulsivity is usually closely associated with the onset of various psychological problems and behavioral disorders.<sup>5</sup> Previous studies have found that individuals with high impulsivity have higher rates of psychiatric disorders such as anxiety and depression.<sup>6</sup> Also, impulsivity is positively associated with problem behaviors such as low self-control,<sup>7</sup> addictive behaviors,<sup>8</sup> aggressive behaviors and self-injurious behaviors.<sup>9,10</sup> In addition, high impulsivity is also considered to be a predictor of various personality disorders, such as Borderline Personality Disorder (BPD),<sup>11</sup> Antisocial Personality Disorder (APD),<sup>12</sup> and Bipolar Affective Disorder (BAD).<sup>13</sup>

In order to measure impulsiveness, scholars have developed appropriate assessment tools based on different theoretical conceptions. The Barratt Impulsiveness Scale (BIS) was developed by Barratt based on the Hull/Spence learning theory.<sup>14</sup> In the first version of the scale, only the items related to “impulsiveness” were developed, without a more specific definition of the concept of impulsiveness. The first version of the scale has been continually developed, resulting in the BIS-11, the most widely used instrument for measuring impulsivity today. The BIS-11 consists of 30 items divided into three dimensions: Motor Impulsiveness, Attentional Impulsiveness and Nonplanning Impulsiveness.<sup>3</sup> In studies of Korean and Italian populations, BIS-11 was found to have good cross-cultural applicability and can be applied to different cultural contexts,<sup>15,16</sup> it may increase the response burden of the subjects and is not conducive to the development of large-scale rapid evaluation. The short version of the questionnaire can effectively solve the above problems without losing too much valid information. Based on this, scholars have attempted to revise a short version of the BIS-11. Spinella M developed a three-dimensional 15-item version and Steinberg L et al. developed a unidimensional 13-item version.<sup>17,18</sup> Morean et al. proposed an 8-item Brief Barratt Impulsiveness Scale (BBIS) including two dimensions of impulsive behavior and poor self-regulation based on fitting and validation of several structural models of impulsivity.<sup>19</sup> This version of indicators meet the psychometric requirements and the scale has been shown to have good cross-cultural consistency in studies in different cultural contexts, including Thailand and the USA.<sup>20,21</sup>

For the first time, Tao L et al. revised the BBIS in a population of Chinese college and middle school students. The results showed that the Chinese version of the BBIS included eight entries in two dimensions, which were consistent with the original version in terms of the number of entries and dimensional classification. The Cronbach's alpha coefficients for the total scale and the two subscales of poor self-control and impulsive behavior were 0.85, 0.88, and 0.80, respectively. And the retest reliability after two weeks was 0.87, 0.89, and 0.86, respectively, indicating that the scale has good internal consistency and stability. At the same time, the two-factor model of the scale had good fit indices and good structural validity. Therefore, the scale can be used as a short version of the instrument to assess the impulsiveness of Chinese young people and be applied in various types of surveys with large samples.<sup>22</sup>

Teenagers tend to be perceived as more impulsive, and research on impulsivity has focused on this population. However, impulsivity is prevalent across age groups, and impulsivity in adults can have a negative impact on their daily work and marital life. Impulsivity is positively correlated with emotional reactivity.<sup>23</sup> Adults with high impulsivity are not only emotionally sensitive, but also have high emotional ups and downs, and experience negative emotions such as anxiety and depression for longer periods.<sup>24,25</sup> In addition, highly impulsive individuals are prone to interpret external information as provocative, unfriendly, and hostile,<sup>26,27</sup> resulting in perceived angry emotions and even aggressive and destructive behaviors.<sup>28</sup> Impulsivity also has a negative impact on the marital quality of couples.<sup>29</sup> Individuals with high impulsivity have higher rates of addictive behaviors such as alcohol and substance abuse and are more likely to be violent toward their spouse or children,<sup>30,31</sup> which affects the couple's perception of marital quality.<sup>32</sup> In conclusion, impulsivity is strongly associated with emotional reactivity, anger, and marital quality in adults.

The BBIS has been found to have good applicability to adult population in the Western population in previous studies. However, there is a lack of tests of the applicability of the BBIS to married adult populations in China. Therefore, it is necessary to examine the psychometric properties of the BBIS in married adults in a Chinese context with the aim of providing a standardized measurement tool for the conduct of subsequent quantitative and intervention studies. In addition, impulsivity was positively correlated with emotional reaction and anger, and negatively correlated with marital quality,<sup>23,26,32</sup> therefore, this study used the Emotion Reactivity Scale (ERS), the Trait Anger Scale (TAS) and the Quality Marriage Index (QMI) as validated scales and tested the validity of the BBIS.

## Methods

### Participants

This study was conducted in two phases with questionnaires in 23 provinces in China, covering the eastern (Beijing, Zhejiang, Jiangsu, etc.), central (Shanxi, Anhui, Henan, etc.), western (Sichuan, Qinghai, Gansu, etc.), and northeastern (Heilongjiang, Jilin, Liaoning, etc.) regions of China. Firstly, an advertising recruitment process was adopted and a total

of 87 university students were recruited as surveyors. The investigators were systematically trained on the purpose, approach, process, and confidentiality principles of the survey.

Criteria for inclusion of subjects: 1) age  $\geq 35$  years. 2) duration of marriage  $\geq 5$  years. 3) Subjects had at least one marital experience and their current marital status included married, divorced, remarried or widowed. 4) Subjects voluntarily participated in the study, and signed an informed consent form.

The survey approach mainly includes two kinds: Firstly, the investigators conduct household surveys with the help of the local village committee or neighborhood committee staff when they participate in the summer social practice volunteer service activities organized by the school. Secondly, the snowballing approach survey method was adopted, in which relatives or friends who meet the inclusion criteria around them are first surveyed, and then they are invited to provide the names of some other people who meet the requirements. This was used as a cue to continuously expand the sample size. The surveys were all conducted using an online platform and were anonymous. A total of 1623 people were surveyed for the study and the data was invalid data were eliminated due to 201 people having too short a response time (less than 120 seconds) and selecting the same option. The final valid data was 1422, of which 664 were valid for the first stage (sample 1), which was used for item analysis and exploratory factor analysis. The valid data for the second stage was 758 for structural validity, internal consistency reliability, and cross-group consistency tests. The study protocol was approved by the Ethics Committee of Jilin International Studies University (project number: 202111001).

## Measures

### Sociodemographic Questionnaire

Participants completed a brief demographic questionnaire that included information regarding the information on the gender, age, date of birth, domicile, nationality, and residence of the participant.

### Brief Barratt Impulsiveness Scale (BBIS)

This study used the Chinese version of the simplified eight-item impulsivity scale proposed by Morean, which was translated and revised by Chinese scholars Tao L et al. in 2020. The Chinese version of the BBIS retained all eight items of the original version and set the same dimensions as the original version, namely impulsive behavior and poor self-regulation. The impulsive behavior items include “I act on the spur of the moment” and “I say things without thinking.” The poor self-regulation items include “I plan tasks carefully” and “I am self-controlled.” The BBIS is a 4-point Likert scale ranging from 1 “never” to 4 “always”. Questions 1, 4, 5, and 6 are reverse scoring questions. Higher scores indicate greater impulsivity.

### Trait Anger Scale (TAS)

The Chinese version of the TAS, revised by Spielberger in 1999, was used in this study. The scale consists of 10 items, including two dimensions: anger-temperament and anger-reaction. The temperamental trait anger items included “I am quick tempered” and “I am a hot headed person.” The reactive trait anger items included “When I get mad, I say nasty things” and “Furious When criticized in front of others.” The scale is scored on a 4-point scale from 1 = “almost never” and 4 = “almost always”, with higher scores indicating stronger anger in different traits of the individual. Spielberger et al. examined the reliability of this scale in different groups and the reliability was good.<sup>33</sup> The Cronbach’s alpha coefficient for this scale in this study was 0.938.

### Quality Marriage Index (QMI)

This study used the Chinese version of the QMI developed by Norton in 1983, which consists of 6 items, the first to the fifth of which are scored on a 7-point scale, including the items “My relationship with my partner is very stable” and “We have a good marriage ” ranging from 1 “strongly disagree” to 7 “strongly agree”. The sixth question is a 10-point scale, with 1 to 10 representing very unhappy to very happy. The higher the score on the scale, the higher the quality of the marriage.<sup>34</sup> In this study, the Cronbach’s alpha coefficient for this scale was 0.962.

### Emotion Reactivity Scale (ERS)

This study used the Chinese revised version of the ERS developed by Nock et al. in 2008, which has 21 items, including three dimensions: emotional intensity, emotional sensitivity and emotional persistence. Emotional intensity includes

“When I experience emotions, I feel them very strongly/intensely” and “I experience emotions very strongly” and “I experience emotions very strongly.” Emotional sensitivity includes “My feelings get hurt easily” and “I tend to get emotional very easily.” Emotional persistence includes “When something happens that upsets me, it’s all I can think about it for a long time” and “When I feel emotional, it’s hard for me.” The scale is scored on a scale from 0 = “not at all like me ” to 4 = “completely like me ”, with higher scores indicating greater emotional reactivity.<sup>35</sup> The Cronbach’s alpha coefficient for this scale in this study was 0.971.

## Statistical Analyses

The data were tested for descriptive statistics, independent samples *t*-test, question total correlation, exploratory factor analysis (EFA), convergent validity, discriminant validity and internal consistency analysis using SPSS 25.0. Confirmatory factor analysis (CFA), competing models, and cross-group consistency tests were performed using Amos 24.0.

## Results

### Sample Characteristics

The mean score of the BBIS was 15.24 (standard deviation = 4.39, min = 8, max = 28) among the 664 participants in Sample 1. Among the 758 participants in Sample 2, the mean score of the scale was 14.75 (standard deviation=4.178, min=8, max=28). The demographic characteristics of the two samples are detailed in Table 1.

**Table 1** Information on Demographic Characteristics of the Sample (N=664)

Variable	Sample 1 (N=664)	Sample 2 (N=758)	Total (N=1422)
<b>Sex</b>			
Man	368 (55.4%)	330 (43.5%)	698 (49.1%)
Woman	296 (44.6%)	428 (56.5%)	724 (50.9%)
<b>Age</b>			
Mean value (standard deviation)	46.10 (0.18)	45.75 (0.17)	45.90 (0.12)
<b>Marriage situation</b>			
Married	598 (90.1%)	677 (89.3%)	1275 (89.7%)
Divorced	35 (5.3%)	46 (6.1%)	81 (5.7%)
Remarried	19 (2.9%)	18 (2.3%)	37 (2.6%)
Widowed	12 (1.8%)	17 (2.2%)	29 (2.0%)
<b>Educational background</b>			
Primary school and below	90 (13.6%)	99 (13.1%)	189 (13.3%)
Junior high school	260 (39.2%)	269 (35.5%)	529 (37.2%)
High school, technical secondary school or technical school	158 (23.8%)	178 (23.8%)	336 (23.6%)
Junior college, night university or electricity university	80 (12.0%)	92 (12.1%)	172 (12.1%)
Bachelor degree or above	76 (11.5%)	120 (15.8%)	196 (13.8%)

## Item Analysis

For the impulsiveness scale, total scores were ranked from high to low, and the total scores were divided into two groups of high and low scores according to the upper and lower 27% criteria, and the differences between the scores of high and low groups on each item were examined using independent samples *t*-test. Critical Ratio (C.R.) Value of the items ranged from 15.32 to 26.88, with *p*-values <0.001, and the results are detailed in Table 2. The results showed that the differences were all statistically significant. Pearson correlation analysis was used to calculate the correlation between each item of the impulsiveness scale and the total score of the items, and the results showed that (see Table 2), the correlation coefficients between the eight items and the total score ranged from 0.582 to 0.690, all of which were greater than 0.4, and the *p*-value was <0.01, which was significant. After performing an internal consistency test on the impulsiveness scale, the results showed that the Cronbach's alpha coefficient for the total impulsivity scale was 0.795. We counted the change in the Cronbach's alpha coefficient if any item was removed. The results (see Table 2) showed that if any item of the scale was deleted, the reliability of the scale decreased. Therefore, in this item analysis, all eight items met the retention criteria and did not need to be deleted.

## Exploratory Factor Analysis

Sample 1 (N=664) was used for item analysis and EFA. The Kaiser–Meyer–Olkin (KMO) measure for the 8 items was 0.817, which was sufficient to indicate a strong relationship.  $\chi^2=2176.541$  and *df*=28 in Bartlett's test of sphericity, *p*<0.001, indicated that the data were suitable for exploratory factor analysis. Next, common factors were extracted from the questionnaire and analyzed using Principal component analysis and rotated with the maximum variance. Two factors with eigenvalues greater than 1 could be extracted from the impulsiveness scale. The eigenvalues of these two factors were 3.312 and 2.136, which explained 41.397% and 26.698% of the overall variance, respectively, and 68.095% of the total variance in aggregate, with a commonality greater than 0.5. The factor loadings of each item ranged from 0.786 to 0.862, and the specific factor loadings and commonality are shown in Table 3. The results of EFA showed that the impulsiveness scale consisted of 8 items with 2 dimensions, and the scale dimensions and the attribution of each item were consistent with the original scale. Referring to Morean's naming of the questionnaire dimensions, Factor 1 was named impulsive behavior and factor 2 was poor self-regulation.

## Construct Validity

### Confirmatory Factor Analysis

CFA was conducted using AMOS 24.0 software to test the data model for sample 2 (N=758) to validate the two-factor structure in sample 1. The results showed that the model had  $\chi^2/df$  less than 3, RFI, CFI, NFI, and IFI greater than 0.90,

**Table 2** Correlation Coefficients Between Items and Total Score (N=664)

Item	High Group (N=179, M±SD)	Low Group (N=179, M±SD)	C.R. Value	Correlation Coefficients (N=664)	$\alpha$ if Deleted
1	2.46±0.80	1.08±0.35	21.18***	0.653**	0.769
2	2.57±0.78	1.20±0.50	19.91***	0.643**	0.773
3	2.55±0.77	1.34±0.58	16.78***	0.615**	0.777
4	2.46±0.78	1.10±0.40	20.81***	0.614**	0.777
5	2.51±0.78	1.10±0.35	21.96***	0.666**	0.766
6	2.73±0.71	1.12±0.37	26.88***	0.690**	0.763
7	2.59±0.76	1.17±0.42	21.85***	0.667**	0.767
8	2.58±0.83	1.40±0.62	15.32***	0.582**	0.785

**Notes:** \*\**p*<0.01, \*\*\**p*<0.001.

**Abbreviations:** C.R. Value, critical ratio value.

**Table 3** Factor Loadings of the BBIS (N=664)

Item	Impulsive Behavior	Poor Self-Regulation	Common Degree
Item 2	<b>0.817</b>	0.096	0.676
Item 3	<b>0.791</b>	0.080	0.632
Item 7	<b>0.811</b>	0.143	0.677
Item 8	<b>0.786</b>	0.025	0.618
Item 1	0.107	<b>0.821</b>	0.678
Item 4	0.036	<b>0.823</b>	0.678
Item 5	0.081	<b>0.862</b>	0.750
Item 6	0.131	<b>0.845</b>	0.732

**Notes:** The bold text marks the dimension to which this item belongs and the factor loadings for this item.

**Abbreviations:** BBIS, Brief Barratt impulsiveness Scale.

RMSEA less than 0.08, and PNFI and PCFI greater than 0.50. This indicated that the two-factor model was well fitted. This model serves as a model 2.

To examine whether the two-factor model is optimal, the possible competition models are compared in this study. In previous studies of the BIS Steinberg argued that impulsivity could be considered as a one-factor structure,<sup>18</sup> so we combined all items to form Model 1 (8 items with only one dimension of impulsivity). The items of BBIS came from three dimensions of BIS-11 respectively, among which items 1, 4, 6 and 7 belonged to nonplanning impulsiveness, and items 5 and 3 came from attentional impulsiveness, items 2 and 8 came from the dimension of motor impulsiveness, according to which a three-factor model, Model 3, was proposed. The results showed that the fit indices of the 2-factor structural model were better than the other two models, and the specific fit parameters are shown in Table 4.

### Criteria Validity Analysis

The TAS, the QMI and the ERS were selected as the calibrated correlational validity of the impulsiveness scale, and the scales were tested for the Criteria-related validity. The results showed (see Table 5) that all correlations were significant at the  $p < 0.01$  level. However, the strength of the correlations varied across scales, with the total impulsivity scale score as well as each dimension showing significant positive correlations with trait anger, emotional reactivity, and significant negative correlations with marital quality.

### Convergent and Discriminant Validity

The Average Variance Extracted (AVE) of each factor was greater than 0.5 and the combined reliability (CR) was greater than 0.7 as the criteria for assessing good convergent validity.<sup>36</sup> The results showed that the AVE of each factor was 0.65 and the CR was 0.88, which indicated that the scale had good convergent validity. If the square roots of AVE corresponding to each factor separately are greater than the correlation coefficients between the factors and other factors, then the discriminant validity is good. The correlation coefficient between AVE square root value and factor is detailed in Table 5. The result shows that the scale has good discrimination validity.

### Reliability Analysis

To assess the internal consistency of the impulsiveness scale, we calculated the reliability of each subscale and the results showed that the Cronbach's  $\alpha$  coefficient was 0.787 for the total impulsivity scale, 0.824 for the poor self-regulation subscale, and 0.826 for the impulsive behavior subscale. It indicates that the internal consistency reliability of the impulsivity scale is high.



**Table 4** CFA Fit Statistics for Competing Models (N=758)

	$\chi^2$	df	$\chi^2/df$	RFI	CFI	NFI	IFI	RMSEA	PNFI	PCFI
Model 1	403.511	18	22.417	0.724	0.828	0.823	0.829	0.168	0.529	0.533
Model 2	41.676	18	2.315	0.971	0.989	0.982	0.990	0.042	0.631	0.636
Model 3	395.029	15	26.335	0.676	0.901	0.826	0.832	0.183	0.443	0.445

**Notes:** Model 1 represents the single-factor model, Model 2 represents the two-factor model, and Model 3 represents the three-factor model.

**Abbreviations:** CFA, confirmatory factor analysis;  $\chi^2$ , chi square; df, degrees of freedom; RFI, relative fit index; CFI, comparative fit index; NFI, normed fit index; IFI, incremental fit index; RMSEA, root mean square error of approximation; PNFI, parsimony normed fit index; PCFI, parsimony comparative fit index.

**Table 5** Correlations of BBIS and Three Subscales (N=758)

	Square Roots of AVE	1	2	3	4	5	6
(1) Impulsiveness		-					
(2) Poor Self-Regulation	0.80	0.740**	-				
(3) Impulsive Behavior	0.81	0.824**	0.228**	-			
(4) Trait Anger		0.338**	0.198**	0.394**	-		
(5) Marital Quality		-0.194**	-0.236**	-0.083*	-0.263**	-	
(6) Emotional responsiveness		0.417**	0.240**	0.402**	0.659**	-0.262**	-
Mean		14.75	6.38	8.37	17.94	37.41	16.73
Standard deviation		4.178	2.431	2.888	5.335	8.260	16.358
Range		8–27	4–16	4–16	10–40	6–45	0–84

**Notes:** \* $p < 0.05$ , \*\* $p < 0.01$ .

**Abbreviations:** BBIS, Brief Barratt Impulsiveness Scale; AVE, average variance extracted.

## Testing for Measurement Invariance Across Gender

Invariance across gender test was conducted for the impulsiveness scale using Sample 2. In the first step, the configural invariance model (M1) for the cross-gender measurement equivalence of the impulsiveness scale was constructed, and each of the obtained fit indices met the requirements, indicating that the invariance of the cross-gender structure of the impulsiveness scale holds. In the second step, under the premise that model M1 holds, the weak invariance model (M2) is constructed by setting the factor loadings equal across gender samples, and comparing the model fit indices of M2 and M1, the resulting  $\Delta CFI$  and  $\Delta RMSEA$  are both less than 0.01, indicating that the weak equivalence model holds, ie, the factor loadings of the impulsiveness scale are equal across gender samples. In the third step, under the condition that model M2 holds, the intercept of the corresponding observed variables is set equal between the cross-sex samples to build a strong invariance model (M3), and the model fit indices of M3 and M2 are compared, and it is concluded that both  $\Delta CFI$  and  $\Delta RMSEA$  are less than 0.01, indicating that the strong equivalence model holds. In the fourth step, on the basis of model M3, the errors of the observed variables were set equal between the cross-sex samples to build the strict invariance model (M4), and comparing the model fit indices of M4 and M3, it was found that both  $\Delta CFI$  and  $\Delta RMSEA$  were less than 0.01, which confirmed that the strict equivalence model was valid. The NFI values of the four models showed a decreasing trend, while the CFI, TLI, RMSEA and SRMR values of each model met the psychometric criteria, indicating that the impulsiveness scale has cross-gender measurement equivalence. Detailed results are presented in Table 6.

**Table 6** Measurement Invariance Across Gender of the BBIS (N=758)

Model	S-B $\chi^2$	df	TLI	CFI	NFI	RMSEA (90%CI)	SRMR	$\Delta$ CFI	$\Delta$ RMSEA
M1	72.529	42	0.982	0.986	0.969	0.031 (0.018–0.043)	0.330		
M2	79.823	50	0.985	0.987	0.965	0.028 (0.016–0.039)	0.331	0.001	0.003
M3	80.529	53	0.987	0.988	0.965	0.026 (0.013–0.037)	0.343	0.001	0.002
M4	99.230	60	0.984	0.983	0.957	0.029 (0.019–0.039)	0.358	0.005	0.003

**Notes:** M1 represents the configural invariance model; M2 represents the weak invariance model; M3 represents the strong invariance model; M4 represents the strict invariance model.

**Abbreviations:** BBIS, Brief Barratt Impulsiveness Scale; df, degrees of freedom; TLI, Tucker-Lewis index; CFI, comparative fit index; NFI, normed fit index; CI, confidence interval; RMSEA, root mean square error of approximation; SRMR, standardized root mean square residual.

## Discussion

Impulsivity undermines family harmony and the harm it causes can affect every member of the family.<sup>37</sup> This study examined the applicability of the BBIS to a population of married adults in China. The results indicate that the BBIS has good reliability and validity and can provide a rapid and accurate assessment in a large-scale test, providing a standardized measurement tool for follow-up studies.

The results of the item analysis in this study showed that the items on the BBIS had good discriminatory power. All item scores were significantly correlated with total scale scores, with correlation coefficients ranging from 0.582 to 0.690, with a high degree of homogeneity. The study also examined the reliability of the BBIS in the married population and found internal consistency between 0.795 and 0.863 for impulsive behavior and poor self-control, as well as for the total BBIS score. The reliability was reduced by deleting any items, so we retained all eight items. The factor structure of the BBIS was examined through EFA and CFA, and two factors, impulsive behavior and poor self-regulation, were extracted. The two-factor structure met the criteria for taking values on the model fit index and satisfied the principles of model identification, which is consistent with the structural delineation of the BBIS by Morean et al. for indicating that the scale has good structural validity. The two-factor model was constructed and the two competing models (one-factor and three-factor) were compared using structural equation software and the results indicated that the two-factor model provided the best fit.

In previous studies, impulsivity was found to be significantly positively correlated with emotional reactivity and trait anger,<sup>23,26</sup> and significantly negatively correlated with marital quality.<sup>32</sup> The results of the present study are consistent with the results of previous studies, which proves that BBIS scale has good criterion-related validity. In the test of equivalence, the configural invariance model, weak invariance model, strong invariance model, strict invariance model of the BBIS measure all held true, indicating that the equivalence of the measure across gender was fully valid. In summary, the psychometric characteristics of the BBIS in this study are satisfactory, demonstrating that the scale has good reliability and validity in the context of the Chinese married population, and that cross-gender measurement equivalence holds and can be applied to measure impulsivity in the married population for cross-group comparisons across genders.

## Conclusion

Exploring the psychological structure of impulsivity in Chinese adults has certain theoretical and practical implications for subsequent research. First, this study enriches the study of impulsivity as a personality trait by validating the two-factor structure of impulsive behavior and poor self-regulation, and more comprehensively examining the level of impulsivity in individuals. In addition, the two-factor structure was shown to be a better predictor of impulsivity in this population than the one-factor and three-factor structures, providing a new empirical basis for the dimensional classification of impulsivity. Secondly, the scale was tested using psychometric methods, demonstrating that the BBIS has good applicability in the Chinese married adult population, and that the scale can be used for cross-group comparisons across genders, extending the applicability of the BBIS in the Chinese context. Finally, the BBIS can be used in large-scale tests to reduce the response burden and provide rapid and accurate assessments due to its concise number of



questions. It provides a scientifically valid measurement tool for subsequent research and lays the foundation for subsequent empirical studies on impulsivity.

Although this study suggests that the BBIS has good psychometric properties and can be used as a tool to assess impulsivity in the Chinese married population, there are some limitations to the study. For example, only married people were surveyed in this study, but the applicability of the scale to the elderly and children will need to be supported by data from future studies. In addition, impulsivity is a complex concept and there is no consensus on the classification of impulsivity dimensions, and more testing is needed to determine whether a two-factor impulsivity scale is the optimal solution.

## Ethical Approval

The study protocol was approved by the Ethics Committee of Jilin International Studies University (project number: 202111001). All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Written informed consent was obtained from all individual participants included in the study.

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## Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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## Disclosure

The authors report no conflicts of interest in this work.

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