

The Development, Validity and Reliability of the Willingness of Prosocial Behavior Scale for Community-Dwelling Older Adults Using Classical Testing Theory

Wanhong Xiong, Ya Lu, Dan Wang, Xinyi Liu, Xi Yao, Jing He, Suting Song, Renhui Wen, Yu Luo

School of Nursing, Army Medical University/Third Military University, Chongqing, People's Republic of China

Correspondence: Yu Luo, School of Nursing, Army Medical University/Third Military University, Chongqing, People's Republic of China, Email luoyuhgl@tmmu.edu.cn

Purpose: Prosocial behavior, as an important social activity, plays a significant role in promoting the physical and mental health of older people. However, the existing measurement tools for prosocial behavior have primarily been developed for and applied to younger populations. There are no specific tools available to fully capture the nuances of prosocial behavior in older adults. Therefore, this study aimed to develop the Willingness of Prosocial Behavior Scale for community-dwelling older adults and to evaluate its psychometric properties.

Patients and methods: Qualitative research, a two-round modified Delphi method, and cognitive interviews were utilized to build the scale items in stage 1, and the reliability and validity were tested using Classical Test Theory in stage 2. Community-dwelling older adults aged ≥ 60 years were selected to participate in interviews or face-to-face surveys.

Results: The final scale included 14 items with four subdimensions: collectivity, relationship, tendency and altruism. The structural equation modeling (SEM) revealed a good model fit: $\chi^2/DF = 1.642$, GFI = 0.939, NFI = 0.902, IFI = 0.959, TLI = 0.947, CFI = 0.959, and RMSEA = 0.051. The overall Cronbach's α , split-half reliability, and ICC were 0.866, 0.803, and 0.954, respectively.

Conclusion: The Willingness of Prosocial Behavior Scale exhibited good reliability and validity, and its development took into full account the collectivist cultural context, prosocial behavioral characteristics, and cognitive abilities of older adults. Future studies should focus on its application and additional testing by large-scale research with diversity types of older people.

Keywords: prosocial behavior, willingness, validation, reliability, older adults

Introduction

Prosocial behavior is defined as voluntary actions intended to benefit others, including helping, donating, volunteering, charitable giving, or sharing,¹ and it plays a crucial role in fostering social cohesion, mental health and well-being. Previous studies have found that the more social connections, the greater the willingness to help others,² and that prosocial behavior has a significant positive effect on social support.³ It was noteworthy that the prosocial behavior could not only significantly decrease individuals' anxiety and depression symptoms,⁴ but also increase peoples' life satisfaction, self-efficacy, and positive emotion.⁵ Moreover, more frequent prosocial behavior is close association with higher happiness and subjective well-being. Hui⁶ revealed a reciprocal model between prosocial behavior and well-being, in which they had significant bidirectional effects, and well-being played a mediating role in the past and future prosocial behavior. Cuesta-Valiño⁷ reported that overall satisfaction significantly and positively affected on happiness, which further influenced on prosocial behavior.

Notably, current studies are also increasingly focusing on the prosocial behavior of older people. Zak⁸ revealed that the age had a significant positive association with charitable donation behaviors (eg, money donation, goods donation,

time donation), and specifically, compared to young people, donation behavior was twice as high among middle-aged adults and 168% higher among older adults. Socioemotional selectivity theory⁹ found that with the age increasing, older people perceived the limitation of time, increasingly prioritized pursuing socioemotional goals and self-transcendence, focused on enhancing social relationship and interpersonal connection, and exhibited more prosocial behavior to others. However, Byrne¹⁰ found that older adults' prosocial behavior was also influenced by effort costs; when the required effort cost was high but the perceived reward was low, their willingness to engage in prosocial activities would decrease. Similarly, older adults' prosocial activities also had a significant positive association with social well-being and a negative association with mental problems, such as depressive symptoms.¹¹ Corrêa JC¹² revealed that the greater the altruistic behaviour among community-dwelling older adults, the greater cognitive function, although this effect was not observed for time donation.

In addition, existing measurement tools of prosocial behavior were primarily developed and validated for young population. Prosocial Tendencies Measure (PTM), comprising 26 items, was compiled by Carlo¹³ to assess adolescents' prosocial behavior in six different situations: emotionality, altruism, compliance, openness, anonymity and urgency. It has been translated into Spanish, Chinese, and Portuguese versions, and widely applied in adolescents and young adults, providing insights into the age-related difference of prosocial tendencies. Similarly, Zheng¹⁴ developed the Internet Altruistic Behavior Scale (IABS), a 26-items scale with five subdimensions: online support, online guidance, online sharing and online reminder. Meanwhile, they found that the altruistic motivation among college students was significantly positively associated with internet altruistic behavior, and empathy and self-esteem mediated this relationship.¹⁵ Moreover, the Prosocial Behavior Scale (PBS) was developed by Caprara,¹⁶ and 10 of 15 items were to measure altruism, trust, and agreeable behaviors in children. Martinez-Gregorio¹⁷ evaluated the psychometric properties of the PBS in Spanish sample and confirmed its good validity and reliability. Japanese scholars¹⁸ developed the Self-Report Altruism Scale Distinguished by the Recipient (SRAS- DR) to measure the daily altruistic behaviors among undergraduate students. This 21-item scale comprised three subdimensions: kin altruism (toward family members), reciprocal altruism (toward friends), and pure altruism (toward strangers), and this scale was later translated into the Chinese by Feng.¹⁹ Additionally, the Altruistic Behavior Questionnaire (ABQ)²⁰ also was developed to measure the prosocial behavior in college students; the five items from Wrightsman's (1964) Philosophy of Human Nature Altruism Scale²¹ was used to assess the older adults' altruistic attitude; and the Prosocialness Scale for Adults (PSA)²² was developed to measure Italian adults' prosocial behavior and behavioral perceptions.

However, the above measurement tools are not fully suitable for measuring prosocial behavior among older adults, particularly those from diverse cultural context. Firstly, some instruments (eg, PTM) overemphasized formal prosocial behaviors like donation and volunteering while neglecting informal prosocial behaviors in daily life, which potentially resulting in underestimating the prosociality in older populations. Secondly, several scales (eg, IABS, PBS, ABQ) were developed for and applied to children or students, and with their usage scenarios being in campus setting, they mainly focused on peer and student-teacher relationships. Thirdly, few scales (eg, PSA, SRAS- DR) adequately considered the influence of varying cultural contexts on individual's prosocial behaviors. Finally, some scales (eg, PTM, SRAS- DR) employed numerous rhetorical questions expression and an excessive number of items, which might be less suitable for older adults. In conclusion, it was necessary to develop a measurement tool based on older people's social networks, cultural backgrounds, prosocial behavior characteristics, and cognitive levels. Therefore, this study was designed to develop the Willingness of Prosocial Behavior Scale (WPBS) for community-dwelling older people by considering culture contexts and using Classical Test Theory (CTT), and to evaluate its psychometric properties. The development of this scale will provide valuable insights to support prosocial engagement and improve the well-being of older adults.

Methods

This study consisted of two stages: 1) developing the Willingness of Prosocial Behavior Scale (WPBS), and 2) testing its reliability and validity using Classical Test Theory (CTT).²³

Stage 1: Development of the WPBS

The WPBS was developed in three steps: First, based on the literature review and the findings of qualitative research, the initial items pool of the WPBS was identified and developed by the research team. Second, a two-round Delphi study²⁴ was conducted to gather and integrate experts' opinions to reach consensus. Third, the cognitive interviews were used to identify problematic items and to enhance the clarity and applicability of the WPBS.²⁵

In the first step, a descriptive qualitative research with semistructured, in-depth, in-person interviews was conducted from July to September 2024 in Southwest China. A purposive sampling method was utilized to select 20 community-dwelling older adults to participate in the interviews. The interview materials were transcribed verbatim into documents within 24 hours, and the content analysis method was employed to extract themes and subthemes. The items pool was derived from the findings of qualitative research and discussed by a focus group.

In the second step, a two-round modified Delphi study²⁴ was conducted from October to December 2024. Eighteen experts in geriatric nursing, community nursing, psychological nursing, and social psychology were invited to rate the importance of the scale's dimensions and items using a 5-point Likert scale (1 = very unimportant, 5 = very important). The results showed that the coefficient of expert authority (Cr) of each item exceeded 0.70, and coefficient of variation (CV) was below 0.25, indicating a high level of expert authority and consensus. The scale's items and dimensions were then revised based on experts' suggestions, comments, and group discussions.

In the third step, the cognitive interviews with twenty-one community-dwelling older people (aged 60–85 years) across three rounds were conducted to refine the scale based on their feedback.²⁵ This resulted in the development of the initial WPBS (shown in [Supplementary Appendix 1](#)), including 22 items within five subdimensions: personal trait, kin altruism, relationship, altruism, and collectivity.

Stage 2: Reliability and Validity

Study Design

The cross-sectional study was conducted from January to March 2025 in three communities of Chongqing, China. The community-dwelling older adults were selected via convenience sampling method. Ethics approval was obtained from by the Medical Ethics Committee of Army Medical University in Chongqing, China (Grant number: 20243802), and the informed consent process (verbal or written) was acceptable and approved by the Medical Ethics Committee of Army Medical University in Chongqing. All study procedures complied with the Declaration of Helsinki.

Participants

Community-dwelling older adults were recruited to conduct the face-to-face surveys. The inclusion criteria for participants were as follows: (i) aged ≥ 60 years old, (ii) resided in the main urban area of Chongqing, China, for at least 3 months, (iii) had adequate cognitive and communication ability, and (iv) voluntarily participated in this study and signed informed consent. The exclusion criteria were as follows: (i) diagnosed psychological distress; (ii) a severe or acute physical illness; (iii) visual and/or hearing impairment; or (iv) withdrew from the study due to personal reasons.

Instruments

Sociodemographic Form

A sociodemographic form was used to collect the sociodemographic information from community-dwelling older adults, including age, gender, characteristic, marital status, education level, living condition, job before retirement, current working status, average monthly income per person, self-rated physical health status, and number of chronic diseases.

The Willingness of Prosocial Behavior Scale (WPBS)

Developed in stage 1 by our research team, the WPBS contains 22 items (shown as [Supplementary Appendix 1](#)) with five subdimensions: personal trait, kin altruism, relationship, altruism, and collectivity. All items are rated based on a five-point Likert scale (1 = strongly disagree, 5 = strongly agree), the higher the score indicating higher the willingness to conduct prosocial behavior.

The Self-Reported Altruism Scale Distinguished by the Recipient (SRAS-DR)

The Chinese version of Self-Reported Altruism Scale Distinguished by the Recipient (SRAS-DR) was translated by Feng,¹⁹ which was developed in 2013 by Japanese scholar.¹⁸ The Chinese version of SRAS-DR contains 21 items with 3 subdimensions: kin altruism (toward family members), reciprocal altruism (toward friends), and pure altruism (toward strangers). All items are rated based on a five-point Likert scale from 1 (strongly disagree) to 5 (strongly agree), with higher the score indicating higher levels of prosocial behavior. In this study, the SRAS-DR exhibited good internal consistency, with a Cronbach's alpha of 0.886 and split-half reliability of 0.869.

Data Collection

The data collection was conducted in three communities of Chongqing, China from January to March 2025. Prior to the study, the researchers received standardized training, and they contacted the managers of the community health service center to explain the study's purpose and procedures. After obtaining the managers' informed consent (verbal or written), the recruitment posters were posted to invite community-dwelling older adults to participate in this survey. Prior to the survey, researchers explained the study details to sufficient participants. After providing the informed consent (verbal or written), participants received paper questionnaires to complete them. In addition, the researcher would check the completeness of each questionnaire, and if necessary, they would explain the meaning of each item and assist participants in completing the questionnaires.

Data Analysis

Data were checked and entered carefully by two researchers, and analyzed using SPSS 26.0 software (SPSS, Inc., Chicago, IL). Continuous variables are represented as mean \pm standard deviation ($\bar{X} \pm s$), and categorical variables as frequency and percentage (%). Item screening was performed based on Classical Test Theory (CTT),²³ and item analysis was conducted by Pearson's correlation analysis, item discrimination test, and item-total correlation. Pearson's correlation analysis was used to evaluate the associations between the WPBS and its items, and the items will be removed when its correlation coefficient (r) was below 0.40, indicating the low representative.²⁶ The critical ration (CR)²⁷ was calculate by the T -test of two independent samples between scores high-27-percent group and low-27-percent group, and when the CR was greater than 3.50, the item was retained. Moreover, the corrected item-total correlation (CITC) was used to screen items and if the CITC value was less than 0.30, the item also was deleted.

Construct validity was assessed using exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). When the Kaiser-Meyer-Olkin (KMO) greater than 0.70 and the p value of Bartlett tests was less than 0.05, the data could be further conducted exploratory factor analysis (EFA) through Principal Component Analysis (PCA) with oblique rotation. Items exhibiting cross-loadings on multiple factors or with factor loading below 0.40 would be removed.

Subsequently, CFA was conducted using structural equation modeling (SEM) in AMOS 21.0,²⁸ with employing maximum likelihood estimation. The model was measured by the fit indexes:²⁹ a chi-square to degree of freedom ratio (χ^2/DF) < 3: 1, goodness of fit index (GFI) > 0.90, normed fit index (NFI) > 0.90, incremental fit index (IFI) > 0.90, comparative fit index (CFI) > 0.90, Tucker-Lewis index (TLI) > 0.90, and root mean square error of approximation (RMSEA) < 0.08. Convergent validity was examined by the average variance extracted (AVE) and combined reliability (CR), and AVE greater than 0.50 and/or CR greater 0.70 indicated the acceptable convergent validity.²⁸ Finally, the criterion-related validity was tested by examining the correlation between the WPBS and the SRAS-DR.

In addition, internal consistency of the WPBS was assessed using split-half reliability and Cronbach's alpha (α), and their values greater than 0.90, between 0.80 to 0.90, and between 0.70 to 0.80, indicated excellent, good, and acceptable internal consistency, respectively.³⁰ Moreover, the test-retest reliability was evaluated using the intraclass correlation coefficient (ICC), with the value between 0.75 to 0.90 as good and greater than 0.90 as excellent.³¹

Results

Sociodemographic Characteristics

As shown in Table 1, this study enrolled a total of 496 community-dwelling older adults from three communities of Chongqing in China: Freedom village community, Shuangbie Village community and Qinju Village community. The

Table 1 Sociodemographic Characteristics of Community-Dwelling Older Adults (n=496)

| Characteristics | | Sample 1 (n=253) | | Sample 2 (n=243) | |
|-------------------------------------|---------------------------------------|-------------------|--------|-------------------|--------|
| | | n | % | n | % |
| Years ($\bar{X}\pm s$) | | 68.87 \pm 7.815 | | 68.80 \pm 7.680 | |
| Gender | Male | 140 | 55.34% | 77 | 31.69% |
| | Female | 113 | 44.66% | 166 | 68.31% |
| Personality characteristics | Introverted personality | 135 | 53.36% | 84 | 34.57% |
| | Extroverted personality | 118 | 46.64% | 159 | 65.43% |
| Marital status | Married | 215 | 84.98% | 181 | 74.49% |
| | Divorced | 12 | 4.74% | 14 | 5.76% |
| | Widowed | 18 | 7.11% | 44 | 18.11% |
| Living condition | Others | 8 | 3.16% | 4 | 1.65% |
| | Living alone | 45 | 17.79% | 37 | 15.23% |
| | Living with spouse | 115 | 45.45% | 108 | 44.44% |
| | Living with offspring | 38 | 15.02% | 50 | 20.58% |
| Education level | Living with both spouse and offspring | 55 | 21.74% | 48 | 19.75% |
| | Illiteracy | 34 | 13.44% | 7 | 2.88% |
| | Primary school degree | 111 | 43.87% | 50 | 20.58% |
| | Middle school degree | 67 | 26.48% | 79 | 32.51% |
| | High school degree | 25 | 9.88% | 84 | 34.57% |
| Pre-retirement occupation | Associate degree and over | 16 | 6.32% | 23 | 9.47% |
| | Worker | 59 | 23.32% | 143 | 58.85% |
| | Farmer | 121 | 47.83% | 37 | 15.23% |
| | Unit employee | 26 | 10.28% | 31 | 12.76% |
| | Self-employed household | 19 | 7.51% | 9 | 3.70% |
| | No job | 20 | 7.91% | 19 | 7.82% |
| Current working status | Others | 8 | 3.16% | 4 | 1.65% |
| | Retirement | 205 | 81.03% | 230 | 94.65% |
| | Re-employment after retirement | 14 | 5.53% | 11 | 4.53% |
| | Others | 34 | 13.44% | 2 | 0.82% |
| Monthly income/ per people (CNY, ¥) | <1000 | 65 | 25.69% | 7 | 2.88% |
| | 1000-2999 | 97 | 38.34% | 54 | 22.22% |
| | 3000-4999 | 57 | 22.53% | 141 | 58.02% |
| | \geq 5000 | 34 | 13.44% | 41 | 16.87% |
| Physical health status | Good | 46 | 18.18% | 29 | 11.93% |
| | Better | 93 | 36.76% | 91 | 37.45% |
| | General | 80 | 31.62% | 83 | 34.16% |
| | Poor | 34 | 13.44% | 40 | 16.46% |
| Number of chronic diseases | 0 | 125 | 49.41% | 77 | 31.69% |
| | 1 | 89 | 35.18% | 103 | 42.39% |
| | 2 | 23 | 9.09% | 42 | 17.28% |
| | \geq 3 | 16 | 6.32% | 21 | 8.64% |
| Number of children | 0 | 1 | 0.40% | 2 | 0.82% |
| | 1 | 83 | 32.81% | 161 | 66.26% |
| | 2 | 93 | 36.76% | 53 | 21.81% |
| | \geq 3 | 76 | 30.04% | 27 | 11.11% |

average age was 68.83 ± 7.733 years. Sample 1 (n = 253), which included 113 (44.66%) females, was used to conduct item analysis and exploratory factor analysis (EFA). Sample 2 (n = 243), which included 166 (68.31%) females, was utilized to perform confirmatory factor analysis (CFA), criterion-related validity and reliability testing.

Item Analysis

Correlation Analysis

The correlation between all items and the WPBS were greater than 0.40 ($p < 0.001$), indicating in this process all items would be retained, as shown in Table 2.

Item Discrimination Test

The total score of the WPBS in sample 1 ranged from 22 to 110, and the 27th and 73rd percentile scores were 84 and 98, respectively. The participants with total scores of the WPBS below 84 were divided into low-score group, and those with 98 scores or above were divided into high-score group. The results of independent sample t - test showed that the critical ration (CR) values of each item were greater than 3.50 ($p < 0.001$, as shown in Table 3), indicating good discriminative power. Thus, no items were removed in this process.

Initial Reliability

The findings showed that only item 07 had a corrected item-total correlation (CITC) value of 0.460 was below 0.50, which needed further consideration for its deletion. Moreover, the Cronbach's α after deleting the item of every item was equal to or less than the Cronbach's α of the WPBS (0.940), which predicted its good internal consistency. Consequently, all item were retained in this process, as shown in Table 4.

Exploratory Factor Analysis (EFA)

The results showed that the KMO value was 0.937 and the p value of Barlett's test was less than 0.001, which demonstrated that the data were suitable for the exploratory factor analysis (EFA). Subsequently, the initial EFA showed

Table 2 Pearson's Correlation Between the WPBS and Its Items (r)

| Items | $\bar{X} \pm s$ | WPBS |
|---------|-----------------|---------|
| Item 01 | 4.10±0.783 | 0.670** |
| Item 02 | 4.27±0.724 | 0.658** |
| Item 03 | 4.16±0.719 | 0.627** |
| Item 04 | 4.14±0.704 | 0.711** |
| Item 05 | 4.14±0.724 | 0.722** |
| Item 06 | 3.95±0.851 | 0.746** |
| Item 07 | 4.10±0.870 | 0.520** |
| Item 08 | 3.98±0.949 | 0.628** |
| Item 09 | 4.23±0.764 | 0.655** |
| Item 10 | 4.24±0.678 | 0.730** |
| Item 11 | 4.41±0.627 | 0.624** |
| Item 12 | 4.38±0.636 | 0.624** |
| Item 13 | 4.21±0.691 | 0.731** |
| Item 14 | 4.27±0.605 | 0.703** |
| Item 15 | 3.79±0.926 | 0.599** |
| Item 16 | 4.33±0.648 | 0.732** |
| Item 17 | 4.11±0.726 | 0.714** |
| Item 18 | 4.34±0.606 | 0.672** |
| Item 19 | 3.82±0.899 | 0.673** |
| Item 20 | 3.86±0.992 | 0.742** |
| Item 21 | 3.76±1.027 | 0.699** |
| Item 22 | 4.37±0.627 | 0.648** |

Note: ** $p < 0.001$.

Abbreviation: WPBS, the Willingness of Prosocial Behavior Scale.

Table 3 Item Discrimination Test Between Low-Score and High-Score Group of the WPBS

| Items | High Scores Group (n = 65) | Low Scores Group (n = 65) | CR | p |
|---------|----------------------------|---------------------------|--------|--------|
| Item 01 | 4.86±0.390 | 3.55±0.830 | 11.497 | <0.001 |
| Item 02 | 4.83±0.378 | 3.68±0.812 | 10.385 | <0.001 |
| Item 03 | 4.77±0.493 | 3.69±0.789 | 9.333 | <0.001 |
| Item 04 | 4.80±0.440 | 3.60±0.806 | 10.532 | <0.001 |
| Item 05 | 4.80±0.403 | 3.55±0.811 | 11.097 | <0.001 |
| Item 06 | 4.72±0.451 | 3.17±0.858 | 12.922 | <0.001 |
| Item 07 | 4.65±0.738 | 3.62±0.860 | 7.331 | <0.001 |
| Item 08 | 4.68±0.533 | 3.35±0.891 | 10.268 | <0.001 |
| Item 09 | 4.80±0.440 | 3.65±0.926 | 9.074 | <0.001 |
| Item 10 | 4.77±0.425 | 3.58±0.610 | 12.856 | <0.001 |
| Item 11 | 4.86±0.348 | 3.94±0.704 | 9.472 | <0.001 |
| Item 12 | 4.74±0.443 | 3.88±0.673 | 8.619 | <0.001 |
| Item 13 | 4.80±0.403 | 3.57±0.684 | 12.499 | <0.001 |
| Item 14 | 4.80±0.403 | 3.89±0.534 | 10.938 | <0.001 |
| Item 15 | 4.54±0.867 | 3.20±0.733 | 9.501 | <0.001 |
| Item 16 | 4.85±0.364 | 3.77±0.580 | 12.682 | <0.001 |
| Item 17 | 4.74±0.477 | 3.48±0.664 | 12.442 | <0.001 |
| Item 18 | 4.74±0.443 | 3.91±0.655 | 8.472 | <0.001 |
| Item 19 | 4.60±0.607 | 3.05±0.717 | 13.338 | <0.001 |
| Item 20 | 4.71±0.522 | 2.75±0.919 | 14.903 | <0.001 |
| Item 21 | 4.65±0.598 | 2.66±0.815 | 15.826 | <0.001 |
| Item 22 | 4.86±0.348 | 3.94±0.704 | 9.472 | <0.001 |

Abbreviation: WPBS, the Willingness of Prosocial Behavior Scale.

Table 4 Corrected Item-Total Correlation (CITC) and Cronbach's α After Deleting the Item

| Items | The Scale Average After Deleting the Item | Scale Variance After Deleting the Item | CITC | Cronbach's α After Deleting the Item |
|---------|---|--|-------|---|
| Item 01 | 86.87 | 116.225 | 0.629 | 0.937 |
| Item 02 | 86.70 | 117.220 | 0.619 | 0.937 |
| Item 03 | 86.81 | 117.792 | 0.586 | 0.937 |
| Item 04 | 86.83 | 116.652 | 0.678 | 0.936 |
| Item 05 | 86.83 | 116.173 | 0.689 | 0.936 |
| Item 06 | 87.02 | 113.861 | 0.709 | 0.935 |
| Item 07 | 86.87 | 118.011 | 0.460 | 0.940 |
| Item 08 | 86.99 | 114.909 | 0.573 | 0.938 |
| Item 09 | 86.74 | 116.743 | 0.613 | 0.937 |
| Item 10 | 86.73 | 116.753 | 0.700 | 0.936 |
| Item 11 | 86.56 | 119.025 | 0.588 | 0.937 |
| Item 12 | 86.58 | 118.902 | 0.588 | 0.937 |
| Item 13 | 86.75 | 116.527 | 0.700 | 0.936 |
| Item 14 | 86.70 | 118.220 | 0.675 | 0.936 |
| Item 15 | 87.18 | 115.806 | 0.542 | 0.939 |
| Item 16 | 86.64 | 117.176 | 0.703 | 0.936 |
| Item 17 | 86.86 | 116.281 | 0.680 | 0.936 |
| Item 18 | 86.63 | 118.630 | 0.641 | 0.937 |
| Item 19 | 87.15 | 114.612 | 0.625 | 0.937 |
| Item 20 | 87.11 | 111.826 | 0.698 | 0.936 |
| Item 21 | 87.21 | 112.315 | 0.647 | 0.937 |
| Item 22 | 86.60 | 118.678 | 0.614 | 0.937 |

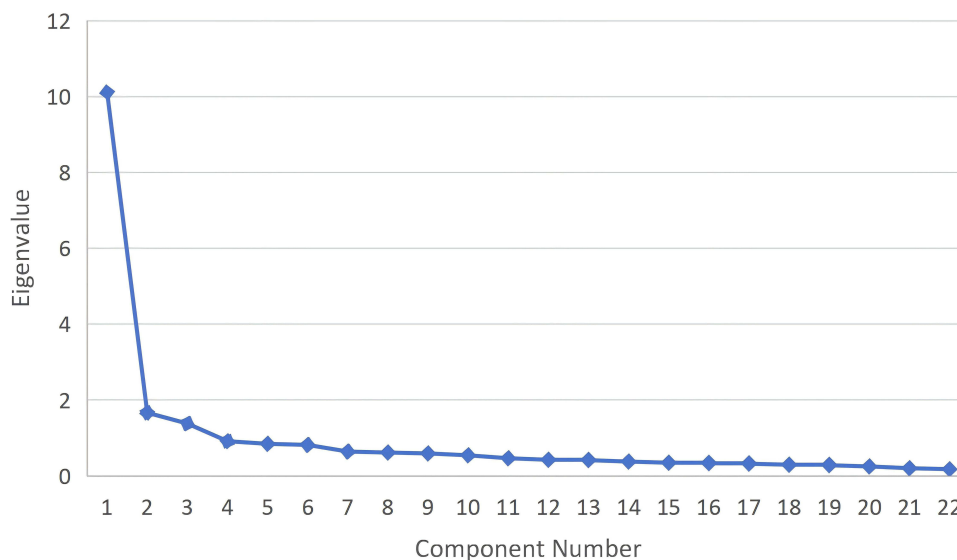


Figure 1 Scree Plot of EFA.

that there were three factors with the initial eigenvalue greater than 1.0, and the total variance interpretation was 59.792%, scree plot shown in [Figure 1](#). Additionally, after three items (item 6, item 8 and item 17) exhibiting cross-loaded on multiple factors were removed, the final EFA showed that the total variance interpretation was 61.33%, and the factor loading of each item was greater than 0.40, as shown in [Table 5](#).

By combining insights from existing literature and group discussion, the factors were defined as follows: factor 1 was divided into two dimensions: relationship (item 10, 12, 13, 14, and 16) and collectivity (item 11, 18, and 22), factor 2 was

Table 5 The Component Matrix After Rotation ^a

| Items | Factor 1 | Factor 2 | Factor 3 |
|---------|----------|----------|----------|
| Item 12 | 0.892 | | |
| Item 18 | 0.794 | | |
| Item 11 | 0.793 | | |
| Item 22 | 0.706 | | |
| Item 14 | 0.691 | | |
| Item 16 | 0.645 | | |
| Item 10 | 0.568 | | |
| Item 13 | 0.531 | | |
| Item 19 | | 0.789 | |
| Item 21 | | 0.783 | |
| Item 15 | | 0.745 | |
| Item 20 | | 0.699 | |
| Item 4 | | | 0.867 |
| Item 1 | | | 0.784 |
| Item 2 | | | 0.761 |
| Item 3 | | | 0.735 |
| Item 5 | | | 0.685 |
| Item 7 | | | 0.456 |
| Item 9 | | | 0.479 |

Notes: Extraction method: principal component analysis, Rotation method: Caesar's normalizing oblique crossover method, ^a rotation converges after 7 iterations.

named as tendency dimension (item 1, 2, 3, 4, 5, 7, and 9), and factor 3 was named as altruism dimension (item 15, 19, 20, and 21). Subsequently, confirmatory factor analysis (CFA) was conducted.

Confirmatory Factor Analysis (CFA)

The initial SEM showed that the five items (item 7, 9, 12, 15, and 16) had factor loadings below 0.50, and following in-depth discussion by the research team, these items were deleted. The modified SEM demonstrated a good model fit: $\chi^2/DF = 1.642$, GFI = 0.939, NFI = 0.902, IFI = 0.959, TLI = 0.947, CFI = 0.959, and RMSEA = 0.051. In the SEM (as shown in Figure 2), the factor loadings of all item were statistically significant ($p < 0.001$), ranging from 0.552 to 0.829. Moreover, significant positive correlations were found between the tendency and altruism ($r = 0.587$, $p < 0.001$), relationship ($r = 0.640$, $p < 0.001$), and collectivity ($r = 0.635$, $p < 0.001$), relationship ($r = 0.614$, $p < 0.001$), and collectivity ($r = 0.531$, $p < 0.001$), and the relationship was correlated with collectivity ($r = 0.616$, $p < 0.001$), and the relationship was correlated with collectivity ($r = 0.616$, $p < 0.001$). The final scale of WPBS was shown in [Supplementary Appendix 2](#).

In addition, the average variance extraction (AVE) values and combined reliability (CR) values of each dimension were as follows: relationship (AVE = 0.542, CR = 0.778), collectivity (AVE = 0.491, CR = 0.743), tendency (AVE = 0.451, CR = 0.804), and altruism (AVE = 0.455, CR = 0.711), which indicated acceptable convergent validity.

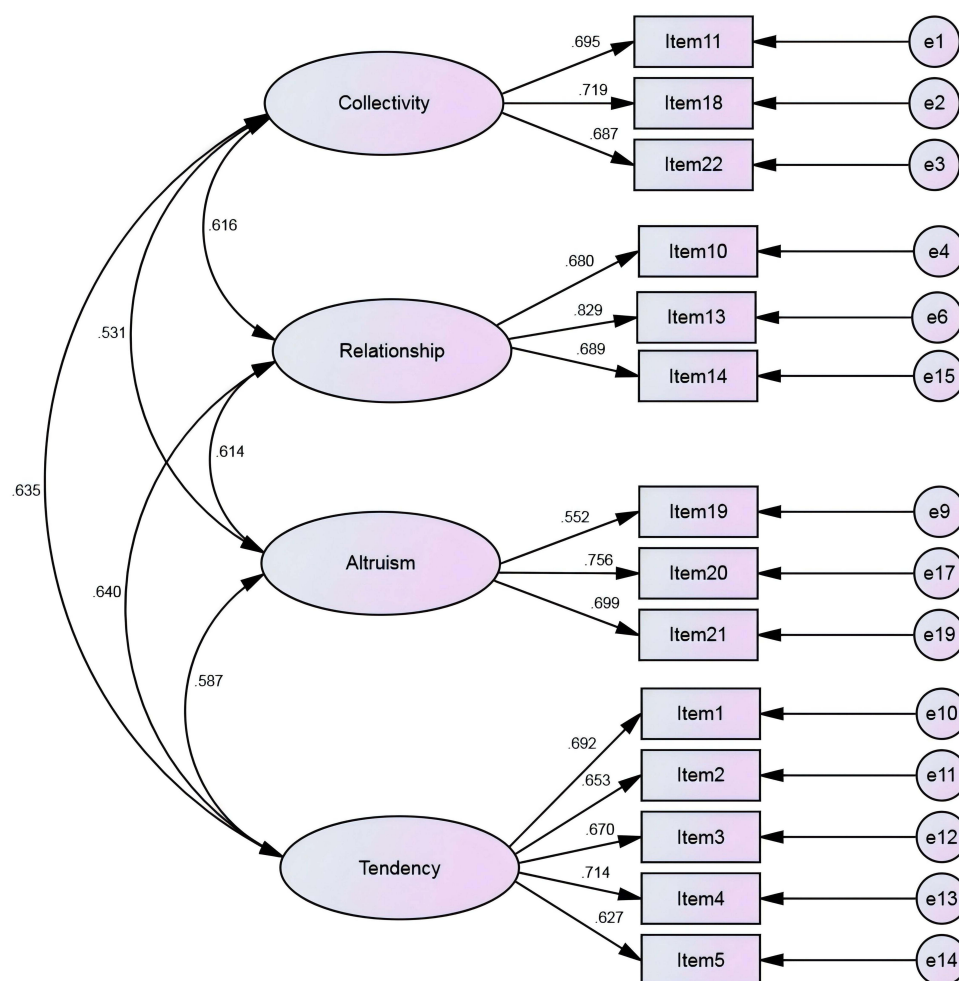


Figure 2 The structural equation model on the WPBS and its items.

Abbreviations: WPBS, the Willingness of Prosocial Behavior Scale; e1-e14, the measurement error of each observed variable to estimate latent variable.

Criterion-Related Validity

The correlation between the WPBS and the SRAS-DR was 0.618 ($p < 0.001$), and the WPBS showed a significant positive association with the SRAS-DR and its three dimensions, as shown in Table 6.

Reliability

Ultimate Internal Consistency

In Table 7, the overall Cronbach's α of the WPBS was 0.866, and its split-half reliability was 0.803, showing good internal consistency.

Test-Retest Reliability

Forty-four older adults completed the retest at a 4-week interval, and the overall intraclass correlation coefficient (ICC) value for the test-retest reliability was 0.954 (95% CI: 0.918–0.975, $p < 0.001$).

Discussion

In this study, we developed the Willingness of Prosocial Behavior Scale (WPBS) to measure the willingness of community-dwelling older adults to engage in prosocial behavior, and the final scale comprised four subdimensions and 14 items. Compared to the existing scale,^{13,14} the WPBS was designed with consideration for the older people's collectivist culture contexts and the decision-making processes of prosocial behavior, thereby facilitating a more comprehensive assessment and understanding prosocial behavior of older adults. The results of CFA found that the model with four factors had a good fit, and all items had satisfactory factor loadings and convergent validity. The Pearson's correlation analysis showed that the WPBS and its four subdimensions had significant positive associations with the SRAS-DR and its three subdimensions. Moreover, the results also showed good internal consistency and test-retest reliability, indicating the scale's excellent stability and reproducibility.

The 14-item WPBS comprises four subdimensions: tendency, altruism, relationship and collectivity, which is inconsistent with existing tools.¹³ Previous studies^{32,33} revealed that individuals influenced by collectivist cultures and values tend to exhibit more prosocial behavior than those influenced by individualistic cultures. Importantly, the collectivity dimension may also potentially reflect the need of fulfill one's sense of self-worth, particularly among older people.⁹ Moreover, the relationship dimension emphasized the importance of tips with friends and siblings and the

Table 6 Pearson's Correlation Between the WPBS and the SRAS-DR

| Sub-Dimensions | Collectivity | Relationship | Altruism | Tendency | WPBS |
|---------------------|--------------|--------------|----------|----------|---------|
| Kin altruism | 0.479** | 0.536** | 0.426** | 0.447** | 0.601** |
| Reciprocal altruism | 0.372** | 0.476** | 0.460** | 0.421** | 0.560** |
| Pure altruism | 0.147* | 0.370** | 0.470** | 0.316** | 0.439** |
| SRAS-DR | 0.362** | 0.532** | 0.542** | 0.456** | 0.618** |

Notes: * $p < 0.05$, ** $p < 0.001$.

Abbreviations: WPBS, the Willingness of Prosocial Behavior Scale; SRAS-DR, the Self-Reported Altruism Scale Distinguished by the Recipient.

Table 7 The Reliability of the WPBS and Its Dimensions

| Sub-Dimensions | Cronbach's α | Split-Half Reliability |
|----------------|---------------------|------------------------|
| Collectivity | 0.731 | 0.707 |
| Relationship | 0.775 | 0.747 |
| Altruism | 0.701 | 0.719 |
| Tendency | 0.801 | 0.782 |
| WPBS | 0.866 | 0.803 |

Abbreviation: WPBS, the Willingness of Prosocial Behavior Scale.

role of close relationships as a driving force for prosocial behavior among older adults. Wild³⁴ found that, compared to younger people, older adults showed a stronger intention to kin selection in prosocial behavior, and exhibited more obviously in-group favoritism. In contrast to the four-item Prosocial Behavior Intention Scale (PBIS),³⁵ the tendency dimension in this study incorporated considerations of the limitation of older adults' ability (eg, physical condition, financial resources, etc) and the actual needs of potential recipients. Within this dimension, older adults would assess the authenticity and urgency of others' needs and then adjust their prosocial response accordingly. In conclusion, in this study, the dimensions that considered culture context, social relationship, and the prosocial decision-making processes ensured a comprehensive assessment of prosocial behavior in older people, and these provide effective evidence to inform strategies for promoting older people's mental health and well-being.

The WPBS was developed mainly through two stages: 1) scale development and 2) reliability and validity testing. In the development stage, an initial item pool was generated through qualitative research, a two-round modified Delphi process, and cognitive interviews. In the testing stage, Classical Test Theory (CTT) guided the item analysis and screening procedures. For item analysis, all items reached the ideal threshold on three criteria (item-total correlation, items discrimination test, and the Cronbach's α after deleting the item), and consequently, no items were removed in this phase. For item screening, the EFA revealed that three items (item 6, 8, and 17) had cross-loadings on two factors,³⁶ possibly because they focused on empathy motivation or behavioral outcomes, and the ambiguous wording made them difficult for old people to comprehend.³⁵ Therefore, following an in-depth team discussion, these items were deleted. Additionally, the conceptual reasons of removing five items with low factor loadings in CFA were as follows: item 12 and item 16 in the relationship dimension emphasized duty/obligation and prosocial outcomes, respectively; item 15 in the altruism dimension used a rhetorical construction (eg, "will not refuse"), which turned prosocial motivation into a passive response mode; and item 7 and item 9 in the tendency dimension contained elements of moral judgment and specific prosocial behavior examples, respectively. In conclusion, although EFA supported a three factors model, CFA found that all fit indices for the four-factor model reached the recommended threshold, confirming its superiority.

Furthermore, this study found a significant positive correlation between the WPBS with the SRAS-DR, and a same correlation between the four subdimensions of the WPBS and the three subdimensions of the SRAS-DR. Interestingly, the correlation of the relationship dimension with three subdimensions of the SRAS-DR showed a decreasing trend, and a similar declining pattern was observed for the tendency dimension. Kin selection theory^{37,38} provided an explanation for these differences: individuals exhibited strong altruistic behaviors towards families members due to genetic relatedness, displayed conditional altruistic behavior toward their friends based on reciprocity, and showed limited altruistic behavior toward strangers based on social norms or group interests. Similarly, Li³⁹ found among university students from China and Indonesia, the level of prosocial behavior for family members and friends were higher than those for strangers. However, the results of this study also reported that the correlation between four subdimension of the WPBS and three subdimension of the SRAS-DR were low to moderate. This probably because the constructs of the SRAS-DR differed from those of the WPBS, and thus it may not fully capture the core content of prosocial willingness in older adults. Additionally, the WPBS demonstrated acceptable internal consistency and good test-retested reliability, which indicated that the scale has excellent stability and reproducibility, and it could stably reflect the psychological traits.⁴⁰ Meanwhile, during the surveys, we also found that older adults could complete this 14-item scale in under five minutes, supporting its feasibility and practicability among this population.

This study also had some limitations. Firstly, the data were collected through self-report measurement from community-dwelling older people, which could introduce bias into the findings. Secondly, the samples mainly involved community-dwelling older adults in urban, but no those in rural, in nursing homes, or in hospital, which could limit the generalizability of the WPBS, to some extent. Finally, although the combined reliability (CR) values of all dimensions supported acceptable convergent validity, the average variance extraction (AVE) for three dimensions were below ideal thresholds of 0.50, which could be due to the moderate factor loading values, the relatively small number of items per dimension, and sampling bias. Therefore, in the future, large-scale research and parallel analysis could be used to refine its psychometric properties and to improve its generalisability.

Conclusion

This study was first designed to develop the Willingness of Prosocial Behavior Scale (WPBS) for community-dwelling older adults, and the final scale comprised 14 item with four subdimensions: collectivity, relationship, tendency and altruism. Incorporating considerations of collectivist culture contexts and prosocial decision-making processes into the WPBS enhances the comprehensive measurement and understanding of prosocial behavior in older adults. Moreover, the WPBS exhibited good reliability and validity, which indicating its excellent accuracy and practicability to provide reliable tool for assessing prosocial behavior among older adults. Therefore, in the future, large-scale studies involving diverse older populations are needed to extend the application of the WPBS, to conduct additional testing, and to inform its refinement.

Abbreviations

WPBS, the Willingness of Prosocial Behavior Scale; CTT, Classical Test Theory; EFA, Exploratory Factor Analysis; CFA, Confirmatory Factor Analysis; SEM, the Structural Equation Modeling; ICC, Intraclass Correlation Coefficient; SRAS-DR, the Self-Reported Altruism Scale Distinguished by the Recipient.

Data Sharing Statement

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Ethics Approval and Informed Consent

Ethics approval was obtained from by the Medical Ethics Committee of Army Medical University in Chongqing, China (Grant number: 20243802), and the informed consent process (verbal or written) was acceptable and approved by the Medical Ethics Committee of Army Medical University in Chongqing. All study procedures were conducted in accordance with the Declaration of Helsinki.

Consent for Publication

All authors have read and approved the publication of this manuscript.

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

No conflict of interest has been declared by the authors.

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