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Evaluating a new scale for infertility psychological distress: psychometric evidence from China

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Abstract

Background China currently does not have a suitable tool to measure infertility-related psychological distress in a culturally relevant manner. Therefore, this study sought to develop and validate a scale specifically designed for the Chinese context, focusing on the unique cultural and psychological experiences of Chinese women undergoing IVF-ET treatment.

Methods A mixed-methods approach was used for scale development. The preliminary scale was based on a previous Grounded theory study and existing literature. Content validity was assessed using the Delphi method. Psychometric testing involved 600 women undergoing IVF-ET treatment in Hubei, China. Item analysis, exploratory factor analysis (EFA), and confirmatory factor analysis (CFA) were conducted for scale refinement and validity assessment.

Results The final scale consists of 25 items across 2 dimensions and 6 sub-dimensions: Distress of disrupting the former self (distress of self-worth questioning, distress of strained family relationships, distress of female image deficit) and Distress linked to the struggling present self (distress of inadequate reproductive self-efficiency, distress of maintaining family relationships, distress of social identity expansion). CFA confirmed a good fit for the 6-factor model. Cronbach's alpha was 0.944 for the total scale, and 0.856 to 0.925 for the dimensions. Content validity was strong (I-CVI = 0.80–1.0, S-CVI = 0.98). The scale showed good criterion-related validity with a significant correlation ($r = 0.528$, $p < 0.001$) to the Kessler-6.

Conclusion The Infertility Psychological Distress Scale demonstrates strong reliability and validity, accurately capturing the psychological distress experienced by women undergoing assisted reproduction in the Chinese cultural context.

Clinical trial number Not applicable.

Keywords Infertility, Psychological distress, Assisted reproduction treatment, Measurement, Scale

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Introduction

Infertility affects 17.5%~18% of reproductive-age individuals [1, 2]. Infertility psychological distress is highly prevalent (affecting 20–70% of patients) [3, 4], particularly among women [5], and manifests as frustration, hopelessness, fear, guilt, loneliness, impaired self-concept, anxiety, depression [4, 6] and even severe mental health disorders [7]. While assisted reproductive technology (ART) offers hope, unsuccessful treatments can exacerbate this distress [5]. This compounded distress can lower quality of life and psychological well-being [8], cause irrational treatment discontinuation [9], reduce treatment success rates [10], and threaten intimate relationships, contributing to marital discord [11, 12].

Due to its profound impact, infertility psychological distress has garnered widespread attention from scholars with many scales being developed and validated to quantify it. Some scholars have measured infertility-related stress to reflect the level of psychological distress experienced by individuals with infertility. A widely used tool was the Fertility Problem Inventory (FPI) assess stress levels among infertile women in domains such as social concern, sexual concern, relationship concern, rejection of childfree lifestyle, and need for parenthood [13]. Another scale, the Fertility Problem Stress Scale (FPSS) measures perceived stress levels related to personal, marital, and social domain among infertile individuals [14]. Additionally, scales have been developed specifically for women undergoing assisted reproductive technologies to measure perceived stress in areas such as social interactions, marital and family life, sexuality, negative thinking, emotional burden, and desire for parenthood [15]. These questionnaires provide a deeper understanding of the pressures faced by individuals experiencing infertility, offering specific areas for targeted intervention programs. However, there are differing opinions on whether the measured stress fully captures an individual's overall psychological distress.

Some scholars have also attempted to measure the emotional and affective responses to infertility-related stress. For instance, the Infertility Distress Scale (IDS) was created to understand the male experience of distress related to infertility itself and the impact of infertility on their marital relationships as well as their work [16]. Additionally, the Infertility Distress Scale for Women (IDS-W) measures distress among women caused by internal pressure, the need to be a mother and social pressure [17]. Another tool, the Infertility Reaction Scale (IRS), quantifies the distress experienced by individuals due to changes in gender role, major focus of life and the effect on sexual life as a result of infertility [18]. The Sexuality and Emotions in Infertility questionnaire (SEIq) focuses specifically on patients undergoing Assisted Reproductive Technology (ART), assessing their distress

in sexological, emotive, partner relationship domain and their reaction to diagnosis [19]. Overall, these specialized measurement tools primarily focus on marital and sexual distress experienced by individuals with infertility. While some tools partially address distress related to gender identity, only one tool specifically considers work-related distress. This highlights a limitation in existing tools, which largely concentrate on personal domains of distress, leaving significant room for further exploration in terms of content breadth.

Infertility psychological distress is often influenced by socio-economic and cultural factors. In cultures that place high value on reproduction, individuals experiencing infertility often suffer significant psychological distress due to the shame associated with unsuccessful childbearing [20]. Those with lower socio-economic status may also experience severe psychological distress because of the higher societal value placed on parenthood [21]. In China, influenced by Confucian culture and a deep-rooted family tradition emphasizing lineage continuation, the importance of childbearing is significant. However, with the rapid socio-economic development and the one-child generation becoming the main childbearing force, it remains unclear whether the conflict between traditional reproductive values and new reproductive beliefs impacts the psychological distress of individuals with infertility. Current tools, which focus primarily on assessing women's infertility-related distress within the private domains of family and marriage [19, 22, 23], fail to consider how contemporary women, who are increasingly active in the public sphere, experience this psychological distress. Yet, there is still a lack of measurement tools specifically developed to assess infertility psychological distress within the cultural context of China. To address these gaps, this study aims to develop and validate a new tool that will better capture women's infertility psychological distress in China and other societies with similar socio-economic backgrounds, thereby expanding the scope of existing measurement tools.

Methods

Design

A mixed-methods design was used to develop a scale for assessing infertility psychological distress (IPD), combining qualitative (item pool and scale development) and quantitative (psychometric measurement) components. The study included three stages: scale development, expert consultation, and psychological characteristic measurement. The study was conducted at two tertiary hospitals' reproductive medicine centers in Wuhan, Hubei, China: Tongji Hospital, Tongji Medical College, Huazhong University of Science and Technology; and Maternal and Child Health Hospital of Hubei Province.

Development of the IPDS

In the qualitative phase, Grounded Theory was used to develop a localized framework for IPD. From May to August 2023, semi-structured interviews were conducted with 27 women undergoing assisted reproductive treatments, selected through theoretical and purposive sampling until saturation was reached. The analysis identified two main forms of distress: distress of describing the former self caused by infertility itself (distress of self-worth questioning, distress of strained family relationships, distress of female image deficit); and distress linked to the struggling present self due to treatment setbacks (distress of inadequate reproductive self-efficiency, distress of maintaining family relationships, and distress of social identity expansion). This segment has been previously published [24].

This study, based on our previous Grounded Theory and existing scales on infertility stress, developed a 39-item questionnaire pool (Supplementary Material 1, Table 1) to create the Infertility Psychological Distress Scale (IPDS). The scale includes two dimensions and six sub-dimensions, with definitions provided in

Supplementary Material 2. It uses a 5-point Likert scale, ranging from 1 (completely disagree) to 5 (completely agree).

Expert consultation and content validity of the IPDS

This study invited 20 field experts with a senior professional title or above and more than 10 years of work experience to participate in a Delphi consultation for the questionnaire [25, 26]. The central tendency of the experts' evaluations of item importance was assessed using the mean importance score and the full score rate. When the mean importance score was ≥ 3.5 and the full score rate was $\geq 80\%$, it was considered that the experts' opinions were highly concentrated [27]. The coefficient of variation (CV) was used to measure the consistency of experts' evaluations of item importance, indicating the level of agreement. A $CV \leq 0.25$ was considered to indicate high coordination among the experts [27]. Items that did not meet these criteria were removed during the item screening process. Expert suggestions regarding the items and questionnaire structure were discussed by the research team to determine whether modifications

Table 1 Demographic characteristics of participants ($n = 600$)

Characteristics	Exploratory factor analysis ($n = 293$)	Confirmatory factor analysis ($n = 307$)
Age (years) ^a	32.75 (4.50)	32.97 (4.27)
Education ^b		
High school or below	84 (28.6)	90 (29.3)
College or university	177 (60.4)	185 (60.3)
Postgraduate	32 (10.9)	32 (10.4)
Monthly household income per capita (RMB) ^b		
≤ 5000	97 (33.1)	106 (34.5)
5001 ~ 8000	103 (35.1)	97 (31.6)
> 8000	93 (31.8)	104 (33.9)
Residence ^b		
Village/Town	89 (30.4)	111 (36.2)
City	204 (69.6)	196 (63.8)
Marital ^b		
First marriage	244 (83.3)	249 (81.1)
Remarriage	49 (16.7)	58 (18.9)
Years of infertility ^b		
3 years or below	215 (73.4)	223 (72.6)
4 years or longer	78 (26.6)	84 (27.4)
Pregnancy history ^b		
No	152 (51.9)	150 (48.9)
Yes	141 (48.1)	157 (51.1)
Birth history ^b		
No	236 (80.5)	236 (76.9)
Yes	57 (19.5)	71 (23.1)
Cause of infertility ^b		
Male cause	25 (8.5)	31 (10.1)
Female cause	141 (48.1)	126 (41.1)
Male and female cause	49 (16.7)	56 (18.2)
Unclear	78 (26.6)	94 (30.6)

Note: ^a, Mean (SD); ^b, n (%)

should be made. The study involved three rounds of expert consultation. In the first round, three items that did not meet the preset item screening criteria were deleted, six new items were added, and remaining items were semantically revised based on expert feedback. In the second round, one item was deleted, one item was added, and wording adjustments were made to some items. In the third round, the wording of three items was modified. Detailed item deletions, revisions, and adjustments are provided in Supplementary Materials 1. After expert consulting, we obtained a provisional version of the scale, which includes 6 dimensions and 39 items. All items meet the pre-established item selection criteria. The I-CVI for the 39 items ranges from 0.80 to 1.0, and the S-CVI is 0.98, indicating that the scale has good content validity [28].

Pilot testing

Before the formal survey, we conducted an evaluation of the readability and comprehensibility of the assessment questionnaire. The pilot-test included 30 women undergoing IVF-ET treatment, with educational levels ranging from elementary school to postgraduate, and treatment cycles including both first-time and repeat treatments. During the survey, participants indicated that they could clearly understand the questionnaire items, and that the content of the questionnaire accurately reflected their psychological condition. The time taken to complete the questionnaire ranged from 4 to 7 min, suggesting that the questionnaire was easy to fill out.

Psychometric properties test of the IPDS

Sample

In March–April 2024, a cross-sectional study was conducted at two tertiary hospitals' reproductive medicine centers in **, ** Province, China (described above). Convenience sampling was employed to select infertile women undergoing IVF-ET treatment to participate in the research. The study subjects were infertile women undergoing IVF-ET treatment who were willing to participate in the research. Patients with diagnosed mental illnesses were excluded. The sample size was estimated based on the sample requirements for factor analysis [29], taking into account the number of questionnaire items and potential invalid responses. The final estimated minimum sample size was 474 cases.

Data collection

Data collection took place in the ultrasound and injection rooms of the study sites, where patients were recruited based on inclusion and exclusion criteria. Participants were fully informed about the study and provided signed consent. They completed an electronic questionnaire by scanning a QR code. In addition to the

IPDS, demographic information (age, education, income, residence, marital status) and the Kessler 6-item psychological distress scale were collected. A total of 600 questionnaires were gathered, with 293 from March 2024 designated as Sample 1 for exploratory factor analysis, and 307 from April 2024 as Sample 2 for confirmatory factor analysis.

Ethics approval and consent to participate

The study has been reviewed and approved by the Ethics Committee of Tongji Hospital, Tongji Medical College, Huazhong University of Science and Technology (reference number:TJ-IRB20230803). All procedures in the study are in accordance with the declaration of Helsinki. All participants were fully informed about the purpose and procedures of the study, as well as their right to withdraw from participation at any time, with written informed consent obtained. Confidentiality of all participant information was strictly maintained.

Data analysis

Data analysis was conducted using SPSS 24.0 and AMOS 27.0. A significance level of $p < 0.05$ was considered statistically significant.

Item analysis Item analysis was employed for item selection with the following methods: (1) Critical Ratio (CR): Independent t-tests compared the top and bottom 27% of scores, retaining items with a $CR > 3$ and $p < 0.05$ [27, 38]. (2) Correlation Coefficient: Items with a correlation > 0.4 to the total score were retained [27]. (3) Cronbach's Alpha: Items removed if deletion increased alpha [39]. (4) Factor Analysis: Items with factor loadings > 0.5 were retained [40].

Validity Exploratory (EFA) and confirmatory factor analysis (CFA) were conducted to assess the construct validity of IPDS. EFA suitability was evaluated using the Kaiser-Meyer-Olkin (KMO) measure ($KMO > 0.9$ for excellent, 0.8 for good, and 0.7 for adequate suitability) and Bartlett's test ($p < 0.05$) [41]. In EFA, factors with eigenvalues > 1 were retained, and items with loadings < 0.4 or differences < 0.15 across factors were removed. CFA assessed model fit using indices such as χ^2/df , RMSEA, GFI, and CFI. Criterion validity was established by correlating IPDS scores with the Kessler-6 Scale, with a correlation > 0.5 and $p < 0.05$ indicating good validity [27].

Reliability Cronbach's alpha assessed IPDS internal consistency, with values > 0.7 considered acceptable and > 0.8 excellent [38].

Results

Participants

The study included a total of 600 participants. Participants' characteristics are presented in Table 1.

Item analysis

In the CR analysis, item CR values ranged from 8.986 to 15.917, all exceeding 3 with significant differences ($P < 0.05$). Correlation coefficients between items and the total score ranged from 0.541 to 0.748, all above 0.4. No item increased Cronbach's α after deletion. Factor loadings for all items were above 0.4, meeting standards. All 39 items were retained (see supplementary material 2).

Exploratory factor analysis

EFA was conducted on 39 items, with a Kaiser-Meyer-Olkin (KMO) of 0.940 and Bartlett's test of sphericity ($P < 0.001$), supporting factor analysis suitability. Both Varimax (orthogonal) and Oblimin (oblique) rotations were used, with results from oblique rotation chosen for this study [27]. After four rounds of exploratory factor analysis, six common factors with eigenvalues greater than 1 were ultimately extracted. The 25 items included

in these factors explained 67.49% of the total variance, with factor loadings ranging from 0.658 to 0.972. The six-factor structure aligned with theoretical assumptions, and the original factor names were retained. Detailed information was presented in Table 2.

Confirmatory factor analysis

In the first-order CFA, the model showed a χ^2/df ratio of 2.668. The RMSEA was 0.07, with GFI and AGFI both exceeding 0.8, indicating acceptable fit. Most incremental fit indices, except the NFI, were above 0.9, confirming a good model fit. Standardized path coefficients for all 25 items were above 0.5, reflecting strong item-factor relationships (see Table 3; Fig. 1). In the second-order CFA, all fit indices were acceptable (see Table 3; Fig. 2), supporting the six-factor structure and good construct validity.

Reliability

The total scale's Cronbach's α coefficient was 0.944, indicating strong internal consistency. Subscale coefficients for distress related to self-worth questioning, strained family relationships, female image deficit, inadequate

Table 2 Factorial load matrix of exploratory factor analysis ($n = 293$)

Item	Factor					
	1	2	3	4	5	6
A2. Thinking that I can't conceive naturally makes me feel worthless.		0.705				
A5. Thinking that I might not have children makes me feel like I'm inferior to others.		0.877				
A6. Thinking that I might not have children makes me feel like my life lacks meaning.		0.815				
A7. Thinking that I might not have children makes me feel like there's no future in my life.		0.866				
B1. I worry that the intimacy between my husband and me might be affected because we don't have children.						0.856
B2. I'm afraid our marriage might become unstable because we don't have children.						0.972
B4. I'm worried that my family might blame me for not having children.						0.717
C3. People asking me about having children makes me feel offended.				0.765		
C4. It makes me sad when people think women are incomplete without having children.				0.788		
C5. It makes me angry when people always blame infertility on women.				0.758		
C6. People judging me because I don't have children makes me feel helpless.				0.915		
D1. I feel confused about the decisions I have to make regarding fertility treatments.	0.689					
D2. I often feel the hardships of the fertility treatment process.	0.717					
D3. Fertility treatments make me swing between hope and disappointment.	0.831					
D5. The treatment results not being as expected makes me feel frustrated.	0.793					
D6. Fertility treatments take up so much time and energy that I feel completely exhausted.	0.782					
D7. I feel hopeless about the lack of progress in my long-term treatment.	0.730					
E1. My husband not being as involved in fertility treatment as I hoped makes me feel upset.			0.794			
E2. My husband arguing with me about fertility treatment issues makes me feel tired.			0.920			
E3. My husband and I argue more easily now about fertility treatments worries me.			0.914			
E4. The impact of fertility treatments on our sex life is distressing to me.			0.658			
E6. The atmosphere at home during fertility treatment makes me feel depressed.			0.739			
F1. I'm frustrated about how fertility treatment is affecting my work.					0.898	
F2. During fertility treatment, I feel anxious about lacking the energy to focus on self-improvement.					0.819	
F3. I'm worried that long-term fertility treatment might affect my career development.					0.770	

Note: Factor 1, Distress of inadequate reproductive self-efficiency; Factor 2, Distress of self-worth questioning; Factor 3, Distress of maintaining family relationships; Factor 4, Distress of female image deficit; Factor 5, Distress of social identity expansion; Factor 6, Distress of strained family relationships

Table 3 The appropriate indices of model for CFA (*n* = 307)

Model fit indices	Good model fit	Acceptable model fit	First-order CFA	Second-order CFA
			Index value	Index value
χ^2/df	$0 \leq \chi^2/df < 3$	$3 \leq \chi^2/df \leq 5$	2.668**	2.797**
GFI	$0.90 < GFI \leq 1$	$0.80 < GFI \leq 0.90$	0.848*	0.833*
AGFI	$0.90 < AGFI \leq 1$	$0.80 < AGFI \leq 0.90$	0.810*	0.798
RMSEA	$0 < RMSEA < 0.05$	$0.05 \leq RMSEA \leq 0.10$	0.074*	0.077*
CFI	$0.90 \leq CFI \leq 0.95$	$0.80 \leq CFI < 0.90$	0.926**	0.918**
NFI	$0.90 \leq CFI \leq 0.95$	$0.80 \leq CFI < 0.90$	0.887*	0.878*
IFI	$0.90 \leq CFI \leq 0.95$	$0.80 \leq CFI < 0.90$	0.927**	0.918**
TLI	$0.90 \leq CFI \leq 0.95$	$0.80 \leq CFI < 0.90$	0.915**	0.908**

Note: CFA, Confirmatory factor analysis; GFI, Goodness of Fit Index; AGFI, adjusted good fit index; RMSEA, Root Mean Square Error of Approximation; CFI, Comparative Fit Index; NFI, Normed Fit Index; IFI, Incremental Fit Index; TLI, Tucker Lewis Index; **, good model fit; *, Acceptable model fit

reproductive self-efficiency, maintaining family relationships, and social identity expansion ranged from 0.856 to 0.925, all exceeding 0.8. This demonstrates the IPDS's good internal consistency.

Discussion

This study developed a novel Infertility Psychological Distress Scale (IPDS) for women undergoing ART with rigorous item construction and psychological measurement procedures. Comprising two dimensions, six sub-dimensions, and 25 Likert-type items, the scale shows strong content validity, structural validity, and internal consistency, offering a reliable tool for measuring infertility psychological distress.

New interpretation of the definition of infertility psychological distress

The IPDS developed in this study is distinct from previous similar scales. First, the scale defines infertility psychological distress in women undergoing ART as emotional/affective pain arising from both infertility itself and the impact of obstacles during ART on women's self-concept, offering a new perspective on this phenomenon. Drawing on the Triple Self-Construction Theory, which posits that an individual's self-construal is composed of three components—individual self, relational self, and collective self—we have provided a novel definition for infertility psychological distress [30, 31]. We define the negative emotional responses and affective states caused by infertility's destruction of the woman's original self-concept as “distress of disrupting the former self”, exploring the distress experience caused by infertility itself. Additionally, the emotional and affective distress resulting from the frustration of reproductive treatments, where women's ability to establish and maintain their expected self-concept is challenged, is defined as “distress linked to the struggling present self”. These

two aspects collectively reflect the dual pressure and distress experienced by this group. This approach enables the tool to comprehensively measure both the distress caused by infertility itself and that caused by reproductive treatments, helping clinicians gain a more thorough understanding of infertility psychological distress.

New expansion of the connotations of infertility psychological distress

While referencing existing tools, this study expands the concept of psychological distress in infertility. Existing tools primarily explore self-blame and feelings of life's meaninglessness in response to infertility events [13, 32]. In addition to addressing these feelings (distress of self-worth questioning), this scale also focuses on the distress experienced by women during reproductive treatment obstacles, stemming from a perceived lack of reproductive efficacy. Together, distress of inadequate reproductive self-efficiency and distress of self-worth questioning reflect the profound pain women experience when their original self-concept is destroyed, but a new self-concept has not yet been solidly established, offering a more comprehensive view of the dual distress women face at the individual-self level.

In any culture, fertility is an essential part of family functions. Individuals experiencing infertility endure significant distress in maintaining intimate relationships and marital stability. Previous tools often included measures of distress in these two domains, though the categorization of these dimensions varied. Some measures categorized them under marital relationship related distress [13, 16], while others placed them under relationship anxiety [32]. The IPDS views concerns about intimate relationships and marital stability as forms of relational self distress. This distress manifests as distress of strained family relationships caused by infertility undermining a woman's existing self-concept, as well as the distress of maintaining family relationships as they attempt to reconstruct their self-concept but encounter a series of obstacles during ART treatment. Although the dimensional categorization and naming in this study differ from those in other scales within the field, they all address the distress infertility and reproductive treatments cause in intimate or marital relationships. Previous studies have also highlighted the distress experienced by infertile individuals in the domain of sexual activity [18, 19]. This study has also considered this, but given that our subjects are women and that Chinese cultural norms discourage open discussions about sex [33, 34], and given that very few participants mentioned this area of distress in preliminary qualitative research, we have only included relevant items under the dimension of “distress of maintaining family relationships”. The item measures the distress caused by the impact of ART on the couple's sexual

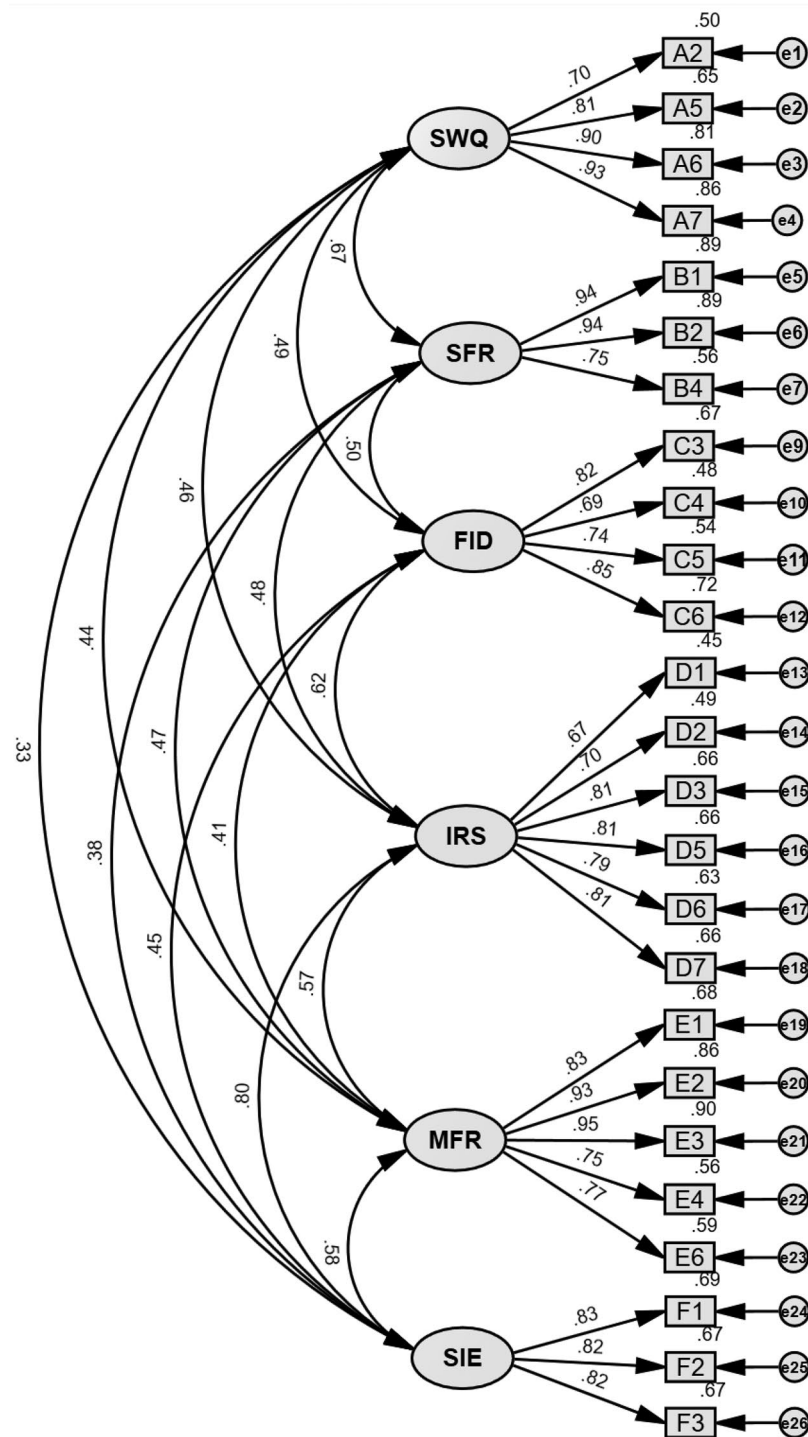


Fig. 1 Standardized item loadings and factor correlations for Infertility Psychological Distress Scale (IPDS) in first order CFA ($n = 307$). Note: SWQ: Distress of self-worth questioning; SFR: Distress of strained family relationships; FID: Distress of female image deficit; IRS: Distress of inadequate reproductive self-efficiency; MFR: Distress of maintaining family relationships; SIE: Distress of social identity expansion

activity. This approach avoids neglecting the topic and offers a culturally sensitive way to assess sexual activity-related distress in this population.

Existing tools have largely focused on the gender role-related distress caused by infertility [16, 18]. Similar to

these studies, the scale we developed also addresses the distress women experience in terms of gender image, which we have termed “distress of female identity deficit.” This dimension measures the painful experiences women undergo due to the stigma associated with gender image,

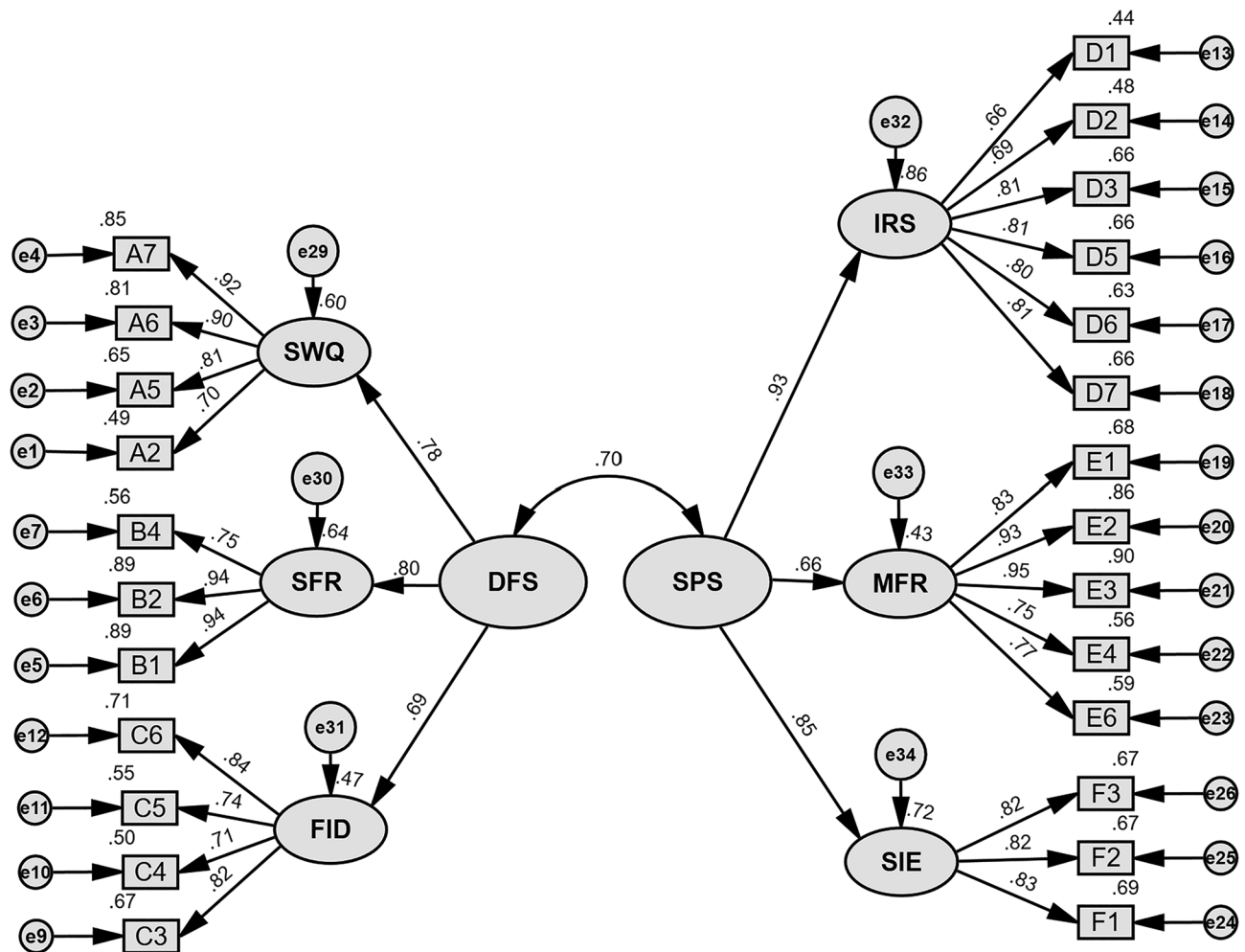


Fig. 2 Standardized item loadings and factor correlations for Infertility Psychological Distress Scale (IPDS) in second order CFA ($n=307$). Note: DFS: Distress of disrupting the former self; SWQ: Distress of self-worth questioning; SFR: Distress of strained family relationships; FID: Distress of female image deficit; SPS: Distress linked to the struggling present self; IRS: Distress of inadequate reproductive self-efficiency; MFR: Distress of maintaining family relationships; SIE: Distress of social identity expansion

resulting from infertility as a life event, and is categorized under the distress aroused during collective self-construction. However, based on the distress arising from gender image deficiency, previous studies primarily focus on the impact of infertility on women within the private sphere. Martin et al.'s infertility distress scale, developed for men, focuses on the distress perceived by infertile men due to the impact of infertility on their work life [16]. With the rapid socioeconomic development and significant changes in social division of labor [35], women now play an increasingly important role not only in the family but also in the public sphere [36, 37]. Reproductive treatments often place them in a difficult position of balancing reproductive functions with other social roles. This inevitably leads to concerns about the potential neglect of other social roles due to excessive focus on fulfilling reproductive functions, causing new distress in the construction of their collective self. This scale

fully considers this fact by introducing the dimension of “distress of social identity expansion” and its associated items. It measures the painful experiences women face when reproductive treatments affect their social identity expansion and hinder their construction of collective self. Together, the distress from gender image deficiency and distress from social identity expansion comprehensively reflect the painful experiences related to collective self-construction faced by contemporary women due to infertility and during ART.

Overall, by referencing existing tools and delving into localized concepts, this study has developed a novel Infertility Psychological Distress Scale. The scale distinguishes between the psychological distress caused by infertility itself and that induced by ART, allowing clinical practice to quantify the infertility psychological distress experienced by women undergoing ART in a more comprehensive and detailed manner. This provides deeper

insights into the psychological health management of this population.

Limitations and strengths

This study has several limitations. The use of convenience sampling may limit the representativeness of the sample and generalizability of findings to the broader population of individuals experiencing infertility. The sample for this study was drawn from two tertiary Grade-A hospitals in a central provincial capital city in China, which may also limit the generalizability of the findings to women experiencing infertility psychological distress in remote areas. Future research is expected to assess the reliability of the scale across multiple regions and different levels of hospitals. This study did not assess the test-retest reliability of the scale; therefore, its measurement invariance requires further validation. Meanwhile, the development of this scale was based on China's fertility culture and economic context. When applied in other cultural settings, the socio-economic and cultural similarities should be considered, or cultural adaptation and revision of the scale may be necessary.

Apart from the aforementioned limitations, this study has several notable strengths. The scale developed in this study expands the concept of infertility psychological distress and provides a new measurement approach. It aids clinical practice in distinguishing between the distress caused by infertility itself and the dual distress induced by assisted reproductive treatments. Furthermore, although the sample for this study was drawn from two tertiary hospitals in a provincial capital city in central China, the research site is well-known nationally, with services covering multiple provinces and cities across China. This broad reach attracted a diverse group from various regions with different socio-economic and cultural backgrounds, which to some extent compensates for the absence of a multicenter study.

Conclusion

The IPDS provides a novel and reliable tool for assessing the infertility psychological distress of women undergoing ART. Through a rigorous process of scale development and the measurement of relevant psychological characteristics, the IPDS demonstrates strong validity and reliability. This instrument enables both researchers and clinical practitioners to more accurately quantify the psychological distress arising from infertility and the challenges posed by ART. By utilizing scores derived from various subscales, targeted interventions can be designed to enhance the psychological well-being of women undergoing ART.

Abbreviations

AGFI	Adjusted Good Fit Index
ART	assisted Reproductive Technology

CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
CR	Critical Ratio
CV	Coefficient of Variation
CVI	Content Validity Index
EFA	Exploratory factor analysis
FPI	Fertility Problem Inventory
FPSS	Fertility Problem Stress Scale
GFI	Goodness of Fit Index
IDS	Infertility Distress Scale
IDS-W	Infertility Distress Scale for Women
IRS	Infertility Reaction Scale
IFI	Incremental Fit Index
I-CVI	Item-Content Validity Index
IPD	infertility psychological distress
NFI	Normed Fit Index
RMSEA	Root Mean Square Error of Approximation
S-CVI	Scale-Content Validity Index
SELq	Sexuality and Emotions in Infertility questionnaire
TLI	Tucker Lewis Index

Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s40359-025-02991-8>.

Supplementary Material 1

Supplementary Material 2

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Author contributions

Lingjun Jiang designed the study, collected the data, performed the data analysis, drafted the manuscript. Tiejing Zeng and Meiliyang Wu designed the study, received funding to support for the project. Liu Yang, Juan Yao, Juan Yang and Qian Zhang provided data collection resources, project operation supervision and participated in the the revision of the manuscript. Zhenjing Hu, Zining Zhu participated in the data collation and analysis. Mengmei Yuan, Ke Zhang, Ye Chen, Meizhen Zhao and Ningjing Jiang provided help in methodology. All authors approved the final version of the manuscript.

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Data availability

Datasets used and analyzed during this study are available from the corresponding author and first author on reasonable request.

Declarations

Human ethics and consent to participate

The study has been reviewed and approved by the Ethics Committee of Tongji Hospital, Tongji Medical College, Huazhong University of Science and Technology (reference number: TJ-IRB20230803). All procedures in the study are in accordance with the declaration of Helsinki. All participants were fully informed about the purpose and procedures of the study, as well as their right to withdraw from participation at any time, with written informed consent obtained. Confidentiality of all participant information was strictly maintained.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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