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Psychometric properties of revised version of the fertility adjustment scale in infertile couples undergoing assisted reproductive technology

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ABSTRACT

Objective: The aim of this study is to validate the edited version of FAS for the purpose of couples undergoing ART.

Study design: In this cross-sectional study, the validity of the revised version of the FAS questionnaire was assessed by testing it on 212 couples volunteered to undergo ART. The revised version comprises 12 items from the original FAS version and 6 items added based on a survey interview conducted on infertile couples. Following an assessment of the content validity and reliability, the construct validity was measured following exploratory factor analysis with a varimax rotation. The correlation of the revised fertility adjustment (R-FAS) score with the level of depression, too, was assessed using depression scale of the depression, anxiety and stress scale (DASS-21).

Results: The assessment of content validity yielded a content validity index and content validity ratio of 0.75 and 0.89. The reliability of the questionnaire measured twice with a correlation index of 0.76 was confirmed. Cronbach's Alpha for the entire questionnaire was 0.83. The exploratory factor analysis was conducted on 15 items by extracting 12 items using two factors: mental freedom and acceptance of extraction conditions. The score made on the R-FAS questionnaire was correlated with the level of depression ($r = 0.51$; $p < 0.0001$).

Conclusion: The study results were indicative of the validity and reliability of the questionnaire for measurement of the adjustment attributed to the infertility in couples undergoing ART. It is proposed that the infertility-related adjustment in couples undergoing ART and with a high potential for mental disorders be measured using this questionnaire.

Introduction

For many couples across the world, fertility is a stressful experience with possible concomitant undesirable consequences [1]. Reduced self-confidence [2], social isolation [3], emotional reactions like anger [4,5], increased possible domestic violence [6], and divorce [7] are, among other things, the mental and social pathology concomitant with infertility, and possibly, such mental disorders as anxiety and depression [8,9]. The importance of the individual and familial problems as well as of the social complications arising from infertility has made infertility a global problem with concomitant extended medical efforts for treatment. However, the psychological aspects have received less attention.

Assisted reproductive treatment (ART), endurance of the lengthy process and complications of benefiting from such treatments as well as the relatively considerable potential for failure require adjustment to infertility to control the conditions. Adjustment to infertility suggests that despite the potential for failure in fertility, the individual can maintain their cognitive, emotional, and behavioral condition in a balanced state and benefit from the other aspects of their life. Adjustment to infertility facilitates crisis control, reduces maladjustment to the life quality of the infertile couples and is accompanied by heightened mental disorders [10–12]. For this reason, a reliable instrument for assessment of maladjustment to infertility will help the treatment team to identify the infertile couples at the risk of mental disorders. In this context, a multitude of instruments including SCREENIVF [13] and Fertility Problem Inventory [14] for fertility treatment have been developed. However, such instruments are

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used to measure the psychological symptoms following infertility, while assessing maladjustment using infertility leading to development of mental disorders is helpful. Furthermore, studies indicate that learning the adjustment strategies is concomitant with health promotion in infertile couples [15].

In this respect, for the first time in 1999, Glover introduced a 12-item fertility adjustment scale (FAS). This instrument was developed to assess the psychological responses to such fertility problems as infertility [16], and used in research as instrument to assess adjustment in infertile couples [17]. Furthermore, the psychometric traits of the instrument were used to assess the adjustment to infertility in Turkish women, indicating their validity for the target population [18].

Although the instrument has been valid for assessment of adjustment to infertility in various populations, its validity needs to be tested on couples undergoing treatment, for entry to ART processes creates special conditions for infertile couples. Accordingly, in this study, a questionnaire for adjustment to infertility was developed using the FAS items and a qualitative study of adjustment to infertility, and then the psychometric traits were assessed separately for men, women, and mixed genders.

Methods

This study was conducted using a standard psychometric method approved by the Ethics Committee, Isfahan University of Medical Sciences, for the period January-May 2018 in Isfahan, Iran.

Measures

Development of the R-FAS

R-FAS questionnaire was developed by integrating 12 FAS items and items resulting from analyzing 10 interviews with four infertile couples (8 individuals) and the assistance of two psychology experts. The participants were selected by purposeful sampling. The data were collected using in-depth semi-structured interviews. The guiding questions repeated on almost all the interviews included an explanation of the experiences of participants, and continuation of the interviews using such words as “more”.

At the end of each interview the recorded interviews and tips were written down. The duration of the interviews varied from 45 to 60 min. Sampling was completed using theoretical saturation for the classes. To data analysis, Inductive Content Analysis suggested and used by Graneheim and Lundman was used [19] by researchers.

Following the analysis of the interview transcripts, key topics raised were mapped onto the 3 themes; including “insist on having a baby” and coping and adjustment and generate 12 items.

The AFS was translated from English to Persian using a standard forward-backward translation procedure by two translators independently and then back translated into English without reference to the original version by a bilingual native speaker, not part of the first step.

The original version of FAS with 12 items contained six inverted items developed and subjected to psychometrics by Glover (16). This questionnaire was developed using a 6-division Likert scale, ranging from "(1) strongly disagree" to "(6) strongly agree".

The initial results of the contents of interviews, too, were 12 items of which, due to the content similarity of the original FAS version (item: 2, 3, 4, 5, 6, 11), 6 items were deleted, leaving 6 items and one inverted item. Finally, 18 items with 7 inverted items found their way into the next psychometric stage. The total score was obtained from the sum of the scores of each item and that a higher score indicated lower adjustment.

The face and content validity of the instrument were assessed using the comments made by three psychology experts, three fertility health experts, and two mental health nurses on the questionnaire. To assess the face validity, the experts' comments on eloquence and compliance with the principles of writing were taken into consideration. To assess the content validity of the instrument, qualitative content validity and measurement of both content validity ratio (CVR) and content validity index (CVI) were taken into consideration. To determine the content validity qualitatively, the experts were asked to assess 18 items of the questionnaire in terms of the content structure. Furthermore, with respect to the sensitivity of the departments under study on influencing certain areas, the experts were asked to report their opinions on compliance with the ethical principles for imparting the concepts.

To measure the CVR, the experts were asked to analyze each of the questionnaire items on a three-division scale of "is necessary", "is useful but not necessary", and "is not necessary" writing down the comments on the checklist. According to Lawshe’s table a CVR of higher than 0.85 was settled for acceptance of each item. To assess CVI, the experts were asked to write their comments on each item on the checklist. The checklist includes the following items "unrelated", "requiring serious revision", "related but requiring revision", and "fully related". Dividing the sum of the checked "related but requiring revision" options into the number of experts, yielded the CVI coefficient for each item. The criterion for each CVI coefficient was 0.79. Items with a CVI ranging from 0.78 to 0.7 was corrected and the item with a score of less than 0.7 was deleted.

Following content validity assessment on 18 items, one item (*I will always feel unfulfilled if I am unable to have my own child*) deleted from FAS questionnaire and another item deleted from the items obtained on the interviews with a CVR of 0.75 and 0.79, leaving the other items with a mean CVR of 0.89. To calculate CVI, for each item, two items (‘*I can talk to my partner about the possibility of not having a child*’ and” *I seem to live my life from month to month*”) were deleted from FAS questionnaire and one item of the questions added, with a CVI of 0.65, 0.63, and 0.69 deleted, leaving a total of 15 items.

In a directed study, the internal consistency of the instrument was measured using Cronbach's Alpha by having R-FAS questionnaire completed by 20 infertile couples volunteered for ART.

Furthermore, the reliability of the instrument was measured by having 20 couples re-complete the questionnaire in two weeks' time and then measure twice the correlation coefficient of the scores available in R-FAS questionnaire. The internal consistency of a questionnaire with 17 items with all the items retained had a Cronbach's Alpha of 0.78 for women and 0.76 for men. The test-retest coefficient was 0.77 for women and 0.75 for men, indicating the reliability of the questionnaire for the couples. Cronbach’s alpha reliability coefficient was performed for the 15-item scale yielding 0.78 for women and 0.76 for men. and for both 0.80.

Table 1
Demographic characterizes and main variables.

	Mean (SD) or Number (%)	
	Women	Men
Number	212	212
Age	32.2 (4.8)	36.6 (5.0)
Educational level (%)		
Less than high school	23 (11.3)	30 (14.1)
High school diploma	157 (74.1)	161 (76.0)
University degree	31 (14.6)	21 (9.9)
Depression score	11.50 (6.3)	8.18 (6.8)
Adjustment score	41.98 (5.4)	39.57 (5.2)

Abbreviation: SD: standard deviation.

Table 2
The Rotated component matrix of exploratory factor analysis of R-FAS.

	Item Loaded					
	Women		Men		Total	
	F1	F2	F1	F2	F1	F 2
Extraction Sums of Squared Loadings	51.942		48.041		50.338	
Items						
FAS_3: I cannot plan for the future until I know for certain whether or not I can have a child	.622		.607		.533	
FAS_5: I want a child of my own more than anything else in life	.622		.689		.602	
FAS_6: I have made plans for a possible future life without a child	.634		.637		.693	
FAS_9: I think I could adjust to a future life without a child (reversed)		.564		.501		.532
FAS_{10}: I make sure that I carry on with my normal life activities (reversed)		.621		.765		.795
FAS_{11}: I cannot imagine a future without a child		.671		.770		.778
FAS_{12}: I think life could be rewarding either with or without children (reversed)		.627		.668		.621
Added Item $_{13}$: Every month I am/my mate is expecting to become pregnant.	.541		.664		.674	
Added Item $_{16}$: Thinking about infertility will not allow me to enjoy the happy life events.	.715		.799		.781	
Added Item $_{17}$: The issue of infertility does not allow me to think about other issues.	.772		.755		.822	
Added Item $_{18}$: I am always wondering why, like other people, I can't be a parent.	.742		.736		.785	

Abbreviations: F: factor, FAS: Fertility Adjustment Scale, R-FAS: Revised Fertility Adjustment Scale.

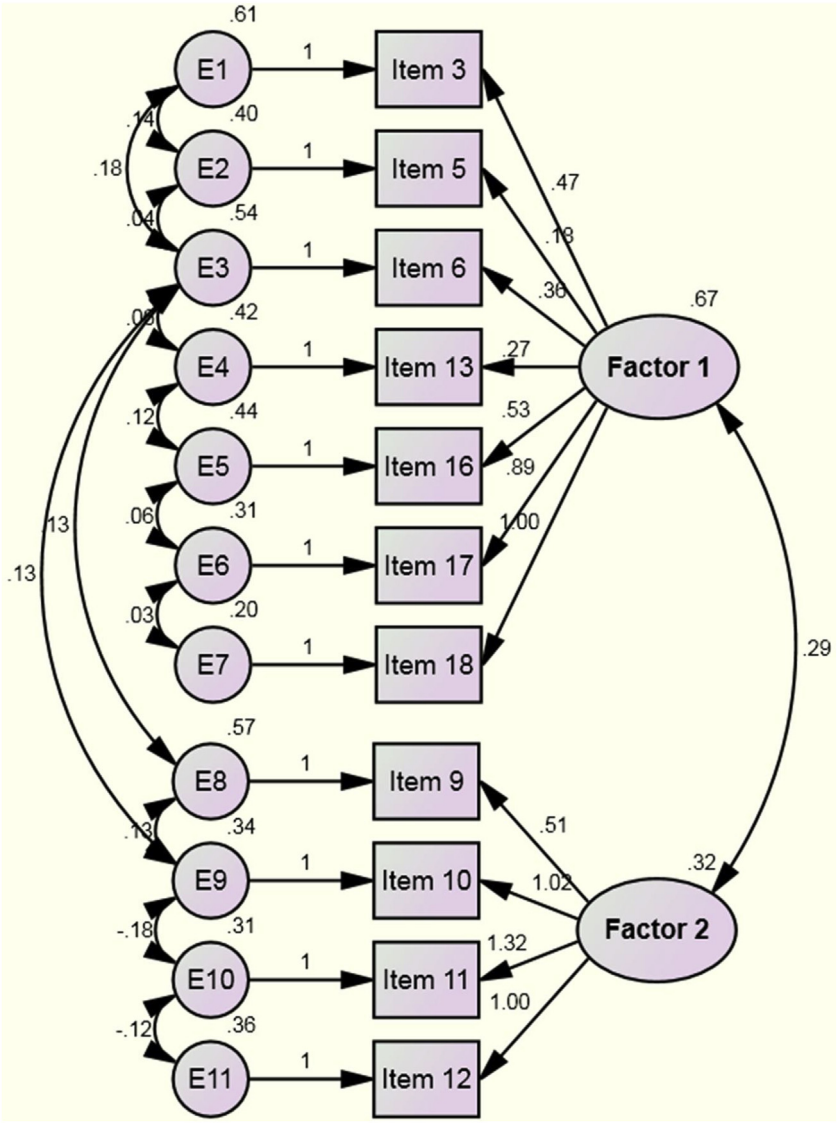

Fig. 1. The 2-factor model of the Revised Fertility Adjustment Questionnaire.

Table 3
Regression Weights: (Default model).

			Standardized regression weights	Estimate	Critical ratio	Sig
Item 3	<—	Factor1	.470	.084	5.607	<0.001
Item 5	<—	Factor1	.179	.066	2.731	0.006
Item 6	<—	Factor1	.358	.083	4.334	<0.001
Item 13	<—	Factor1	.274	.067	4.068	<0.001
Item 16	<—	Factor1	.533	.083	6.406	<0.001
Item 17	<—	Factor1	.894	.079	11.363	<0.001
Item 18	<—	Factor1	1.000			
Item 9	<—	Factor2	.506	.127	3.994	<0.001
Item 10	<—	Factor2	1.023	.175	5.854	<0.001
Item 11	<—	Factor2	1.321	.207	6.381	<0.001
Item 12	<—	Factor2	1.000			

Depression level

The depression of the couples was measured using the valid DASS-21 questionnaire. In this questionnaire, each scale comprises 7 items developed with a four-point scale, such that a higher score indicates severe depression.

Participants and procedure

In a cross-sectional study on 212 infertile couples (424 people) volunteered to undergo ART, the construct validity of the R-FAS questionnaire was measured. The criterion for admission to the study was non-use of ovules, sperms, donated embryos, and lack of any form of mental disorder under treatment. Sampling was conducted at Esfahan Specialty Infertility Treatment Center using the accessible method having obtained the informed consent of the couples. The background details completed, R-FAS questionnaire was completed by the couples (men and women), self-reporting separately.

Statistical analysis

The research data were then analyzed using SPSS version 19. The construct validity was measured using exploratory factor analysis, PMA method and a varimax rotation. Kaiser-Meyer-Olkin (KMO) value was used to verify the adequacy of the number of samples. Furthermore, a factor loading of 0.5 was used to verify each item. The extracted factors were labeled following factor analysis. The concurrent validity of R-FAS questionnaire was calculated using the correlation obtained from the R-FAS questionnaire and depression score.

A confirmatory factor analysis was carried out using the AMOS™ 5.0 statistical package to test the fit of the proposed factor model to the questionnaire data in an independent sample. The indicators included the proportion of Chi-square to the degree of freedom and scores less than 3 indicated suitability. A root mean square error of approximation (RMSEA) of 0.05 or less was considered suitable in this study.

Results

Statistical analysis comprising exploratory factor analysis was conducted on 212 infertile couples (212 women and 212 men) with 100% participants. In 106 infertile couples (56.68%), the primary cause of infertility was male factor, in 85 (45.45%) infertile couples, the primary cause of infertility was female factor, and in 25 (11.79%) infertile couples, the primary cause was unexplained. Neither the husband nor wife had previously had or parented a child. The background details mean scores of the couple from R-FAS questionnaire and depression scores are recorded in Table 1.

The exploratory factor analysis with varimax rotation was conducted on 15 items. With regard to the KMO value of 0.80, the adequacy of the sample quantity was approved.

Out of 15 items, 12 items (with 4 inverted items) and a factor loading of over 0.5 were extracted from both factors of mental freedom and acceptance of conditions (Table 2). One item was deleted from FAS and another item developed based on the interviews was deleted. The results of the internal consistency for the entire questionnaire for men and women were 0.82 and 0.83.

The confirmatory analysis showed that the 2-factor model (Fig. 1) has an acceptable fit with the data for couples (Fig. 1), for women and for men (Table 3).

The positive and significant correlation between the scores obtained on R-FAS and depression ($r = 0.51$; $p < 0.0001$) in men and depression in women ($r = 0.55$; $p < 00001$) supported the R-FAS validity.

Comments

The aim of this study was to assess the validity and reliability of FAS revised version for measuring adjustment to infertility in couples using ART, and that during the different stages of psychometrics, the validity and reliability of the 12-item R-FAS questionnaire were supported for the two factors which named mental freedom and acceptance. Furthermore, the psychometric results of the questionnaire yielded similar findings for men and women, indicating that the questionnaire was valid for assessment of adjustment to infertility in both genders.

The validity of the FAS questionnaire was measured and supported by the data from the research conducted on couples undergoing diagnosis and treatment for infertility [16].

The validity of the Turkish version of the FAS questionnaire was also approved by extracting the two factors of "stuck into having children" and "acceptation of life without children" without deleting items [18]. Assessment of the Persian version of the FAS questionnaire conducted on infertile Iranian couples brought the number of the extracted items to 9 after deleting items 4, 7, and 12 [20]. In this study, too, items 4 and 7 had been deleted, indicating for the Iranian couples, that the two items were not suitable for measuring the adjustment to infertility. However, unlike this study, items 1 and 2, too, had no good factor loading. This finding indicates that people who have volunteered to undergo ART have different experiences of adjustment. Nevertheless, ART is the end line of infertility treatment, and people who enter the process have passed the diagnostic stages of infertility and received more medical treatment involving medication and outpatient services than others. Therefore, the first item of the original FAS questionnaire referring to continued diagnosis and treatment is good for this group of infertile couples. Furthermore, couples who undergo ART will probably not worry about the disadvantages of having children.

In developing the R-FAS, in addition to 12 FAS items, in the first stage, 6 items were extracted from the qualitative study which found their way into the psychometric stages. Extraction of the items from the interview with the couples undergoing ART, which were different from the FAS items, and extraction of 4 items at the exploratory factor analysis, indicated that adjustment in couples undergoing ART will involve great dimensions of their life. Extraction of the items with a high factor loading for "*The issue of infertility does not allow me to think about other issues.*" items indicates that the concern for infertility without using ART is a highly important issue that can affect adjustment to infertility.

Confirmation of the internal consistency and reliability of the R-FAS questionnaire indicates its acceptable reliability. Furthermore, the correlation of the degree of adjustment to infertility in couples with depression is another finding indicating the validity of the questionnaire, for the findings from other studies indicate the direct relationship between the level of maladjustment and the degree of both anxiety and depression in individuals confronted with infertility [10,12] and other major life crises. In a study by Tiyuri et al in Iran [20] and a study by Arsalan et al in Turkey [18], too, the FAS questionnaire enjoyed a good reliability standard. The finding of this study substantiates the relationship between adjustment and infertility and mental health [10].

Although the instrument introduced is valid for measurement of adjustment to infertility in couples undergoing ART, and has been tested on a considerable number of psychometric participants of the population, its application is confined to couples who use donated ovules, sperms, and embryos as well as hired uteruses.

In conclusion the results of this study indicated that the revised FAS version is sufficiently valid and reliable for measurement of adjustment in couples undergoing ART. Although it is inadvisable to routinely use the questionnaire for people undergoing ART, it can be used for couples with mental disorders on pre-ART screening.

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Declaration of Competing Interest

The authors declare that there are no conflicts of interest.

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