Research Square

Preprints are preliminary reports that have not undergone peer review.
They should not be considered conclusive, used to inform clinical practice,
or referenced by the media as validated information.

A Comprehensive Psychometric Assessment of Spider Fear Scales in a Chinese Sample

Sam Lau

samlau@hkbu.edu.hk

Hong Kong Baptist University

Andras Zsido

University of Pecs

Marco Cheng

Hong Kong Baptist University

Jakub Polák

Ambis University

Research Article

Keywords: Spider Questionnaire (SPQ), Fear of Spiders Questionnaire (FSQ), Chinese, arachnophobia, fear, phobia, validation

Posted Date: June 5th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-9640601/v1

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

Additional Declarations: No competing interests reported.

Abstract

Background

Arachnophobia is among the most common specific phobias, yet validated tools for assessing spider fear remain limited in Chinese-speaking populations despite China's large population, rapid urbanisation, and increasing human–nature interactions. Establishing culturally adapted and psychometrically robust measures is therefore important for cross-cultural research and for understanding how demographic factors and nature connectedness relate to spider fear in Chinese contexts.

Methods

The Spider Questionnaire (SPQ) and Fear of Spiders Questionnaire (FSQ) were administered to 1,430 Chinese participants aged 18–51 years, recruited between August and September 2022. Psychometric evaluation involved parallel analysis, exploratory and confirmatory factor analyses, assessments of internal consistency, and construct validity testing. Various SPQ versions (SPQ-31, SPQ-15, SPQ-12, and modified forms) and FSQ versions were compared to identify the optimal instrument for measuring arachnophobia within this cultural context. Associations between spider fear, other animal fears, nature connectedness, and demographic variables were also examined.

Results

The unidimensional SPQ-12 demonstrated the best model fit and excellent reliability and validity among tested scales. Spider fear correlated positively with fear of snakes and other harmless animals and negatively with nature connectedness. Consistent with prior findings in Western countries, higher arachnophobia levels were observed among females and younger participants.

Conclusions

The SPQ-12 is a culturally validated and psychometrically sound tool for assessing spider fear in Chinese populations. Findings support an evolutionary basis for spider fear and highlight urbanisation's potential role in weakening human–nature connections globally.

1. Background

1.1. Prevalence of arachnophobia

Arachnophobia, defined as an intense and persistent fear of spiders, ranks the most prevalent specific phobias worldwide (Eaton et al. 2018). Specific phobias are characterised by excessive and enduring fear responses to particular stimuli, situations, or creatures (American Psychiatric Association, 2013).

Research has consistently shown that spiders provoke stronger feelings of fear and disgust in the general population than other arthropods, such as bees or wasps, or other small animals (Gerdes et al. 2009; Polák et al. 2020a). The prevalence of arachnophobia varies considerably across countries, with estimates ranging from 2.7% in the Netherlands (Oosterink et al. 2009), 3.5% in Sweden (Fredrikson et al. 1996), and between 8.1% and 9.5% in Hungary (Zsido 2017; Zsido et al., 2018), to as high as 10.3% in the Czech Republic (Polák et al. 2020b; Polák et al. 2022). Notably, higher rates of arachnophobia have been reported among women compared to men (Fredrikson et al. 1996), and among younger individuals relative to older cohorts (Polák et al. 2022).

Even the mere suspicion of a spider's presence within private living spaces can evoke profound emotional responses (de Jong et al. 2002). Spiders frequently elicit strong aversive reactions, including fear, disgust, and discomfort, in a majority of people (Polák et al. 2020a; de Jong et al. 2002; Mulkens et al. 1996). Those with arachnophobia often harbour fears related to injury, contamination, or dirt, which are commonly accompanied by feelings of disgust (Mulkens et al. 1996; Arntz et al. 1993). When confronted with spiders, affected individuals may exhibit a range of physiological and behavioural symptoms, such as screaming, crying, emotional dysregulation, respiratory difficulties, faintness, sweating, and increased heart rate (American Psychiatric Association, 2013). Despite the severity of these reactions, arachnophobia, like many specific phobias, frequently remains undiagnosed and untreated, as sufferers seldom seek professional help (Doctor et al. 2010).

1.2. Measurement of arachnophobia

Given the significant health implications associated with arachnophobia, accurately assessing its prevalence has become a crucial focus within epidemiological research and clinical practice (Muris and Merckelbach 1996; Hinze et al. 2021). The availability of a validated and reliable self-report instrument is essential for effectively screening the severity of arachnophobia.

The Spider Questionnaire (SPQ), originally developed by Klorman et al. (1974), is one of the most widely employed tools in clinical and psychiatric research (Zsido et al. 2018; Polák et al 2022; Mulkens et al. 1996; Fredrikson et al. 1983; Johnsen and Hungdahl 1990; Olatunji et al. 2009). The original SPQ comprises 31 dichotomous items designed to capture a unidimensional construct reflecting the intensity of arachnophobia. Each item describes various scenarios and emotional reactions related to spiders. The SPQ's reliability and validity have been supported across multiple studies (Zsido 2017; Fredrikson 1983; Johnsen and Hugdahl 1990). Nonetheless, certain limitations—such as its length and the inclusion of nine reverse-scored items—have prompted further refinement (Zsido et al. 2018). These efforts have resulted in shorter versions, notably the SPQ-15 (Olatunji et al 2009) and a Hungarian version of SPQ-12. Research by Zsido et al. (2018) and Polák et al. (2020) suggests that a cut-off score of seven or above on the SPQ-12 may indicate clinically relevant arachnophobia. It is important to note, however, that many validation studies have relied predominantly on confirmatory factor analysis (CFA) without incorporating exploratory factor analysis (EFA) (Polák et al. 2020; Zsido 2017; Zsido et al. 2018, 2022; Klorman et al. 1974; Fredrikson 1983; Olatunji et al. 2009). Moreover, the diversity of reliability and validity assessments

across studies has yielded inconsistent psychometric findings, highlighting certain limitations in the existingliterature.

The Fear of Spiders Questionnaire (FSQ), developed by Szymanski and O'Donohue in 1995, is another widely used instrument designed to assess the intensity of arachnophobia at the individual level. Comprising 18 items, the FSQ evaluates various dimensions of fear and avoidance behaviours associated with spiders. The questionnaire has consistently demonstrated strong psychometric properties, including high internal consistency, with Cronbach's alpha values typically ranging from 0.80 to 0.90, indicating reliable measurement of the underlying construct. Moreover, the FSQ exhibits good test–retest reliability, reflecting stability of scores over time (Muris and Merckelbach, 1996). Evidence of convergent validity is supported by positive correlations with other measures of spider fear and related constructs such as anxiety and disgust sensitivity (Mulkens et al. 1996). Furthermore,, the FSQ effectively discriminates between individuals with clinically significant arachnophobia and those without, underscoring its discriminant validity. Overall, the FSQ stands as a robust and valid tool for assessing fear of spiders, widely employed in both research and clinical contexts.

Table 1 summarises validation studies conducted the SPQ and FSQ instruments. Three versions of the SPQ were identified, including SPQ-31 (Zsido 2017; Klorman et al. 1974; Johnsen and Hugdahl 1990), SPQ-15 (Olatunji et al. 2009), and SPQ-12 (Zsido 2017). The sample size ranged from 223 to 1,555. Some of these studies adopted EFA, parallel analysis (PA), and/or CFA in the validation studies, where some adopted none.

Table 1
Summary of previous validation studies of the Spider Questionnaire and Fear of Spiders Questionnaire.

Sources	Language (Country)	Number of items	N	Modification to original scale	EFA and PA employed	CFA employed
SPQ-31						
Klorman et al. (1974)	English (US)	31	702	Original study	×	×
Fredrikson (1983)	Swedish (Sweden)	31	223	No modification	×	×
Zsido (2017)	Hungarian (Hungary)	31	850	No modification	×	×
SPQ-15						
Olatunji et al. (2009)	English (Netherland, US)	15	S_1 = 1555 S_2 = 50 S_3 = 116 S_4 = 61 S_5 = 30	Removed items 3, 6, 12, 14, 16–18, 20, 22–28, 30	×	✓
SPQ-12						
Zsido et al. (2018)	Hungarian (Hungary)	12	1354	Removed items 2, 6, 8, 11, 12, 14–20, 22–25, 27, 28, 31	×	✓
Polák et al. (2020b)	Czech (Czech Republic)	12	1797	Ditto	×	✓
FSQ						

Note. EFA = exploratory factor analysis; PA = parallel analysis; CFA = confirmatory factor analysis

Sources	Language (Country)	Number of items	N	Modification to original scale	EFA and PA employed	CFA employed
Szymanski and O'Donohue (1995)	English (US)	18	338	Original Study	✓	×
Booth et al. (2016)	Turkish (Turkey)	18	S_1 = 137	No modification	✓	×
Note. EFA = exploratory factor analysis; PA = parallel analysis; CFA = confirmatory factor analysis						

1.3. Arachnophobia of Chinese

Given the high prevalence of arachnophobia and its enduring cognitive and emotional consequences, alongside the associated economic burden, it is imperative to develop reliable screening instruments in widely spoken languages such as Chinese, which counts over 1.1 billion speakers worldwide. China, with its vast population of approximately 1.4 billion, expansive territory of 9.6 million square kilometres, considerable geographic diversity, and rich biodiversity, offers a distinctive setting for the study of arachnophobia. The country's rapid urbanisation has transformed its landscapes and intensified human–nature interactions, further underscoring the importance of understanding arachnophobia within this context. Research within the Chinese population promises to deepen insights into the mechanisms and correlates of spider fear amid a society undergoing swift environmental and social change. Notably, Zsido et al. (2022) have suggested that a strong sense of nature connectedness may serve as a protective factor against specific fears such as arachnophobia, while also fostering pro-environmental attitudes. Assessing the prevalence and characteristics of arachnophobia in China can therefore inform public health strategies, contribute to the mitigation of human–wildlife conflicts, and guide urban planning and environmental education initiatives.

1.4. Study Aim, Objectives and Hypotheses

The primary aim of the present study was to generate new data comparing the performance of several arachnophobia measures, to examine their factor structures, and to further validate the SPQ and FSQ within a large Chinese sample.

The availability of specific phobia questionnaires in multiple languages is vital for cross-cultural research, enabling a deeper understanding of arachnophobia across diverse cultural and environmental contexts (Zsido 2017). While the SPQ has been widely employed in Western countries such as Sweden (Fredrikson 1983), the Netherlands (Soeter and Kindt 2015), Hungary (Zsido 2017), and Czech Republic (Polák et al. 2022), there remains a notable absence of a reliable and validated instrument for assessing arachnophobia among Chinese speakers. Consequently, the development of Chinese versions of both the SPQ and FSQ is essential to facilitate research into arachnophobia within this population. Such

cross-cultural validation would also serve to stimulate further investigation and advance the field in China.

To address this notable gap in the literature, our primary objective was to translate and culturally adapt the Spider Questionnaire (SPQ) and Fear of Spiders Questionnaire (FSQ) into Chinese, subsequently evaluating their psychometric validity and reliability within a large Chinese sample. We aimed to establish normative benchmark values to facilitate the future application of these instruments and to contextualise the prevalence of spider fear in China relative to other cultural settings. A secondary objective was to examine the replicability of previously reported sex and age differences in arachnophobia, utilising a sizeable cohort from a cultural context hitherto unexplored in this regard.

Drawing on extant research, our first hypothesis (H1) anticipated that women participants would exhibit higher arachnophobia scores than men, reflecting their generally greater susceptibility to anxiety-related symptoms. The second hypothesis (H2) posited a decline in arachnophobia with advancing age, consistent with the notion that increased knowledge and life experience mitigate specific fears. Furthermore, building on the findings Zsido et al. (2022), which suggested that nature connectedness may serve as a protective factor against spider fear, our third aim was to investigate whether higher levels of nature connectedness similarly confer resilience against arachnophobia among Chinese individuals. The third hypothesis posited that greater nature connectedness would be inversely associated with arachnophobia severity.

2. Methods

2.1 Sampling and procedure

The online survey was created using the Qualtrics platform and distributed through multiple channels to reach a diverse community sample. The questionnaire was disseminated via email and social media channels (including Facebook, Instagram, and WhatsApp) by leveraging the established community networks affiliated with the first author's Research Centre for Environment and Human Health. Additionally, district councillors from all districts were invited to facilitate survey distribution among local residents. Eligible participants were Hong Kong residents aged 18 years or older who could read and understand Chinese. Informed consent was obtained from all respondents before participation, and the study was conducted anonymously.

All procedures adhered to the ethical standards set forth by relevant national and institutional committees on human research, in accordance with the Helsinki Declaration (1964, revised 2013). Ethical approval was granted by the research ethics committee of the first author's institution. Reporting of the study follows the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines to ensure transparency and completeness. The authors affirm that the manuscript provides an honest and accurate account of the research, with no significant omissions.

Sample size considerations were informed by established recommendations, which suggest that a minimum of 200 participants or a case-to-variable ratio exceeding 5:1 is adequate for validation studies (Memom et al. 2020). To enhance statistical power, we collected a substantially larger sample of 2,120. Data cleaning involved exclusion of invalid responses, including 609 incomplete surveys, 40 rapid completions (defined as survey completion in under eight minutes), 22 failed attention checks, and 19 duplicate entries, resulting in a final valid sample of 1,430. To assess test–retest reliability, a subset of 64 participants (aged 18 to 51 years; M = 25.17, SD = 7.57) were invited to complete the same battery of instruments approximately 70 days following their initial participation.

The entire sample was randomly split into six subsamples (1a, 1b, 2a, 2b, 3a, and 3b) (see Fig. 1). Subsamples coded “a” were used to conduct the EFA, and subsamples with code “b” were entered into the CFA.

2.2 Study setting: A highly urbanised city in China

The work was conducted between August and September 2022 in Hong Kong, a city situated in the south-eastern region of China. Hong Kong comprises 263 islands and boasts an extensive coastline stretching 1,178 kilometres. Covering an area of 1,118 square kilometres, the city is home to approximately 7.5 million residents (Census and Statistics Department 2024). With a population density of around 6,700 individuals per square kilometre, Hong Kong ranks among the most densely populated urban centres globally, with the majority of its inhabitants residing and working in high-rise buildings. Despite its highly urbanised character, Hong Kong’s landscape is marked by hilly terrain, with steep slopes accounting for over 20% of the total land area. Only 24% of the territory is developed, and a mere 7% is designated for residential use (Planning Department 2024). Consequently, a substantial portion of Hong Kong’s biodiverse land remains in a largely natural state. Nevertheless, the rapid development of available flat land has intensified human–wildlife interactions, often leading to conflicts within urban environments (Wierucka et al. 2023). The juxtaposition of dense urban living alongside expansive natural landscapes renders Hong Kong a particularly pertinent setting in which to explore arachnophobia within the Chinese context.

Measures

Demographic factors: This included the participants’ age and gender assigned at birth.

Spider Questionnaire (SPQ)

The SPQ (Klorman et al. 1974) was used to measure fear of spiders. We used three versions, including the original long version with 31 items, the medium length version with 15 items (Olatunji et al. 2009), and the short version with 12 items (Zsido 2017). Each question was scored on a dichotomous scale of 0 and 1. Participants were asked to report their fear in various scenarios related to spiders. A higher score indicates a higher level of fear. The internal consistency was excellent in this study (Cronbach’s α = 0.85–0.92, McDonald’s ω = 0.85–0.92).

Fear of Spiders Questionnaire (FSQ)

The FSQ consists of 18 questions that participants rate on a 7-point Likert scale (from 1 = Definitely disagree to 7 = Definitely agree) to assess arachnophobia (Szymanski and O'Donohue 1995). Szymanski and O'Donohue (1995) pointed out that the FSQ could be used to indicate a unique factor of arachnophobia, namely "fear of harm". A higher total score indicates a greater fear of harm from spiders. The internal consistency was excellent in this study (Cronbach's $\alpha = 0.96$, McDonald's $\omega = 0.96$).

The following instruments were used in the validation of both SPQ and FSQ:

Fear Survey Schedule (FSS): The FSS was used to measure fear of specific stimuli (Arrindell and Emmelkamp 1984). Items are rated on a 5-point Likert scale ranging from 1 (Never) to 5 (Always). In this study, we used two of the five subscales of FSS: Fear of Harmless Animals (ANI; 6 items; Cronbach's $\alpha = 0.85$, McDonald's $\omega = 0.84$) and Injury Fears (INJ; 12 items; Cronbach's $\alpha = 0.87$, McDonald's $\omega = 0.87$).

Snake Questionnaire (SNAQ)

The SNAQ is a 30-item self-report scale used to measure the cognitive–emotional component of fear of snakes (Klorman et al. 1974). It is a unidimensional scale using dichotomous responses (True, False). Each statement asks about the participants' concerns regarding snakes in various scenarios. "True" responses are summed to yield a score. Overall, a higher score indicates a higher level of fear of snakes. The internal consistency was excellent in this study (Cronbach's $\alpha = 0.92$, McDonald's $\omega = 0.92$).

Inclusion with Nature in Self (INS)

The INS was used to assess nature-connectedness through a single pictorial question (Schultz 2002). The scale shows a strong positive correlation with other tools that evaluate a person's connection with nature (Schultz 2002). It consists of seven sets of circles that vary in their degree of overlap. One circle is labelled "self", while the other is labelled "nature", and the degree of overlap ranges from 1 (Complete separation) to 7 (Complete overlap). Participants choose the circle set that best reflects their relationship with nature.

Cultural adaptation

Forward and backward translation was performed. The original scales were first translated from English into Chinese independently by two native bilingual speakers, followed by a meeting convened by the first author to resolve any discrepancies. Afterwards, a back-translation was performed independently by two other bilingual speakers. Subsequently, an expert review panel, including three environmental and three psychological experts, reviewed the original and back-translated versions. Revisions were made until a consensus was reached where semantic and conceptual equivalence were confirmed. A pilot study was conducted with 15 target participants to confirm the comprehensibility and clarify any ambiguities before the start of the main study. The English and Chinese translated versions of the SPQ and FSQ are

available in Supplementary Tables S1 and S2, respectively, and are available for use for research purposes.

Data analysis

Data analyses were performed using SPSS Statistics for Windows, version 29.0 (IBM Corp., Armonk, N.Y., USA), and the AMOS 29.0 statistic package. A *p*-value of less than 0.05 was considered statistically significant. We used descriptive statistics to present demographic characteristics, with mean values (*M*) and standard deviations (*SD*) for continuous variables, and frequencies for categorical variables. Normality was checked by computing skewness and kurtosis (George and Mallery 2010; Field 2009).

The CFA was carried out to verify the factor structure of the scales. If not confirmed, an EFA was conducted to examine the appropriate factor structure, and then a second CFA to confirm the revised structure. Before conducting EFA, the suitability of data for a factor analysis was checked using Bartlett's Test of Sphericity and the Kaiser-Meyer-Olkin (KMO) test. KMO values between 0.8 and 1.0 are considered good, and above 0.9 are considered excellent (Field 2009; Hutcheson and Sofroniou 1999; Baglin 2014). Scree plots and parallel analyses were used in the determination of the factor structure (Cattell 1966; Horn 1965). An item with a factor loading of 0.40 was recommended as a cut-off value to retain established items (Stevens 1992). Multiple model fit indices adopted in the CFA were as follows: the comparative fit index (CFI) and the Tucker–Lewis index (TLI) were both > 0.90; the root mean square error of approximation (RMSEA) and the standardised root mean squared residual index (SRMR) were both < 0.08 (Hu and Bentler 1998; Byrne 2001; Browne and Cudeck 1992). After the CFA, measurement invariance was examined by means of multi-group CFA models to demonstrate its generalisability across subgroups including sex and age groups. We tested configural, metric, and scalar invariance, using the recommended cutoffs of $\Delta CFI \leq |0.010|$, $\Delta RMSEA \leq |0.015|$, $\Delta SRMR \leq |0.030|$ (for metric invariance), and $\Delta SRMR \leq |0.015|$ (for scalar invariance).

Internal consistency reliability was assessed using Cronbach's alpha (α) and McDonald's omega (ω), based on a value ≥ 0.70 being taken as acceptable (Nunnally 1994). Construct reliability was tested by the item-to-total and item-to-item correlations. Test–retest reliability was examined using the Intraclass Correlation Coefficient (ICC) and Pearson correlation. An ICC of ≥ 0.70 indicates good (Prinsen et al. 2018) and ICCs > 0.80 indicate excellent test–retest reliability (Cicchetti 1994). Validity was tested based on the correlation with the subscales of the FSS (ANI and INJ), SNAQ, and INS. The correlation was interpreted as high for $r > 0.7$, moderate if $0.3 \leq r \leq 0.7$, and low for $r < 0.3$) (Akoglu 2018). Floor or ceiling effects were considered absent if less than 15% of participants achieved the lowest or highest scores (Bernstein et al. 2019). To evaluate the scales across various sociodemographic factors, we tested the demographic adaptation and compared the mean difference in those demographic groups using an independent *t*-test or one-way ANOVA test.

3. Results

3.1 Sample characteristics

The descriptive statistics for the participants are presented in Table 2. Our final sample has a broad age range (18–70 years, M = 26.9, *SD* = 10.48) and more women than men (72.0% vs 28.0%).

Table 2
Sample descriptive statistics.

	***N* (%)**			
	Total sample ***N* = 1,430**	**Sample 1** n_1 **= 478**	**Sample 2** n_2 **= 476**	**Sample 3** n_3 **= 476**
Age	*M* = 26.90, *SD* = 10.48	*M* = 27.25 *SD* = 11.19	*M* = 26.53 *SD* = 9.68	*M* = 26.90 *SD* = 10.51
18 to 20	420 (29.4%)	145 (30.3%)	125 (26.3%)	150 (31.5%)
21 to 30	688 (48.1%)	219 (45.8%)	254 (53.4%)	215 (45.2%)
31 or above	322 (22.5%)	114 (23.8%)	97 (20.4%)	111 (23.3%)
Gender assigned at birth				
Male	401 (28.0%)	132 (27.6%)	137 (28.8%)	132 (27.7%)
Female	1029 (72.0%)	346 (72.4%)	339 (71.2%)	344 (72.3%)

3.2 Analysing the questionnaires' factor structure

3.2.1 Confirmation of original structure

We first conducted a CFA to assess whether the Chinese version fitted the original structure of the three versions of the SPQs and FSQ. Table 3 shows the statistical results. SPQ-31, SPQ-15, and FSQ demonstrated an invalid fit of CFI and TLI (< 0.90). Only SPQ-12 was validated with an appropriate model fit (SRMR < 0.08, RMSEA < 0.08, CFI > 0.90, TLI > 0.90). Hence, the structure of the unidimensional SPQ-12 scale was confirmed, whereas SPQ-31, SPQ-15, and FSQ need to be further revised for a better model structure with the use of EFA.

Table 3
Results of the first confirmatory factor analysis (N = 1,430, n_1 = 478, n_2 = 476, n_3 = 476).

Scale	Items	Sample (*n*)	SRMR	RMSEA	CFI	TLI
SPQ-31	31	1 (n_1 = 478)	0.070	0.072	0.832	0.762
SPQ-15	15	2 (n_2 = 476)	0.059	0.081	0.885	0.866
SPQ-12	12	3 (n_3 = 476)	0.045	0.066	0.931	0.916
FSQ	18	1,430	0.062	0.114	0.873	0.889

Note. SPQ = Spider Questionnaire; FSQ = Fear of Spiders Questionnaire; SRMR = the standardised root mean squared residual index; RMSEA = the root mean square error of approximation; CFI = comparative fit index; TLI = Tucker–Lewis index

3.2.2 Revision of SPQ-31, SPQ-15, and FSQ

Exploratory factor analysis

The skewness and kurtosis of the SPQ and FSQ were mostly found to be within the acceptable limits of ± 2.00, and ± 7.00, except items 1, 24, and 29 of the SPQ (see Supplementary Table S3). Overall, a normal distribution was assumed after item exclusion. The EFA was conducted through a principal component analysis with Varimax rotation for exploring a more suitable factor structure of SPQ-31 and SPQ-15. We excluded items 24 and 29 from SPQ-31, and items 1 and 29 from SPQ-15, as they failed to meet normality requirements. The scree test and parallel analysis showed that SPQ-31 gave the best model structure with three factors, SPQ-15 with a unidimensional factor structure, and the FSQ with a two-factor solution (see Supplementary Fig. S1 and Supplementary Table S4). We then conducted EFAs based on the previous results for both versions. For SPQ-31, the first EFA revealed 45.05% of the total variance and removed seven cross-loading items (items 2, 9, 19, 21, 25, 26, 28). Then, the second EFA revealed an increased total variance of 46.86% and identified two cross-loading items (items 13, 31). Besides that, the statements of item 4 (“I dislike looking at pictures of spiders in a magazine”) and 15 (“I shudder when I think of spiders”) were found to be not consistent with the other statements and thus removed. The third EFA was therefore conducted; this revealed a 3-factor structure with 46.78% of the total variance explained (KMO = 0.86, Barlett’s test of sphericity $\chi^2_{(153)}$ = 1153.26, p < 0.01). We refer to this scale as SPQ-18 from here on. SPQ-18 has three components: “Aggravating visualisation (AgV)” (items 5, 7, 8, 10, 11, 30), which refers to anxiety and emotional discomfort when imagining or visualising spiders; “Appreciating (Apr)” (items 6, 12, 14, 16, 17, 27), which describes normalising spiders that pose no threat and regarding them as attractive; and “Avoiding interaction (Avl)” (items 1, 3, 18, 20, 22, 23), which indicates individuals do not like having any interaction with spiders, especially touch. For SPQ-15, after removing items 1 and 31 due to non-normality, the first-time EFA result revealed an acceptable unidimensional factor structure with 13 items and a total of 43.81% variance explained (KMO = 0.86, Barlett’s test of sphericity $\chi^2_{(153)}$ = 1153.26, p < 0.01). We refer to this scale as SPQ-13 from here on.

In addition, we conducted EFAs of the FSQ. The first attempt indicated that the factor structure explained 67.46% of the total variance but found five cross-loading items (items 3, 5, 6, 9, 13). With these five items removed, the second attempt revealed an acceptable model solution of FSQ-13 with an increased total variance of 70.03% explained (KMO = 0.95, Barlett's test of sphericity $\chi^2_{(78)} = 7946.39$, $p < 0.01$). FSQ-13 has two components: "avoidance/help seeking behaviours" (items 1, 8, 10, 11, 12, 14, 15, 16, 17, 18) and "fear of harm" (items 2, 4, 7). All factor loadings of the three newly developed versions (SPQ-18, SPQ-13, and FSQ-13) were above 0.4 (SPQ-18: 0.428–0.776; SPQ-13: 0.500–0.780; FSQ-13: 0.654–0.916, see Supplementary Table S5 for the factor loadings).

Confirmatory factor analysis

After EFA, we conducted CFA to assess the model fit of the three newly developed versions, SPQ-18, SPQ-13, and FSQ-13. The model fit statistics of these versions, together with that of SPQ-12, are presented in Table 4. Overall, the three SPQ versions showed good model indices (SRMR < 0.08, RMSEA < 0.08, CFI > 0.90, TLI > 0.90), with SPQ-12 having better model fit and hence better structural validity compared with SPQ-18 and SPQ-13. FSQ-13 demonstrated an acceptable CFI, TLI, and SRMR fit, but FSQ-13 showed a poor RMSEA fit (RMSEA = 0.085).

Table 4
Model fit statistics of confirmatory factor analysis.

SPQ-31	Number of items in the original version	Revised version	Number of items in the revised version	Subsample (*n*)	SRMR	RMSEA	CFI	TLI
	31	**SPQ-18**	**18**	**1b (n_{1b} = 239)**	**0.060**	**0.056**	**0.900**	**0.890**
SPQ-15	15	SPQ-13	13	2b (n_{2b} = 238)	0.058	0.066	0.910	0.900
SPQ-12	12	/	/	3 (n_3 = 476)	0.045	0.066	0.931	0.916
FSQ	18	FSQ-13	13	4b (n_{4b} = 715)	0.039	0.085	0.958	0.949

Note. SPQ = Spider Questionnaire; FSQ = Fear of Spiders Questionnaire; SRMR = the standardised root mean squared residual index; RMSEA = the root mean square error of approximation; CFI = comparative fit index; TLI = Tucker–Lewis index

3.3 Psychometric evaluations of SPQ-12, SPQ-18, SPQ-13, and FSQ-13

To gain a more comprehensive understanding of the scale performance of SPQ-12 and the three newly developed scales (SPQ-18, SPQ-13, and FSQ-13), further psychometric evaluations were conducted as

follows.

3.3.1 Measurement invariance

We conducted multi-group CFA analysis to evaluate the invariance across the sex and age groups of SPQ-12 and the three newly developed versions (SPQ-18, SPQ-13, and FSQ-13). All statistical results are presented in Supplementary Table S6. Based on the criteria of |ΔSRMR| ≤ 0.030, |ΔRMSEA| ≤ 0.015, and |ΔCFI| ≤ 0.010 for metric invariance, and |ΔSRMR| ≤ 0.015 for scalar invariance, with the exception of an issue regarding the scalar invariance of SPQ-13 (with |ΔSRMR| being 0.0265), the results showed that the measurement was generally consistent across the sex and age groups.

3.3.2 Reliability analysis and construct validity

All four versions had excellent internal consistency reliability with Cronbach α and McDonald ω values greater than 0.80 (see Supplementary Table S7). We found acceptable construct validity by the item-to-item correlations (see Supplementary Table S8–S11). All four versions and their subscales had excellent ICCs (0.81–0.97) and strong correlations (0.71–0.90), indicating good test–retest reliability (see Supplementary Table S12).

3.3.3 Concurrent and discriminant validity

All versions of the SPQ and FSQ had acceptable concurrent validities with the other constructs employed, performing consistently significant positive correlations (Supplementary Table S13 presents the correlational values). We found that all versions of the SPQ and FSQ were positively associated with fear of harmless animals and injury and fear of snakes, suggesting concurrent validity. Conversely, they were negatively associated with the INS scale, suggesting discriminant validity. These indicate that higher levels of arachnophobia are associated with higher levels of harmless animal fear, fear of injuries, and fear of snakes, as well as lower levels of nature-connectedness.

3.3.4 Floor and ceiling effects

The results showed that SPQ-18, SPQ-13, SPQ-12, and FSQ-13 showed acceptable normality and had no floor (values ranged between 0.4–10.1%) or ceiling effects (values ranged between 0.6–4.2%) (see Supplementary TableS14).

3.4 Association of the four versions with demographic data

To explore an association between each of the arachnophobia questionnaires and demographic factors, we extended the analyses to report the mean difference between the three versions of SPQ and FSQ-13 with age and sex. The statistical results indicated that females scored higher than males (on SPQ-18, SPQ-18AgV, SPQ-13, SPQ-12, FSQ-13, and FSQ-13 factor 1, *p*s < 0.01). Furthermore, younger people showed higher levels of fear of spiders than older individuals on all scales (*p*s < 0.05–0.01), except for SPQ-18Apr. All statistical results and central tendencies are presented in Supplementary Table S15.

4. Discussion

The present study evaluated the psychometric properties of several widely used measures of arachnophobia, including the SPQ in its three versions (SPQ-31, SPQ-15, and SPQ-12) as well as the FSQ —within a large Chinese sample. Among these, the unidimensional SPQ-12 demonstrated the best model fit, allowing us to retain its original structure and items without modification. In contrast, challenges emerged during the adaptation of the other versions. Specifically, the SPQ-31 and SPQ-15 required modification, resulting in the development of the SPQ-18 and SPQ-13, respectively, while the FSQ was similarly revised to an FSQ-13. These findings align with prior validation research (Olatunji et al., 2009), which highlighted concerns regarding the stability and psychometric robustness of the original 31-item SPQ, particularly relating to the reverse-scored items that have consistently exhibited poor measurement properties (Lindwall et al. 2012).

Based on multiple model fit indices from the CFA, each of SPQ-12, SPQ-18, and SPQ-13 showed good model fit, while FSQ-13 exhibited only partial model fit. Among the three SPQ versions, SPQ-12 demonstrated superior model fit and hence structural validity in comparison with SPQ-18 and SPQ-13. Further psychometric evaluations of SPQ-12, SPQ-18, SPQ-13, and FSQ-13 showed that all four versions demonstrated excellent internal reliability (α = 0.83–0.89; ω = 0.83–0.89) and test–retest reliability (ICC = 0.91–0.95), with no floor and ceiling effect. The four versions also showed good concurrent validity, as indicated by a positive and moderate correlation with fear of harmless animals, injury, and snakes. The results demonstrated that individuals with a fear of spiders were also likely to correspond to van Overveld et al.'s (2006) notion that fear of spiders was associated with blood-injury phobia (see also Arntz et al. 1993; Mulkens et al. 1996). In addition, the four versions displayed discriminant validity, evidenced by their negative association with nature-connectedness. These findings indicate that higher levels of arachnophobia are linked to higher levels of harmless animal fear, fear of injuries, and fear of snakes, while being inversely associated with lower levels of nature-connectedness, suggesting that our Chinese participants were predisposed to phobic responses towards animals in general, which could be mitigated by their connectedness with nature.

Among the four versions, our findings showed that the unidimensional SPQ-12 is the most reliable screening tool for arachnophobia in our Chinese sample, confirmed by favourable model fit indices, high internal consistency, strong test–retest reliability, and robust construct validity measures. Being a brief scale, SPQ-12 demonstrated no deterioration in its relative predictability paired with its advantage of using the fewest scale items, irrespective of the language used to collect data or any cultural considerations.

Our study also examined the demographic differences in arachnophobia based on age and sex. The results showed that females and younger adults tend to experience greater fear of spiders compared with males and older people, respectively. This is consistent with previous results (Zsido 2017; Zsido et al. 2018; Polák et al. 2022; Fredrikson et al. 1983; Soeter and Kindt 2015). However, it is important to note that our developed scales (SPQ-18, SPQ-13, SPQ-12, and FSQ-13) were specifically designed for the

Chinese population and their fear of spiders. Future studies may need to validate the scales with physiological arousal levels among individuals with diagnosed arachnophobia in Chinese culture (Woody and Teachman 2000). Furthermore, the rich biodiversity of the country offers a unique opportunity for future studies to investigate whether geographic aspects and past experiences with venomous and harmless snake species of a given area could simultaneously extinguish arachnophobia (see, e.g., Coelho et al. 2021) to confirm the relationship between the correlated phobias in our study. These are still open questions, not answered by previous studies, that may have an impact on treatment and intervention.

Our study revealed that higher levels of arachnophobia are associated with lower levels of nature-connectedness. It underscores the importance of nature-connectedness as a possible protective factor against arachnophobia. Interventions designed to increase nature-connectedness, such as spending more time in green spaces, have been reported to reduce fear responses towards spiders (Zsido et al. 2022). It is important to note that cultural beliefs and attitudes towards spiders between urban and rural populations in China may differ significantly, and these differences could influence the prevalence and treatment of arachnophobia. Therefore, future research should also focus on investigating these cultural aspects in association with the effects of urbanisation and nature-connectedness. The variation of owned green space is also a factor to study in China. Whether people living in urbanised or rural areas have differing arachnophobia responses would be worth studying. According to the National Bureau of Statistics of China (National Bureau of Statistics of China 2023), data from 2022 have shown an increasing trend in the urban population, meaning more people are moving away from natural into concrete environments. This shift could potentially have a significant impact on the prevalence and intensity of fearful reactions towards spiders. Urbanisation, with its reduced exposure to natural environments, could result in an increase in arachnophobia due to the unfamiliarity and perceived threat of spiders (Mulkens et al. 1996; Lemelin and Yen 2015) and the richness of spider fauna (Theodorou 2022). A phenomenon known as a reduced contact with nature and its diverse species might contribute to an inflated fear response (Zsido et al. 2022; Soga et al. 2023). As such, urbanisation could be a potential risk factor for the development or exacerbation of arachnophobia, which is a point that needs to be investigated in more depth.

Strengths and limitations

A key strength of this study lies in its substantial sample size, which notably exceeds those of many prior validation efforts (White 2022), alongside the adoption of validated instruments such as the FSS-ANI, FSS-INJ, SNAQ, and INS. The adoption of an online survey methodology facilitated the efficient collection of data from a large cohort within a relatively short timeframe. Nevertheless, several limitations warrant consideration. Our sample was confined to adults aged 18 and over residing in a single, highly urbanised Chinese city, thereby excluding children, rural populations, and inhabitants of other regions across China. Additionally, the sample comprised few males (28.0%), which may have implications for the generalisability of our findings, given evidence that males typically report lower levels of spider fear compared to females (Gerdes et al. 2009). Future validation studies would benefit from recruiting a more

demographically representative sample, adequately balanced across sex. It is also possible that individuals with pronounced arachnophobia opted not to participate, potentially leading to an underestimation of prevalence rates. Furthermore, reliance on self-report measures introduces the risk of under-reporting due to social desirability or other biases. We did not include a clinical sample formally diagnosed with arachnophobia in the validation of the SPQ and FSQ scales. This reflects the broader challenge posed by the limited availability of specialised healthcare infrastructure for diagnosing arachnophobia within Chinese clinical settings. In light of this, the development of the SPQ-12 as a validated, culturally appropriate instrument represents a valuable and accessible tool for both research and potential clinical application. Future research should seek to validate this measure within clinical populations to ascertain its utility in psychiatric and therapeutic contexts.

5. Conclusion

This study has validated the SPQ-12 as a psychometrically robust instrument for assessing arachnophobia within the Chinese population. Given China's considerable demographic heterogeneity and the ecological diversity across its regions, future research employing the SPQ-12 with such a broad and hitherto underexplored sample holds considerable promise for elucidating the underlying mechanisms of arachnophobia. This advancement opens avenues for rigorous investigations into the prevalence of spider fear across diverse Chinese subpopulations, as well as for the systematic evaluation of therapeutic interventions tailored to this context. In alignment with findings from Western populations, our results substantiate the hypothesis of a universal evolutionary substrate underpinning arachnophobia, whilst also highlighting the pervasive impact of urbanisation in diminishing human–nature connectedness within China. A more nuanced comprehension of the interplay between urban development, nature connectedness, and culturally mediated attitudes towards spiders is imperative for informing the design of more effective preventative and remedial strategies for this condition.

Declarations

Ethics approval and consent to participate

The study protocol was approved by the research ethics committee of Hong Kong Baptist University (REC/21-22/0551). All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards. Written informed consent was obtained from all individual participants included in the study.

Consent for publication

All participants have consented to the publication of their unidentifiable data in journal article.

Availability of data and materials

The data used in this study will be made available (from an OSF link) upon publication.

Competing interests

The authors have no relevant financial or non-financial interests to disclose.

Funding

This study was funded by the Research Grant Council, Hong Kong, China (UGC/IDS(R) 23/20). The publication fee was covered by Department of Psychology and Social Sciences, Ambis University.

Authors contributions

Sam SS Lau: Conceptualisation, Study Design, Methodology. Research administration, Data Collection, Data analysis, Supervision, Funding, Writing – original draft preparation; Writing – review and editing; Marco CH Cheng: Data analysis; Andras N Zsido: Conceptualisation, Writing – review and editing; Jakub Polák: Conceptualisation, Funding, Writing – review and editing. All authors read and approved the final manuscript.

References

1. Akoglu H. User's guide to correlation coefficients. Turk J Emerg. 2018;18(3):91–3. https://doi.org/10.1016/j.tjem.2018.08.001.
2. American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 5th ed. Washington: American Psychiatric Publishing; 2013.
3. Arrindell WA, Emmelkamp PM. Phobic dimensions: I. Reliability and generalizability across samples, gender and nations: The fear survey schedule (FSS-III) and the fear questionnaire (FQ). Adv Behav Res Ther. 1984;6(4):207–53.
4. Arntz A, Lavy E, Van den Berg G, Van Rijsoort S. Negative beliefs of spider phobics: A psychometric evaluation of the Spider Phobia Beliefs Questionnaire. Adv Behav Res. 1993;15:257–77.
5. Baglin J. Improving your exploratory factor analysis for ordinal data: A demonstration using FACTOR. PARE. 2014;19:1–14.
6. Bernstein DN, Houck JR, Hammert WC. A comparison of PROMIS UE versus PF: Correlation to PROMIS PI and depression, ceiling and floor effects, and time to completion. J Hand Surg Am. 2019;44(10):901. https://doi.org/10.1016/j.jhsa.2018.12.006. .e1-901.e7.
7. Browne MW, Cudeck R. Alternative ways of assessing model fit. Sociol Methods Res. 1992;21:230–58. https://doi.org/10.1177/0049124192021002005.
8. Byrne BM. Structural equation modeling with Amos: Basic concepts, applications, and programming. Mahwah: Lawrence Erlbaum Associates; 2001.
9. Cattell RB. The scree test for the number of factors. Multivar Behav. 1966;1(2):245–76.

10. Census and Statistics Department. (2024) Population estimates [Internet]. Hong Kong SAR Government. https://www.censtatd.gov.hk/en/scode150.html Accessed 17 April 2024.
11. Cicchetti DV. Guidelines, criteria, and rules of thumb for evaluating normed and standardized assessment instruments in psychology. Psychol Assess. 1994;6(4):284–90. https://doi.org/10.1037/1040-3590.6.4.284.
12. Coelho CM, Polák J, Suttiwan P, Zsido AN. Fear inoculation among snake experts. BMC Psychiatry. 2021;21(1):539. https://doi.org/10.1186/s12888-021-03553-z.
13. de Jong PJ, Muris P. Spider phobia: Interaction of disgust and perceived likelihood of involuntary physical contact. J Anxiety Disord. 2002;16:51–65. https://doi.org/10.1016/s0887-6185(01)00089-5.
14. Doctor RM, Kahn AP, Adamec CA. The encyclopedia of phobias, fears, and anxieties. 3rd ed. New York: Infobase Publishing; 2010.
15. Eaton WW, Bienvenu OJ, Miloyan B. Specific phobias. Lancet Psychiatry. 2018;5(8):678–86.
16. Field A. Discovering statistics using SPSS: Introducing statistical method. 3rd ed. Thousand Oaks: Sage; 2009.
17. Fredrikson M, Annas P, Fischer H, Wik G. Gender and age differences in the prevalence of specific fears and phobias. Behav Res Ther. 1996;34(1):33–9.
18. Fredrikson M. Reliability and validity of some specific fear questionnaires. Scand J Psychol. 1983;24(4):331–4. https://doi.org/10.1111/j.1467-9450.1983.tb00507.x.
19. George D, Mallery M. SPSS for Windows step by step: A simple guide and reference 17.0 update. 10th ed. Boston: Pearson; 2010.
20. Gerdes AB, Uhl G, Alpers GW. Spiders are special: Fear and disgust evoked by pictures of arthropods. Evol Hum Behav. 2009;30:66–73. https://doi.org/10.1016/j.evolhumbehav.2008.08.005.
21. Hinze J, Röder A, Menzie N, Müller U, Domschke K, Riemenschneider M, Noll-Hussong M. Spider phobia: Neural networks informing diagnosis and (virtual/augmented reality-based) cognitive behavioral psychotherapy—A narrative review. Front Psychiatry. 2021;12:704174. https://doi.org/10.3389/fpsyt.2021.704174.
22. Horn JL. A rationale and test for the number of factors in factor analysis. Psychometrika. 1965;30(2):179–85. https://doi.org/10.1007/BF02289447.
23. Hu LT, Bentler PM. Fit indices in covariance structure modeling: Sensitivity to underparameterized model misspecification. Psychol Methods. 1998;3(4):424–53. https://doi.org/10.1037/1082-989X.3.4.424.
24. Hutcheson G, Sofroniou N. The Multivariate Social Scientist: Introductory Statistics Using Generalized Linear Models. Thousand Oaks, CA: Sage; 1999. https://doi.org/10.4135/9780857028075.
25. Johnsen BH, Hugdahl K. Fear questionnaires for simple phobias: Psychometric evaluations for a Norwegian sample. Scand J Psychol. 1990;31(1):42–8. https://doi.org/10.1111/j.1467-

9450.1990.tb00800.x.

26. Klorman R, Weerts TC, Hastings JE, Melamed BG, Lang PJ. Psychometric description of some specific-fear questionnaires. Behav Ther. 1974;5(3):401–9.
27. Memon M, Ting H, Cheah JH, Ramayah T, Chuah F, Cham TH. (2020) Sample Size for Survey Research: Review and Recommendations. JASEM 4(2):i-xx. https://doi.org/10.47263/JASEM.4(2)01
28. Mulkens SA, de Jong PJ, Merckelbach H. Disgust and spider phobia. J Abnorm Psychol. 1996;105:464–8. https://doi.org/10.1037/0021-843X.105.3.464.
29. Muris P, Merckelbach H. A comparison of two spider fear questionnaires. J Behav Ther Exp Psychiatry. 1996;27(3):241–4.
30. National Bureau of Statistics of China. Annual Data of Population. https://data.stats.gov.cn/easyquery.htm?cn=C01. Accessed 17 April 2024.
31. Nunnally JC. (1994) Psychometric Theory (3rd ed). Tata McGraw-Hill Education, New York. https://books.google.com.hk/books?id=_6R_f3G58JsC. Accessed 17 April 2024.
32. Lemelin RH, Yen A. Human-Spider Entanglements: Understanding and Managing the Good, the Bad, and the Venomous. Anthrozoos. 2015;28(2):215–28. https://doi.org/10.2752/089279315X14219211661697.
33. Lindwall M, Barkoukis V, Grano C, Lucidi F, Raudsepp L, Liukkonen J, Thøgersen-Ntoumani C. Method effects: The problem with negatively versus positively keyed items. J Pers Assess. 2012;94(2):196–204. https://doi.org/10.1080/00223891.2011.645936.
34. Olatunji BO, Woods CM, de Jong PJ, Teachman BA, Sawchuk CN, David B. Development and initial validation of an abbreviated Spider Phobia Questionnaire using item response theory. Behav Ther. 2009;40(2):114–30. https://doi.org/10.1016/j.beth.2008.04.002.
35. Oosterink FM, De Jongh A, Hoogstraten J. Prevalence of dental fear and phobia relative to other fear and phobia subtypes. Eur J Oral Sci. 2009;117(2):135–43.
36. Planning Department. (2024) Land Utilization in Hong Kong. Planning Department of Hong Kong SAR Government. https://www.pland.gov.hk/pland_en/info_serv/open_data/landu/. Accessed 17 April 2024.
37. Polák J, Rádlová S, Janovcová M, Flegr J, Landová E, Frynta D. Scary and nasty beasts: Self-reported fear and disgust of common phobic animals. Br J Psychol. 2020a;111(2):297–321. https://doi.org/10.1111/bjop.12409.
38. Polák J, Sedláčková K, Landová E, Frynta D. (2020b) Faster detection of snake and spider phobia: Revisited. Heliyon, 6(5).
39. Polák J, Sedláčková K, Janovcová M, Peléšková Š, Flegr J, Vobrubová B, Frynta D, Landová E. Measuring fear evoked by the scariest animal: Czech versions of the Spider Questionnaire and Spider Phobia Beliefs Questionnaire. BMC Psychiatry. 2022;22:18. https://doi.org/10.1186/s12888-021-03672-7.

40. Prinsen CA, Mokkink LB, Bouter LM, Alonso J, Patrick DL, De Vet HC, Terwee CB. COSMIN guideline for systematic reviews of patient-reported outcome measures. Qual Life Res. 2018;27:1147–57. https://doi.org/10.1007/s11136-018-1798-3.
41. Schultz PW. Inclusion with Nature: The Psychology of Human-Nature Relations. In: Schmuck P, Schultz PW, editors. Psychology of Sustainable Development. Boston: Springer; 2002. pp. 61–78.
42. Stevens JP. Applied multivariate statistics for the social sciences. 2nd ed. Hillsdale: Erlbaum; 1992.
43. Soeter M, Kindt M. Retrieval cues that trigger reconsolidation of associative fear memory are not necessarily an exact replica of the original learning experience. Front Behav Neurosci. 2015;9:122. https://doi.org/10.3389/fnbeh.2015.00122.
44. Soga M, Gaston KJ, Fukano Y, Evans MJ. The vicious cycle of biophobia. Trends Ecol Evol. 2023;38(6):512–20. https://doi.org/10.1016/j.tree.2023.02.007.
45. Szymanski J, O'Donohue W. Fear of Spiders Questionnaire. J Behav Ther Exp Psychiatry. 1995;26(1):31–4. https://doi.org/10.1016/0005-7916(94)00072-t.
46. Theodorou P. The effects of urbanisation on ecological interactions. Curr Opin Insect Sci. 2022;52:100922. https://doi.org/10.1016/j.cois.2022.100922.
47. van Overveld WJM, de Jong PJ, Peters ML, Cavanagh K, Davey GCL. Disgust propensity and disgust sensitivity: Separate constructs that are differentially related to specific fears. Pers Indiv Differ. 2006;41:1241–52.
48. White M. Sample size in quantitative instrument validation studies: A systematic review of articles published in Scopus, 2021. Heliyon. 2022;8(12):e12223. https://doi.org/10.1016/j.heliyon.2022.e12223.
49. Wierucka K, Hatten CER, Murphy D, Allcock JA, Andersson AA, Bojan JWN, Dingle C. Human-wildlife interactions in urban Asia. Glob Ecol Conserv. 2023;46:e02596. https://doi.org/10.1016/j.gecco.2023.e02596.
50. Woody SR, Teachman BA. Intersection of disgust and fear: Normative and pathological views. Clin Psychol-Sci Pr. 2000;7(3):291–311.
51. Zsido AN. The spider and the snake - A psychometric study of two phobias and insights from the Hungarian validation. Psychiatry Res. 2017;257:61–6. https://doi.org/10.1016/j.psychres.2017.07.024.
52. Zsido AN, Arato N, Inhóf O, Janszky J, Darnai G. Short versions of two specific phobia measures: The snake and the spider questionnaires. J Anxiety Disord. 2018;54:11–6.
53. Zsido AN, Coelho CM, Polák J. Nature relatedness: A protective factor for snake and spider fears and phobias. People Nat. 2022;4:669–82.

Figures

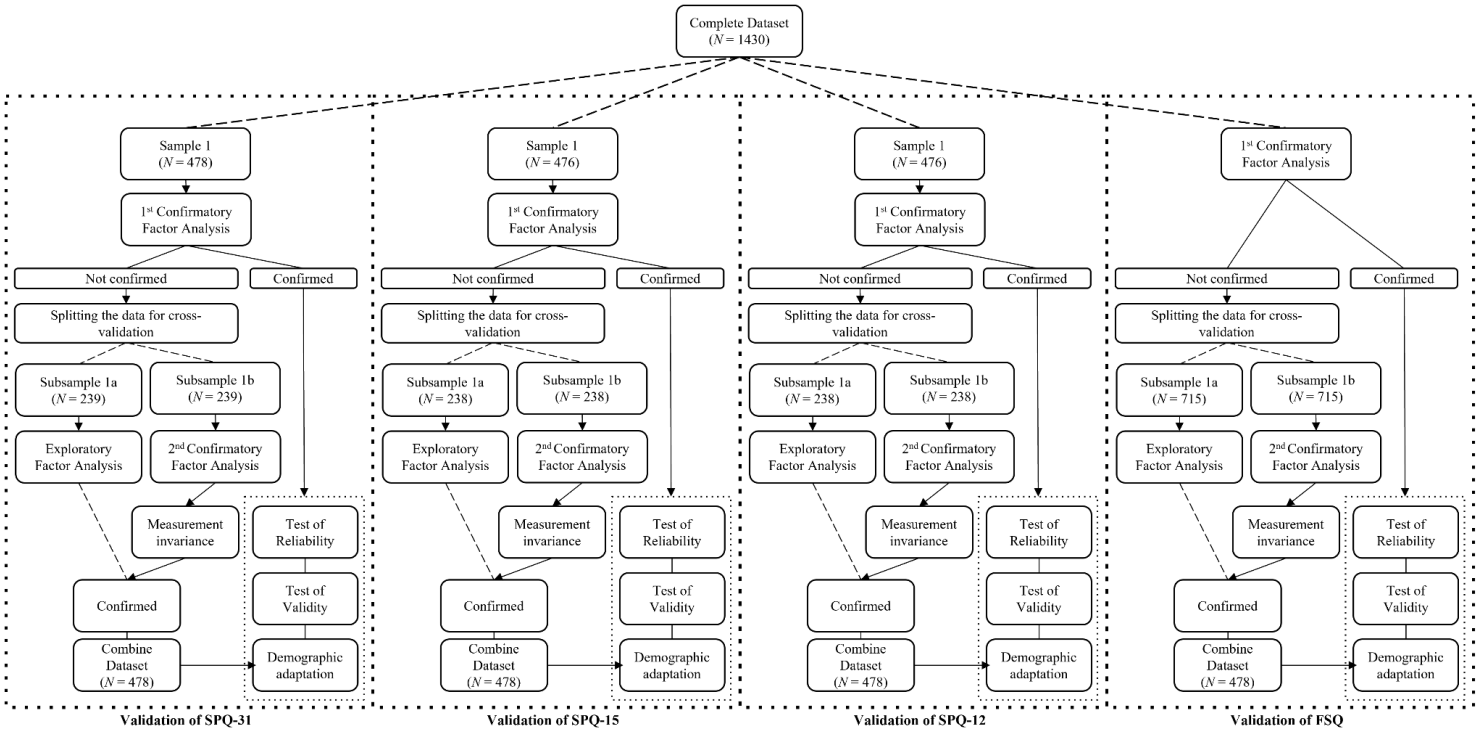

Figure 1

Flow chart of the validation procedures of the Spider Questionnaire and Fear of Spiders Questionnaire.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- Spidersupplements.docx