

Development and Validation of a Brief Self-Assessed Wisdom Scale

Sai-fu Fung(Former Corresponding Author)

City University of Hong Kong <https://orcid.org/0000-0002-3526-6568>

Esther Oi-wah Chow(New Corresponding Author) (✉ esther.chow.ss@cityu.edu.hk)

<https://orcid.org/0000-0003-3904-4847>

Chau-ku Cheung

City University of Hong Kong

Research article

Keywords: Wisdom, SAWS, BSAWS, confirmatory factor analysis, older adults

Posted Date: September 27th, 2019

DOI: <https://doi.org/10.21203/rs.2.10874/v2>

License:  This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Version of Record: A version of this preprint was published on February 12th, 2020. See the published version at <https://doi.org/10.1186/s12877-020-1456-9>.

Abstract

Background This longitudinal study aimed to develop a nine-item Brief Self-Assessed Wisdom Scale (BSAWS) derived from the original 40-item Self-Assessed Wisdom Scale (SAWS). Methods The psychometric properties of the shortened scale were evaluated based on a sample of 157 older adults. The factor structure and dimensionality of the original SAWS were examined using confirmatory factor analysis. Subsequent explorative factor analysis of the BSAWS supported the construct validity of the shortened scale. Results The internal consistency, criterion validity and construct validity of the shortened scale were also evaluated and the results indicated that the BSAWS possesses good psychometric properties and is comparable with the full version. Conclusions This scale refinement may help researchers and practitioners conduct epistemological surveys or clinical research related to wisdom.

Background

Wisdom is an ancient construct with a long history of conceptualisation based on normative approaches across cultures, ranging from Greek philosophers such as Socrates and Aristotle to Chinese philosophers such as Confucius. In recent years, the concept of wisdom has been further revitalised in empirical research on social and positive psychology [1-4]. The latest empirical research on wisdom can be broadly categorised into two domains [5]. The first one is performance measure of personal wisdom, also known as Berlin wisdom paradigm, involves the analysis of wisdom-related performance in laboratory setting with trained raters to transcribe the responded data introduced in the 1980s [6, 7]. In recent years, this explicit theory based method was utilised and adapted in different contexts, such as in Australia [8], China [9], Germany [10] and United States [11]. The focus of this paper is the second approach, i.e., latent factor analyses of wisdom that mainly rely on using self-reported survey methods to assess wisdom, such as Self-Assessed Wisdom Scale (SAWS) [2], Three-dimensional Wisdom Scale [12], Practical Wisdom Scale and Transcendent Wisdom Scale [13] and Wisdom Development Scale [14], etc. We acknowledge that the above constructs indeed provide important tools for researchers and practitioners to study the issues related to different facets of wisdom. The purpose of this study is not to compare the wisdom constructs, which have been widely discussed and debated by scholars, both normatively and with empirical evidence [3, 15-20]. Rather, we embrace the idea that each wisdom construct has its own merits and the variety of constructs can enhance our understanding of wisdom across different dimensions and situations.

Nevertheless, the abovementioned latent factor analyses of wisdom constructs suffer from two limitations. First, the scale developers did not employ the latest validation tools to evaluate the dimensionality and factor structure of the scales. These scales were developed with a sole reliance on the exploratory factor analysis (EFA) results to identify the factor structure, without verification by a confirmative factor analysis (CFA) [2, 13]. Second, while some studies have attempted to validate the wisdom scales with a CFA, the adopted cut-off criteria were far below the current standards, and the scales also suffer from problems like a lack of internal reliability [2, 5, 12, 21, 22]. To solve the above problems, many wisdom scales have been revised, validated and adapted into different languages or

developed into shortened versions for ease of use [12, 17-19, 23-26]. Yet, there is paucity of study examined the dimensionality and validity of SAWS with the latest psychometric tools which warrant our attention.

The Self-Assessed Wisdom Scale (SAWS), a self-reported instrument for measuring wisdom at the individual level, has been widely used by researchers and clinical practitioners. SAWS focuses on five dimensions, namely experience, reminiscence, openness, emotion regulation and humour, and has received positive evaluations of its internal consistency and psychometric properties [2, 18, 19, 23, 27]. Numerous studies have used SAWS to explore the relationships between wisdom and various psychosocial outcomes. JD Webster [28] suggested that wisdom is positively associated with psychosocial characteristics derived from the Erikson tradition, such as ego-integrity, life attitudes and values. Using hierarchical regression analysis, JD Webster, GJ Westerhof and ET Bohlmeijer [29] identified a positive relationship between wisdom and mental health among Dutch adults. The balanced time perspective also uniquely predicted both mental health and wisdom in a sample of 512 adults in the Netherlands [30]. JD Webster and XC Deng [31] used the wisdom scale to study the relationship between traumatic life events and mental health outcomes among 320 respondents in Canada. A later study further suggested that wisdom and meaning contribute to positive self-development in areas such as optimism, self-esteem and self-characteristics in emerging adulthood [27]. In a recent study, C Cheung and EO Chow [32] identified a positive relationship between wisdom and well-being among older Chinese.

Despite the widespread application of SAWS, few studies have managed to fully replicate its original factor structure. Although SAWS possesses good internal consistency and criterion validity [23, 27], its factor structure and dimensionality are inconclusive and subject to a number of limitations [17, 19]. First, to date, no studies have used CFA to validate the 40-item five latent factor structure of the scale. JD Webster [23] used CFA to analyse five sub-scale factors used to predict the latent construct wisdom rather than analysing all of the 40 items. Second, some of the SAWS items have a complicated factor structure. For example, JD Webster [2] reported that the ‘humor and openness dimensions have some overlap and weaker loadings’ (p. 16). In particular, items 12, 27 and 17 share the attributes of emotion regulation and reminiscence, items 14 and 24 are related to both emotion regulation and humour and items 5 and 20 are related to openness and humour.

Hence, controversies have arisen when studies have attempted to adapt the scale to other contexts. P Alves, L Morgado and Bd Oliveira [33] attempted to validate a Portuguese version of the 40-item SAWS, but their EFA results showed that the factor structure was significantly different from that of the original scale. In response, the authors proposed five alternative wisdom domains, namely reflection, mood, emotional self-regulation, experience and open mindedness, which are significantly different from those of the original SAWS. Due to the mixed findings on the factor structure of the wisdom scale, A Urrutia, GM de Espanes, C Ferrari, G Borgna, AM Alderete and F Villar [34] combined the 40-item SAWS and 79-item Wisdom Development Scale (WDS) to obtain a shortened 20-item scale with a three-factor structure for studying wisdom related issues. They applied the shortened scale in a study based on a sample of older adults in Argentina. However, their CFA results suggested very marginal model fit.

Given the controversies surrounding the full version of SAWS, this study explores whether the factor structure and dimensionality of the scale need further refinement. As JD Webster [2], who developed the original scale, stated, 'continued refinement of specific scale items may eliminate those which explain little overall variance' (p. 21). The first part of this study shows that the full 40-item scale fails to replicate the factor structure of SAWS using CFA. However, the EFA results support the development of a unidimensional nine-item Brief Self-Assessed Wisdom Scale (BSAWS). In the next section, the psychometric properties of the newly proposed BSAWS are evaluated and various tools are used to examine its internal consistency, criterion validity and construct validity. Overall, the results show that the BSAWS provides an efficient and valid tool for assessing wisdom using empirical data and psychometric evidence in different cultural contexts, i.e., Chinese culture.

Methods

Participants

This study used a longitudinal repeated measures design with 157 community-dwelling older adults from elderly service centres in Hong Kong [35-37]. According to Table 1, the respondents were aged 72.8 years on average ($SD = 8.55$) and participated in the study on a voluntary basis. The respondents possessed sufficient cognitive ability (with 7.9 years of education on average) to understand and respond to the self-reported questionnaire. The sample comprised 25.5% male and 74.5% female respondents. There were four waves of data collection: the initial study (study 1; $n = 157$) was conducted in June 2016. The respondents then completed the questionnaire again after one (study 2; $n = 136$), two (study 3; $n = 135$) and eight (study 4; $n = 98$) months. The research team strictly adhered to the relevant ethical standards and the project was approved by the university's research ethics committee.

Table 1. Participant demographic characteristics

Variable	Respondents (n=157)
Age mean (SD)	72.8 (8.55)
Gender n (%)	
Male	40 (25.5%)
Female	117 (74.5%)
Education level n (%)	
No formal education	26 (16.6%)
Primary education	50 (31.8%)
Secondary education	45 (28.7%)
Tertiary education	30 (19.1%)
Missing	6 (3.8%)
Martial status n (%)	
Single	15 (9.6%)
Married	64 (40.8%)
Divorce/separated	15 (9.6%)
Widowed	62 (39.5%)
Other	1 (0.6%)

Measurement

The latest SAWS comprises 40 items that measure five dimensions: emotion regulation (items 32, 2, 22, 12, 27, 7, 14, 24 and 17), reminiscence (items 12, 27, 17, 8, 28, 23, 13, 18, 3 and 33), openness (items 35, 25, 30, 38, 5, 20 and 34), experience (items 26, 6, 16, 21 and 1) and humour (items 14, 24, 5, 20, 39, 19, 29, 4, 9 and 10). The respondents were asked to indicate their level of agreement on a Likert-type scale ranging from 1 = *strongly disagree* to 6 = *strongly agree* [2, 18, 23].

Procedure

The interviewers administered the questionnaire to the respondents at 13 elderly service centres located in different districts in Hong Kong. The items were translated into Chinese using the back-translation procedure [38].

CFA was used to replicate and evaluate the construct validity of the SAWS and BSAWS [39-41]. The CFA estimator used diagonally weighted least squares (DWLS) due to the ordinal nature of the Likert scale. DWLS is regarded as less biased and a more optimal fit for this type of scale [42-46]. The results for the following criteria indicated adequate model fit: CFI > 0.95, TLI > 0.95, RMSEA < 0.08, SRMR < 0.08 [39, 47-49]. In addition to these measures, $\chi^2 / df \leq 3$ can be used to determine acceptable model fit [50-53].

Factor analysis with the principal component estimation method was used to evaluate the dimensionality and factor structure of the BSAWS [2, 33, 47, 54]. The Kaiser-Meyer-Olkin (KMO) and Bartlett's tests of sphericity were used to evaluate the model. The KMO estimates were over 0.70 and the Bartlett's test was significant ($p < 0.01$), thus confirming that the model had a satisfactory factor structure [55].

In addition, various psychometric testing tools and validated instruments were used to examine the newly proposed BSAWS. The internal consistency of the scale was assessed using Cronbach's alpha [56] and by examining the corrected item-total correlation between the nine items [47, 57].

The criterion validity was evaluated using other validation constructs reported in the literature on latent factor analyses of wisdom. The wisdom construct was reported to be significantly positively correlated with well-being, self-esteem and other wisdom measures [5, 58-62]. Hence, this study used the following well-established scales to evaluate the criterion validity of the BSAWS: the Personal Well-being Index (PWI) [63], Rosenberg self-esteem (RSE) scale [64, 65] and dimensions of the WDS [5, 21]. Research also suggests that wisdom is negatively correlated with depression symptoms [2, 66, 67]. Hence, we used the Geriatric Depression Scale (GDS) [68-70] to evaluate the relationship between depression and the two wisdom scales. The above analysis was implemented using IBM SPSS 25.0 and the R (3.6.0) computing software with lavaan package 0.6-3 [71].

Results

Table 2 shows the CFA results for the original SAWS and variations of the factor structure in the literature [2, 23, 33]. The CFA results based on study 1 ($n = 157$) suggested that the original full version of SAWS

(Model 1) failed to fit the model, with χ^2 (1570.703) / 510 = 3.08, $p < 0.001$, SRMR = 0.121, CFI = 0.887, TLI = 0.876 and RMSEA = 0.126. Similarly, Model 2 failed to fulfil the cut-off criteria for good model fit, as χ^2 (2135.089) / 692 = 3.09, $p < 0.001$, SRMR = 0.119, CFI = 0.885, TLI = 0.877 and RMSEA = 0.126.

Table 2. Confirmatory factor analysis of SAWS and BSAWS

Model	χ^2	Df	χ^2/df	RMSEA	CFI	TLI	SRMR
[90% CI]							
1. Webster et al. (2007)	1570.703	510	3.08	0.126	0.887	0.876	0.121
[0.119-0.133]							
2. Alves et al. (2014)	2135.089	692	3.09	0.126	0.885	0.877	0.119
[0.120-0.132]							

With reference to the literature on SAWS [2, 23, 33] and the EFA results in Table 3, this study proposes a nine-item BSAWS with a single factor structure (see the appendix). The BSAWS includes the following domains used in the full scale: emotion regulation (items 22 and 27), reminiscence (items 18, 23 and 40), openness (item 34), experience (items 6 and 36) and humour (item 29). The newly proposed BSAWS scores in study 1, 2, 3 and 4 are 35.529 (SD = 9.14), 36.610 (SD = 8.44), 37.704 (SD = 7.66) and 37.780 (SD = 9.04), respectively. The results of repeated measures ANOVA with a Greenhouse-Geisser correction indicated that mean BSAWS scores differed significantly between time points [$F(2.726, 256.228) = 2.894, p = 0.041$].

Internal Consistency and Factorial Validity

Table 3 presents the descriptive statistics, including the mean, standardised deviation, skewness, kurtosis, corrected item-total correlations and Cronbach's alpha, if item deleted, for all nine items of the BSAWS based on the data from study 1. The results show that the BSAWS demonstrates good internal consistency. The corrected item-to-total correlations for the BSAWS ranges from 0.349 to 0.619 and Cronbach's alpha is above the acceptable range, i.e., 0.808. The BSAWS is also significantly positively correlated ($r = 0.912, p < 0.001$) with SAWS.

Table 3. Descriptive statistics and factor loadings from the exploratory factor analysis of BSAWS

Item	\bar{x}	SD	sk	ku	r_{it}	α_{iid}	λ
6	4.222	1.742	-0.805	-0.635	0.368	0.807	0.477
18	3.898	1.630	-0.572	-0.752	0.511	0.787	0.636
22	4.331	1.571	-0.905	-0.143	0.582	0.779	0.707
23	3.936	1.636	-0.618	-0.779	0.349	0.808	0.447
27	3.828	1.594	-0.513	-0.728	0.505	0.788	0.643
29	3.790	1.664	-0.447	-0.976	0.579	0.778	0.711
34	3.955	1.499	-0.663	-0.404	0.619	0.775	0.738
36	4.376	1.439	-1.194	0.698	0.534	0.785	0.654
40	3.191	1.769	0.086	-1.365	0.504	0.788	0.646

Note: \bar{x} = mean; SD = standard deviation; sk = skewness; ku = kurtosis; r_{it} = corrected item-total correlations; α_{iid} = Cronbach's alpha, if item deleted; λ = factor loadings

The results of the KMO and Bartlett's tests of sphericity for the nine-item BSAWS were 0.823 ($\chi^2 = 374.389, p < .001$), thus indicating appropriate scale construction. The EFA results showed that the factor loadings ranged from 0.477 to 0.738 and explained 40.453% of the total variance (Table 3).

Criterion Validity

The results from study 1 show the relationships between BSAWS and SAWS and the other construct-related scales suggested in the wisdom literature. Well-being as measured by the PWI has significant moderate positive relationships with SAWS ($r = 0.363, p < 0.001$) and BSAWS ($r = 0.347, p < 0.001$). The self-esteem scale also possesses a moderate positive relationship with the two scales. SAW and BSAWS are strongly correlated with the WDS, with $r = 0.730 (p < 0.001)$ and $r = 0.741 (p < 0.001)$, respectively. The results also show a negative relationship between the scales and GDS, with $r = -0.290 (p < 0.001)$ for SAWS and $r = -0.345 (p < 0.001)$ for BSAWS. The above findings have been replicated in the subsequent study 2, 3 and 4 (Table 4). To sum up, the nine-item BSAWS is comparable with the full scale and possesses good criterion validity.

Table 4. Correlations between SAWS and BSAWS in relation to other construct-related scales

Scale	SAWS	BSAWS	SAWS	BSAWS	SAWS	BSAWS	SAWS	BSAWS
	<u>Study 1</u>		<u>Study 2</u>		<u>Study 3</u>		<u>Study 4</u>	
PWI	0.363***	0.347***	0.469***	0.389***	0.617***	0.584***	0.530***	0.531***
RSE	0.340***	0.357***	0.392***	0.410***	0.329***	0.280***	0.441***	0.488***
WDS	0.730***	0.741***	0.858***	0.783***	0.833***	0.803***	0.798***	0.818***
GDS	-0.290***	-0.345***	-0.258**	-0.240**	-0.294***	-0.294***	-0.184*	-0.214*

Note: * $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$.

Construct validity

To further validate the construct validity of BSAWS, CFA was implemented on the data collected from studies 2, 3 and 4. The CFA results for BSAWS (Table 5) indicate good model fit, particularly the combined results across studies 2, 3 and 4, with $\chi^2 (51.278) / 27 = 1.90$, SRMR = 0.040, CFI = 0.996, TLI = 0.995 and RMSEA = 0.040. Overall, the results indicate that the nine-item BSAWS has generally good fit for a unidimensional factor structure without any post hoc modifications.

Table 5. Factor loadings and fit indices from the confirmatory factor analysis of BSAWS, by study (see Figure 1 for the estimated model)

		<u>Study</u>			
Factor/question		2	3	4	Combo
6. I have made important decisions throughout my life.	λ_1	0.459	0.641	0.710	0.585
18. Reviewing my past gives me a good perspective on my current concerns.	λ_2	0.775	0.749	0.692	0.732
22. I can easily express my emotions without feeling like I am losing control of the situation.	λ_3	0.805	0.727	0.760	0.760
23. I often recall the past to see if I have changed since then.	λ_4	0.506	0.528	0.576	0.538
27. I am good at identifying subtle emotions in myself.	λ_5	0.668	0.678	0.830	0.721
29. I often use humour to put other people at ease.	λ_6	0.622	0.582	0.849	0.680
34. Now I know I can truly appreciate the little things in life.	λ_7	0.818	0.801	0.839	0.815
36. I have learned valuable life lessons with others.	λ_8	0.643	0.699	0.789	0.705
40. I often wonder about the mysteries of life and what lies beyond death.	λ_9	0.592	0.554	0.668	0.587
Model fit					
N		136	135	98	369
RMSEA		0.055	0.069	0.084	0.049
RMSEA 90% confidence interval		0.000- 0.093	0.029- 0.105	0.038- 0.126	0.028- 0.070
SRMR		0.059	0.057	0.064	0.040
χ^2 (df = 27)		37.984	44.441	45.609	51.278
χ^2/df		1.41	1.65	1.69	1.90

CFI	0.995	0.992	0.994	0.996
TLI	0.993	0.989	0.993	0.995

Note: RMSEA = root mean square error of approximation; SRMR = standardised root mean residual; CFI = comparative fit index; TLI = Tucker Lewis index; Study 2 = initial study plus 1 month; Study 3 = initial study plus 2 months; Study 4 = initial study plus 8 months; Combo = combined across the three studies.

Discussion

The proposed BSAWS possesses good psychometric properties and is comparable with its full-scale version. According to JD Webster, M Taylor and G Bates [19], 'the SAWS subscales [are] based upon input by a panel of wisdom experts' (p. 256). The results of this study show that the BSAWS supports the original five domains of wisdom advocated in the original SAWS, i.e., emotion, regulation, reminiscence, openness, experience and humour. Cronbach's alpha for the BSAWS is 0.808, which is similar to the values ranging from 0.78 to 0.90 reported in the original SAWS studies [2, 23]. The nine-item shortened version of SAWS also possesses good criterion validity. The results show that SAWS and the BSAWS both hold identical correlational direction and magnitude with the other well-established measurements of well-being, self-esteem and depression. Both scales also have very strong and significant positive correlations ($r = 0.912, p < 0.001$). The independent-sample t-test results show that no significant differences were observed in both scale scores on sex of the respondents. There were only a weak significant correlation between the educational level ($r = 0.294, p < 0.001$; $r = -0.328, p < 0.001$) and age ($r = 0.292, p < 0.001$; $r = -0.265, p < 0.001$) of the respondents in BSAWS and SAWS scores, respectively. These findings are aligned with the other wisdom constructs that focused on older adults [12].

This study contributes to the measurement of wisdom in the following ways. First, the shortened version of SAWS can help resolve disputes related to the complicated factor structure and dimensionality of the full version of SAWS. The original scale developer and the subsequent validation studies have generally failed to fully replicate the five latent factor structure of the 40 item scale [2, 18, 23, 33, 34]. For example, a recent study showed that some SAWS items did not load on any factor and that the openness dimension had a questionable Cronbach's alpha of 0.68 [18]. Consequently, some studies have attempted to shorten the scale by forcefully combining SAWS with other wisdom related constructs without using strict validation procedures to examine the psychometric properties of the revised scale [32, 34]. A validated abbreviated version of SAWS can serve as a useful instrument for designing future studies related to wisdom among older adults and other populations.

This study also provides empirical evidence to support the factor structure of the BSAWS using CFA. Numerous SAWS related studies have used only EFA to evaluate the factorial validity of the scale, without verifying the construct validity with CFA [2, 18, 33]. The only SAWS validation study to use CFA was based

on five sub-scales, which served as the latent factors for estimating the loadings on the wisdom construct rather than evaluating all 40 items. The results failed to meet the criteria for adequate model fit, with CFI = 0.947 and RMSEA = 0.107 [23]. The CFA results of Models 1 and 2 (Table 2) in this study managed to replicate the problem of analysing the 40 items using a five latent factor structure. The results showed that none of the models were considered to have a good fit. However, the CFA results for the newly proposed nine-item BSAWS fulfilled all of the stringent criteria for determining good model fit in the structural equation modelling literature [47, 48, 52].

The procedure for developing the BSAWS strictly adhered to the recognised scale development and validation principles [41, 72]. The sample from study 1 ($n = 156$) was used to conduct EFA to identify the factor structure of BSAWS. The study 2 ($n = 136$), 3 ($n = 135$) and 4 ($n = 98$) samples were then used to verify the scale's construct validity using CFA. In addition, various psychometric evaluation tools were used to examine the internal consistency and criterion validity of the nine-item BSAWS. In short, the BSAWS was found to possess excellent psychometric properties.

This study has the following potential limitations. First, the small sample size may limit the reliability of the results. This limitation may account for why the CFA results in study 4 ($n = 98$) only yielded a marginally adequate RMSEA value. The research team had difficulty recruiting significant numbers of respondents from the elderly service centres in Hong Kong. However, the longitudinal repeated measures design used in this study may have compensated for this limitation. It is worth mentioning that the original SAWS was developed and validated using similar numbers of respondents in Canada and Australia [2, 18, 23]. The second potential limitation is related to the demographic background of the respondents. Specifically, the results based on Chinese older adults in Hong Kong may have limited generalisability. Lastly, the standalone 9-item scale may need further validation, as the participants may potentially affected by responding to the other 31 items in the scale. Thus, further research is needed to replicate our findings or apply the BSAWS in different cultural contexts to verify this refinement of SAWS. With the abbreviated version of SAWS, it enables researchers to further examine the queries related to wisdom and other psychosocial outcomes, such as its relationship with hedonic and eudaimonia well-being [10, 73-75] in future research projects.

Conclusions

This study developed and validated an abbreviated nine-item version of SAWS. The results suggest that the BSAWS possesses excellent psychometric properties and is comparable with its 40-item full version. The newly developed scale can provide an efficient and valid assessment of wisdom for older adults. This abbreviated standardised wisdom measure may encourage researchers and practitioners to conduct epidemiological surveys to evaluate the effectiveness of interventions in a clinical setting.

List Of Abbreviations

BSAWS: Brief Self-Assessed Wisdom Scale; CFI: Comparative Fit Index; ER: Emotion regulation; EXP: Experience; GDS: Geriatric Depression Scale; HU: Humour; OP: Openness; PWI: Personal Wellbeing Index; RE: Reminiscence; RMSEA: root mean square error of approximation; RSE: Rosenberg self-esteem; SAWS: Self-Assessed Wisdom Scale; SRMR: standardized root mean residual; TLI: Tucker Lewis Index; WDS: Dimensions of the Wisdom Development Scale.

Declarations

Ethics approval and consent to participate

This study was approved by the research ethical committee of the City University of Hong Kong. Its procedure was in compliance with the Declaration of Helsinki guidelines. All of the participants gave informed consent prior to the study.

Consent for publication

Not applicable.

Availability of data and material

The datasets used and analysed during the current study are available from Esther Oi-wah Chow on reasonable request.

Competing interests

The authors declare that they have no competing interests.

Funding

The project is funded by the General Research Fund provided by the Research Grant Council, Hong Kong (grant number: 9042296). The funding body had no influence on the content of the paper and the publication process.

Authors' contributions

SF developed the idea of the paper, conducted literature review, data analysis, data interpretation and manuscript preparation. EC is the principal investigator of this study. CC is the co-investigator of this study. All authors reviewed the manuscript critically and approved the final version.

References

1. Ferrari M, Weststrate NM: **The Scientific Study of Personal Wisdom**. In: *The Scientific Study of Personal Wisdom: From Contemplative Traditions to Neuroscience*. Edited by Ferrari M, Weststrate NM. Dordrecht: Springer Netherlands; 2013: 325-341.

2. Webster JD: **An exploratory analysis of a self-assessed wisdom scale.** *J Adult Dev* 2003, **10**(1):13-22.
3. Bangen KJ, Meeks TW, Jeste DV: **Defining and Assessing Wisdom: A Review of the Literature.** *Am J Geriatr Psychiatr* 2013, **21**(12):1254-1266.
4. Seligman MEP, Csikszentmihalyi M: **Positive psychology - An introduction.** *Am Psychol* 2000, **55**(1):5-14.
5. Brown SC, Greene JA: **The wisdom development scale: Translating the conceptual to the concrete.** *J Coll Stud Dev* 2006, **47**(1):1-19.
6. Baltes PB, Staudinger UM: **Wisdom - A metaheuristic (pragmatic) to orchestrate mind and virtue toward excellence.** *Am Psychol* 2000, **55**(1):122-135.
7. Staudinger UM, Pasupathi M: **Correlates of wisdom-related performance in adolescence and adulthood: Age-graded differences in "paths" toward desirable development.** *J Res Adolesc* 2003, **13**(3):239-268.
8. Zacher H, McKenna B, Rooney D, Gold S: **Wisdom in the Military Context.** *Milit Psychol* 2015, **27**(3):142-154.
9. Hu CS, Ferrari M, Wang QD, Woodruff E: **Thin-Slice Measurement of Wisdom.** *Frontiers in Psychology* 2017, **8**:10.
10. Mickler C, Staudinger UM: **Personal Wisdom: Validation and Age-Related Differences of a Performance Measure.** *Psychol Aging* 2008, **23**(4):787-799.
11. Wink P, Staudinger UM: **Wisdom and Psychosocial Functioning in Later Life.** *Journal of Personality* 2016, **84**(3):306-318.
12. Ardelt M: **Empirical assessment of a three-dimensional wisdom scale.** *Res Aging* 2003, **25**(3):275-324.
13. Wink P, Nelson R: **Practical and transcendent wisdom: Their nature and some longitudinal findings.** *J Adult Dev* 1997, **4**(1):1-15.
14. Brown SC: **Learning across the campus: How college facilitates the development of wisdom.** *J Coll Stud Dev* 2004, **45**(2):134-148.
15. Glück J, König S, Naschenweng K, Redzanowski U, Dorner-Hörig L, Strasser I, Wiedermann W: **How to measure wisdom: content, reliability, and validity of five measures.** *Frontiers in Psychology* 2013, **4**(405).
16. Glück J: **Measuring Wisdom: Existing Approaches, Continuing Challenges, and New Developments.** *The Journals of Gerontology: Series B* 2017, **73**(8):1393-1403.
17. Ardelt M: **The measurement of wisdom: A commentary on Taylor, Bates, and Webster's comparison of the SAWS and 3D-WS.** *Exp Aging Res* 2011, **37**(2):241-255.
18. Taylor M, Bates G, Webster JD: **Comparing the Psychometric Properties of Two Measures of Wisdom: Predicting Forgiveness and Psychological Well-Being with The Self-Assessed Wisdom Scale (SAWS) And The Three-Dimensional Wisdom Scale (3D-WS).** *Exp Aging Res* 2011, **37**(2):129-141.

19. Webster JD, Taylor M, Bates G: **Conceptualizing and measuring wisdom: A reply to Ardelt reply.** *Exp Aging Res* 2011, **37**(2):256-259.
20. Bassett CL: **Understanding and Teaching Practical Wisdom.** In: *Adult Education and the Pursuit of Wisdom.* Edited by Tisdell EJ, Swartz AL: New York, John Wiley & Sons Inc; 2011: 35-44.
21. Greene JA, Brown SC: **The wisdom development scale: Further validity investigations.** *Int J Aging Human Dev* 2009, **68**(4):289-320.
22. Chen L-M, Wu P-J, Cheng Y-Y, Hsueh H-I: **A Qualitative Inquiry of Wisdom Development: Educators' Perspectives.** *The International Journal of Aging and Human Development* 2011, **72**(3):171-187.
23. Webster JD: **Measuring the Character Strength of Wisdom.** *The International Journal of Aging and Human Development* 2007, **65**(2):163-183.
24. Thomas ML, Bangen KJ, Ardelt M, Jeste DV: **Development of a 12-Item Abbreviated Three-Dimensional Wisdom Scale (3D-WS-12): Item Selection and Psychometric Properties.** *Assessment* 2017, **24**(1):71-82.
25. Bang HY, Zhou YC: **The function of wisdom dimensions in ego-identity development among Chinese university students.** *International Journal of Psychology* 2014, **49**(6):434-445.
26. Li HQ, Wang FY: **A three-dimensional model of the wise personality: A free classification approach.** *Social Behavior and Personality* 2017, **45**(11):1879-1888.
27. Webster JD, Weststrate NM, Ferrari M, Munroe M, Pierce TW: **Wisdom and Meaning in Emerging Adulthood.** *Emerg Adulthood* 2018, **6**(2):118-136.
28. Webster JD: **Wisdom and Positive Psychosocial Values in Young Adulthood.** *J Adult Dev* 2010, **17**(2):70-80.
29. Webster JD, Westerhof GJ, Bohlmeijer ET: **Wisdom and Mental Health Across the Lifespan.** *J Gerontol Ser B-Psychol Sci Soc Sci* 2014, **69**(2):209-218.
30. Webster JD, Bohlmeijer ET, Westerhof GJ: **Time to flourish: the relationship of temporal perspective to well-being and wisdom across adulthood.** *Aging Ment Health* 2014, **18**(8):1046-1056.
31. Webster JD, Deng XC: **Paths From Trauma to Intrapersonal Strength: Worldview, Posttraumatic Growth, and Wisdom.** *J Loss Trauma* 2015, **20**(3):253-266.
32. Cheung C, Chow EO: **Contribution of Wisdom to Well-Being in Chinese Older Adults.** *Applied Research in Quality of Life* 2019.
33. Alves P, Morgado L, Oliveira Bd: **Wisdom assessment: Portuguese adaptation of the Self-Assessed Wisdom Scale – SAWS – by Jeffrey Webster.** *Psychologica* 2014, **57**(1):39-57.
34. Urrutia A, de Espanes GM, Ferrari C, Borgna G, Alderete AM, Villar F: **Development and validation of the Brief Scale of Self-assessed Wisdom (EBAS) in Argentinian older adults.** *Univ Psychol* 2016, **15**(2):11.
35. Dunlap WP, Cortina JM, Vaslow JB, Burke MJ: **Meta-analysis of experiments with matched groups or repeated measures designs.** *Psychological Methods* 1996, **1**(2):170-177.

36. Obrien RG, Kaiser MK: **Manova method for analyzing repeated measures designs - an extensive primer.** *Psychological Bulletin* 1985, **97**(2):316-333.
37. Ellis MV: **Repeated Measures Designs.** *The Counseling Psychologist* 1999, **27**(4):552-578.
38. Brislin RW: **Back-Translation for Cross-Cultural Research.** *Journal of Cross-Cultural Psychology* 1970, **1**(3):185-216.
39. Brown TA: **Confirmatory Factor Analysis for Applied Research, Second Edition:** New York: Guilford Publications; 2014.
40. Jöreskog KG: **A general approach to confirmatory maximum likelihood factor analysis.** *Psychometrika* 1969, **34**(2):183-202.
41. Loewenthal KM: **An introduction to psychological tests and scales,** 2 edn: Philadelphia, Pa. : Psychology Press; 2001.
42. DiStefano C, Morgan GB: **A Comparison of Diagonal Weighted Least Squares Robust Estimation Techniques for Ordinal Data.** *Structural Equation Modeling: A Multidisciplinary Journal* 2014, **21**(3):425-438.
43. Li C-H: **Confirmatory factor analysis with ordinal data: Comparing robust maximum likelihood and diagonally weighted least squares.** *Behavior Research Methods* 2016, **48**(3):936-949.
44. Lionetti F, Keijsers L, Dellagiulia A, Pastore M: **Evidence of factorial validity of parental knowledge, control and solicitation, and adolescent disclosure scales: When the ordered nature of Likert scales matters.** *Frontiers in Psychology* 2016, **7**, 941.
45. Fung S: **Psychometric Evaluation of the Warwick-Edinburgh Mental Well-being Scale (WEMWBS) with Chinese University Students.** *Health and Quality of Life Outcomes* 2019, **17**:46.
46. Fung S: **Cross-cultural validation of the Social Media Disorder scale.** *Psychol Res Behav Manag* 2019, **12**:683-690.
47. Hair JF: **Multivariate data analysis,** 7 edn: Upper Saddle River, NJ : Prentice Hall; 2010.
48. Hu Lt, Bentler PM: **Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives.** *Structural Equation Modeling: A Multidisciplinary Journal* 1999, **6**(1):1-55.
49. Schreiber JB, Nora A, Stage FK, Barlow EA, King J: **Reporting Structural Equation Modeling and Confirmatory Factor Analysis Results: A Review.** *The Journal of Educational Research* 2006, **99**(6):323-338.
50. Bentler PM, Bonett DG: **Significance tests and goodness of fit in the analysis of covariance structures.** *Psychological Bulletin* 1980, **88**(3):588-606.
51. Byrne BM: **Structural equation modeling with LISREL, PRELIS, and SIMPLIS : basic concepts, applications, and programming:** Mahwah, N.J. : L. Erlbaum Associates; 1998.
52. Kline RB: **Principles and practice of structural equation modeling,** 2 edn: New York: Guilford Press; 2005.
53. Satorra A, Bentler PM: **A scaled difference chi-square test statistic for moment structure analysis.** *Psychometrika* 2001, **66**(4):507-514.

54. Jennrich RI, Sampson PF: **Rotation for simple loadings.** *Psychometrika* 1966, **31**(3):313-323.
55. Field AP: **Discovering statistics using IBM SPSS statistics**, 5th edn: Los Angeles, California: SAGE Publications; 2018.
56. Cronbach LJ: **Coefficient alpha and the internal structure of tests.** *Psychometrika* 1951, **16**(3):297-334.
57. Tabachnick BG: **Using multivariate statistics**, 6 edn: Boston: Pearson Education; 2013.
58. Ardelt M: **Disentangling the Relations Between Wisdom and Different Types of Well-Being in Old Age: Findings from a Short-Term Longitudinal Study.** *J Happiness Stud* 2016, **17**(5):1963-1984.
59. Etezadi S, Pushkar D: **Why are wise people happier? An explanatory model of wisdom and emotional well-being in older adults.** *Journal of Happiness Studies: An Interdisciplinary Forum on Subjective Well-Being* 2013, **14**(3):929-950.
60. Hultsch DF, MacDonald SWS, Hunter MA, Maitland SB, Dixon RA: **Sampling and generalisability in developmental research: Comparison of random and convenience samples of older adults.** *International Journal of Behavioral Development* 2002, **26**(4):345-359.
61. Clark PG: **Quality-of-life, values, and teamwork in geriatric care - do we communicate what we mean.** *Gerontologist* 1995, **35**(3):402-411.
62. Day JM: **Religion, Spirituality, and Positive Psychology in Adulthood: A Developmental View.** *J Adult Dev* 2010, **17**(4):215-229.
63. IWG: **Personal Wellbeing Index: 5th edition.** In. Melbourne: Australia Center on Quality of Life, Deakin University; 2013.
64. Rosenberg M, Schooler C, Schoenbach C: **Self-Esteem and Adolescent Problems: Modeling Reciprocal Effects.** *American Sociological Review* 1989, **54**(6):1004-1018.
65. Wu Y, Zuo B, Wen FF, Yan L: **Rosenberg Self-Esteem Scale: Method Effects, Factorial Structure and Scale Invariance Across Migrant Child and Urban Child Populations in China.** *Journal of Personality Assessment* 2017, **99**(1):83-93.
66. Khalaila R: **Depression statuses and related predictors in later life: A 10-year follow-up study in Israel.** *Eur J Ageing* 2016, **13**(4):311-321.
67. Blazer DG, Hybels CF: **Origins of depression in later life.** *Psychological Medicine* 2005, **35**(9):1241-1252.
68. Yesavage JA, Brink TL, Rose TL, Lum O, Huang V, Adey M, Leirer VO: **Development and validation of a geriatric depression screening scale - a preliminary-report.** *J Psychiatr Res* 1983, **17**(1):37-49.
69. Dow B, Lin X, Pachana NA, Bryant C, LoGiudice D, M.Y. Goh A, Haralambous B: **Reliability, concurrent validity, and cultural adaptation of the Geriatric Depression Scale and the Geriatric Anxiety Inventory for detecting depression and anxiety symptoms among older Chinese immigrants: an Australian study.** *International psychogeriatrics* 2017, **30**(5):735-748.
70. He J, Zhong X, Yao S: **Factor structure of the Geriatric Depression Scale and measurement invariance across gender among Chinese elders.** *Journal of Affective Disorders* 2018, **238**:136-141.

71. Rosseel Y: **lavaan: An R Package for Structural Equation Modeling.** *Journal of Statistical Software* 2012, **48**(2):36.
72. Fokkema M, Greiff S: **How Performing PCA and CFA on the Same Data Equals Trouble Overfitting in the Assessment of Internal Structure and Some Editorial Thoughts on It.** *European Journal of Psychological Assessment* 2017, **33**(6):399-402.
73. Hu CS, Huang J, Ferrari M, Wang Q, Xie D, Zhang H: **Sadder but wiser: Emotional reactions and wisdom in a simulated suicide intervention.** *International Journal of Psychology* 2018.
74. Kunzmann U, Baltes PB: **Wisdom-related knowledge: Affective, motivational, and interpersonal correlates.** *Personality and Social Psychology Bulletin* 2003, **29**(9):1104-1119.
75. Waterman AS: **2 conceptions of happiness: Contrasts of personal expressiveness (eudaimonia) and hedonic enjoyment.** *Journal of Personality and Social Psychology* 1993, **64**(4):678-691.

Appendix

Appendix. Factor structure and dimensionality of SAWS and BSAWS

Item	Webster et al. (2007)	Alves et al. (2014)	BSAWS
1 During my life I have already overcome many painful facts.	EXP	EXP	-
2 I easily adjust my emotions to the present situation.	ER	ESR	-
3 I often relate past with present situations.	RE	REF	-
4 I am able to laugh in embarrassment situations.	HU	MO	-
5 I love to read books that challenge me to think differently about many issues.	OP, HU	EXP	-
6 I have taken important decisions throughout my life.	EXP	EXP	EXP
7 When I take personal decisions I do not let myself take over by emotions.	ER	ESR	-
8 I often think about my own past.	RE	REF	-
9 There may be funny elements even in very difficult life's situations.	HU	MO	-
10 Besides my favourite kind of music I like to listen to other musical styles.	HU	MO	-
11 Throughout my life I have dealt with many types of people.	-	EXP	-
12 I am in tune with my own emotions.	ER, RE	ESR	-
13 I often dedicate myself to the remembering of past events.	RE	REF	-
14 When I face major life transitions I try and find a funny side.	ER, HU	MO	-
15 I love trying a variety of different ethnic foods.	-	OM	-
16 I have gone through various moral dilemmas.	EXP	OM	-
17 I am very good at interpreting my emotional states.	ER, RE	OM	-
18 Reviewing my past helps me to have a good perspective of my current concerns.	RE	REF	RE
19 I laugh easily.	HU	MO	-
20 I often try new things.	OP, HU	OM	-
21 I have met a lot of the negative side of life (e.g., dishonesty, hypocrisy...)	EXP	EXP	-
22 I can easily express my emotions without feeling like I am losing control of the situation.	ER	OM	ER
23 I often recall the past to see if I have changed since then.	RE	REF	RE
24 At this point in my life it is easy for me to laugh at my mistakes.	ER, HU	MO	-
25 Controversial works of art play an important and valuable role in society.	OP	OM	-
26 I went through many difficult changes throughout life.	EXP	EXP	-
27 I am good at identifying subtle emotions in myself.	ER, RE	OM	ER
28 Remembering my past helps me understand the important things in my life.	RE	REF	-
29 I often use humour to put other people at ease.	HU	MO	HU
30 I like being surrounded by people whose views are quite different from mine.	OP	MO	-
31 I discovered by myself that "not everything that shines is gold."	-	EXP	-
32 I am able to control my emotions when the situation demands it.	ER	ESR	-
33 I often notice that my past can be an important source of knowledge.	RE	REF	-
34 Now I know I can truly appreciate the little things in life.	OP	ESR	OP
35 I have a lot of curiosity to know more about other religions and other philosophies.	OP	ESR	-
36 I have learnt valuable life lessons with others.	-	EXP	EXP
37 It seems I have a certain gift to understand the emotions of others.	-	OM	-
38 Reliving past events increases my confidence to live today.	OP	REF	-
39 To comfort others I often make fool of me.	HU	MO	-
40 I wonder many times about the mysteries of life and what lies beyond death.	-	REF	RE

Note: ER: Emotion regulation; RE: Reminiscence; OP: Openness; EXP: Experience; HU: Humour (Webster et al. 2007); ESR: Emotional self-regulation; REF: Reflection; OM: Open-mindedness; EXP: Experience; MO: Mood (Alves et al. 2014)

Figures

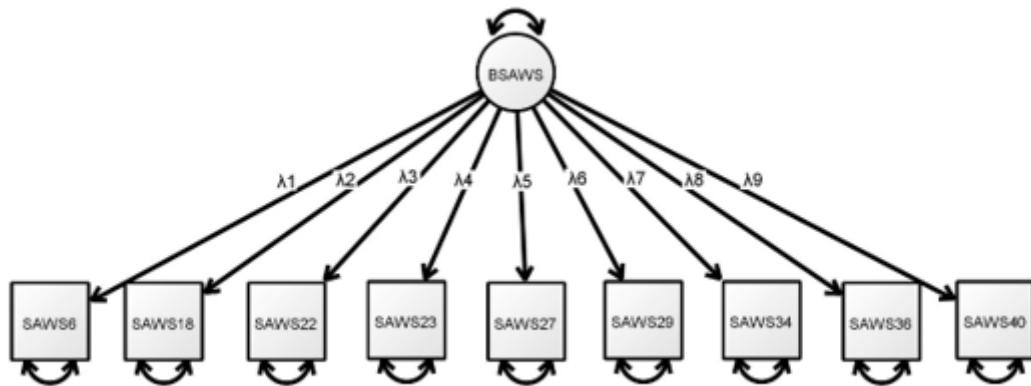


Figure 1

Estimated model of the nine-item BSAWS