

**Assessing infertility stress: Re-examining the factor structure of the Fertility  
Problem Inventory**

RUNNING TITLE: Assessing infertility stress

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## Assessing infertility stress:

### Re-examining the factor structure of the Fertility Problem Inventory

#### Abstract

**Background:** Research has documented that fertility problems can negatively affect infertile patients' life, by imposing an obstacle to one important life goal: the achievement of parenthood. The Fertility Problem Inventory (FPI) proposes a comprehensive approach in assessing infertility stress, by measuring the impact on social, marital and sexual life dimensions and the importance of parenthood in infertile patients' life. This study examined the factor structure of the FPI, testing two alternative models. **Method:** A sample of 209 infertile patients was recruited in two public hospital departments of assisted reproductive technology. Measures included the FPI, the Brief Symptom Inventory, and the ENRICH Marital Inventory. Two higher-order factor models were tested using a confirmatory factor analysis. **Results:** Results confirmed the original measurement model of the instrument but suggested that the inclusion of an intermediate conceptual level resulted in a better fit to the model, i.e., the instrument assesses infertility related stress by assessing two main conceptual domains: the impact of infertility in infertile patients' life and representations about the importance of parenthood in one's life. The instrument revealed measurement and structure invariance. The FPI also revealed good construct validity by correlating with other measures assessing similar constructs. **Conclusions:** This approach to the FPI has important contributions for both research and clinical practice by distinguishing between the impact of infertility on different dimensions couples' life and representations about the importance of parenthood in one's life, therefore extending the utility of the FPI in research and clinical practice.

**Keywords:** Infertility, stress, Fertility Problem Inventory, assisted reproductive technology

## Introduction

Infertility is clinically defined as the failure to achieve a clinical pregnancy after 12 months or more of regular unprotected sexual intercourse (Zegers-Hochschild et al., 2009), affecting approximately 9% of couples worldwide (Boivin et al., 2007). Although the psychosocial effects of infertility have been highly documented, studies have often recurred to standardized measures of depression, anxiety and marital functioning, not always addressing specific concerns of infertile couples.

There is longstanding interest in the psychological impact of fertility problems in the individual and relational adjustment, as well as in the understanding of factors that contribute to increase or attenuate this impact. The experience of infertility and assisted reproductive technology (ART) has been associated with deleterious social and psychological consequences to the individual (Cousineau and Domar, 2007; Leiblum, 1997; Watkins and Baldo, 2004), although different conclusions can be drawn when comparing infertile patients adjustment with norms (Verhaak et al., 2007). Negative consequences in the marital relationship have also been reported (Monga et al., 2004; Wang et al., 2007); however, findings about the marital relationship in infertile couples have been inconsistent, with some studies reporting stability (Sydsjo et al., 2005) or even improvement (Hjelmstedt et al., 1999; Holter et al., 2006; Peterson et al., 2011; Schmidt et al., 2005b) in the marital relationship. The couples' sexual relationship is thought to be affected by infertility, mainly during infertility assessment and treatment, due to medical procedures of evaluation and the scheduling of sexual intercourse (Leiblum, 1997; Takefman et al., 1990).

The negative impact of infertility in the social context of infertile couples has also been documented: Infertile couples may feel isolated and neglected in an environment that highly values parenthood and may thus withdraw from their family and friends

(Wilson and Kopitzke, 2002). Their social relations may also be affected because of social pressure to achieve parenthood and distress raised by other couples' pregnancies and children (Cousineau and Domar, 2007; Daniluk, 1997).

The majority of studies on infertility adjustment (for a review of studies focusing on women's emotional adjustment to IVF, cf. Verhaak et al., 2007) have used reliable and validated instruments. The use of standardized measures allows the comparison with control groups, namely groups of fertile people that can be paired and compared in terms of age and marital status. These comparisons have been useful to demonstrate that although infertile couples appear to be more emotionally distressed than other individuals, it is not in a clinically significant way (Greil, 1997). However, several researchers have noted that these standardized measures may not be sensitive enough to reflect the experience of infertility and have argued for the need of using more infertility specific measures in the assessment of infertility impact (Greil, 1997; McQuillan et al., 2003; Newton et al., 1999). For instance, after conducting a systematic review of the effectiveness of psychosocial interventions in infertility, Boivin (2003) found that these interventions' positive effects were more likely to be detected by questionnaires designed to assess specific effects of infertility than by non-specific questionnaires. Although the author acknowledges that these differences could be explained by the lack of empirical validity in some of these questionnaires, the consistency of these results suggested 'that the kinds of emotional and behavioural reactions infertile people experience were in fact confined to specific domains which were not properly addressed in general measures of functioning' (Boivin, 2003, p. 2334).

Until now, research studies have used different measures, each tapping different constructs associated with infertility adjustment. Instruments have assessed emotional reactions to infertility (e.g. the Infertility Reaction Scale, Keye et al., 1984; the

Infertility Specific Well Being and Distress Scales, Stanton, 1991; and the Effects of Infertility Scale, Anderheim et al., 2005); different life domains disrupted by the fertility problem (e.g. the Fertility Problem Stress Inventory, Abbey et al., 1991, that was further adapted for the study of the The Copenhagen Multi-centre Psychosocial Infertility (COMPI) Research Programme, Schmidt, Holstein et al., 2005a); and cognitive appraisals of the experience of infertility and the need for parenthood in one's life (e.g. the Fertility Adjustment Scale, Glover et al., 1999, the Infertility Distress Scale, Pook et al., 1999, and the Meaning of Parenthood scale, Edelman et al., 1994).

These measures that have been used in infertility research have frequently been developed by researchers to cover adjustment issues that were not assessed by other more general measures, namely emotional or cognitive processes in infertility, the impact of infertility problems in the marital and sexual relationship and in social relations and the importance of parenting and children in one's life. However, usually each measure has only focused on some of those dimensions and scarcely assessed all of them.

In our opinion, the most comprehensive approach to the assessment of infertility adjustment is proposed by Newton et al. (1999). The authors aimed to assess infertility related stress and developed the Fertility Problem Inventory (FPI) considering five main different domains: social concern, sexual concern, relationship concern, need for parenthood and rejection of childfree lifestyle, all of those contributing to the assessment of overall infertility stress, the global stress. Thus, this instrument goes beyond already existing standardized measures because it adopts a comprehensive approach to infertility stress, focusing both on the impact of the infertility experience on several domains of the individual's life (social, marital and sexual), and on the

importance of parenthood in one's life, by assessing the need for parenthood and the rejection of a future lifestyle without children.

The FPI has been widely used in research on the experience of infertility. Examples are studies that aimed at assessing infertility stress as an adjustment outcome (Peterson et al., 2007) and a predictor of psychological distress (van der Broeck et al., 2010); at relating infertility stress with other important variables such as coping strategies (Peterson et al., 2006b), stigma and disclosure (Slade et al., 2007); and at examining the congruence between partners infertility stress and its impact in marital adjustment and depression (Peterson et al., 2003). As a clinical tool, the FPI was also used to screen for specific problem areas, helping clinicians to select interventions that match the problematic areas identified (O'Donnel, 2007).

Despite its wide use in research, to our knowledge, until the present date, no published studies have confirmed the factor structure of the FPI. Previous studies have reported validation studies using exploratory procedures to test the validity and reliability of the instrument (Gourounti et al., in press; Ribeiro, 2007) and failed to confirm the original structure. However, because the development of the original version of the instrument was theoretically-based, and relationships among factors have been empirically estimated, a confirmatory factor analysis is a better approach, and it is also less likely to capitalize the final factor structure on chance characteristics of the data (Fabrigar et al., 1999). The confirmation of the factor structure may not only give stronger confidence in the validity of results reported, but will also increase comprehensibility of the concept of infertility stress, namely by contributing to the definition of which issues should be considered when referring to that construct.

The present study aimed to develop a confirmatory factor analysis of the Fertility Problem Inventory. Because the FPI is a multidimensional instrument, that assesses the

impact of the infertility experience in several domains of participants' life that contribute to a general measure of infertility stress (Global stress), a second-order model was tested to confirm the original framework proposed by the authors (Model 1). Additionally, this study aimed to test an alternative model (Model 2), suggesting that, as previously stated, two different issues are assessed by the FPI, nevertheless both contributing to measuring global stress: the impact of infertility in life domains (social, sexual and relationship concerns) and representations about the importance of parenthood in men and women's life (rejection of childfree lifestyle and need for parenthood). In this model, it was hypothesised that the five first-order factors would load reliably on the two second-order factors reflecting the impact in life domains and representations about the importance of parenthood, and both second-order factors would load on a third-order factor reflecting overall infertility stress. In this alternative model, the basic structure is not modified, but an intermediate (conceptual) level of comprehension is added. Although differences in the degree of infertility related stress can be expected between men and women (Newton et al., 1999; Peterson et al., 2006a) and in different phases of the experience of infertility (Peterson et al., 2009), the FPI is expected to have structural and measurement invariance.

More specifically, the main objectives were:

(1) To test the original factor structure of the FPI proposed by the authors (Newton et al., 1999) (Model 1 – original model) with confirmatory factor analysis using a second-order factor model (global stress) that is hypothesized to account for the relations among the lower-order factors (subscales);

(2) To test a third-order model that proposes an alternative factor structure (Model 2 – proposed model) based on the two theoretical dimensions proposed above, comprising five first-order factors loading on two second-order factors (impact in life

domains and representations about the importance of parenthood), which in turn loaded on a third-order factor.

(3) To test the structural and measurement invariance of the FPI across groups, namely across gender and two groups of infertile patients (one group initiating an ART cycle and the other group assessed after a failed ART cycle);

(4) To study the criterion validity of the FPI, namely to test if the conceptual domains in Model 2 are measuring different dimensions of the infertility stress by being differently associated with other measures.

## **Methods**

### **Participants & Procedures**

Ethical approval was obtained from the Research Ethics Committees Coimbra University Hospitals (CUH) and Vila Nova de Gaia Central Hospital (VNGCH). A sample of 280 infertile participants was invited to participate in the study by a clinical psychologist at the Genetics and Human Reproduction Service in the CUH and at the Reproductive Medicine in the VHGCH. No one refused to participate but only 209 assessment protocols (74.6%) were received by the research team. Although reasons for nonresponse were not analysed systematically, non-responders motives were mainly lack of time to participate in the study and cancelation of ART treatment before filling in the questionnaires.

Two groups were recruited: One group of participants (G1, 71.3%) was recruited in the beginning of their infertility treatment by ART, during the hormonal stimulation phase prior to the ART technique. The other group of participants (G2, 28.7%) was recruited two weeks after a failed IVF cycle.



When recruiting participants, a full explanation of the research objectives, the participants' role and the researchers' obligations were given and participation in the study was asked. If participants agreed to collaborate, they filled out a consent form. Clinical information regarding fertility history and treatment procedures was obtained from the patients' medical records. Inclusion criteria were age (18 years or older), history of infertility and literacy skills to complete the assessment protocol. All participants were married or cohabiting with a partner in a heterosexual relationship, as required by Portuguese law for couples referred to ART.

### **Measures**

Fertility Problem Inventory (Newton et al., 1999): This is a 46 item scale measuring perceived infertility stress. Participants are asked to rate how much they agree or disagree with fertility related concerns or beliefs, and responses are given in Likert-type format, ranging from 0 (*Strongly disagree*) to 6 (*Strongly agree*), where 18 items are reversed scored. Sum of scores were always used. Higher scores indicate higher infertility stress.

To develop the Portuguese version of the FPI (Moura-Ramos et al., 2008), the items were translated by two English fluent independent researchers. Both translations were compared in order to detect discrepancies in the translation. The final translated version was back translated by an English native-speaker that was also a Portuguese fluent speaker. Similarity of both versions confirmed the equivalence of the original and the translated versions and changes were made in items where differences were found (Hambleton, 2005).

The FPI scores are organized in 5 subscales and one global score (for a full description of the items, cf. Newton et al., 1999):

Social concern: Sensitivity to comments, reminders of infertility, feelings of social isolation, alienation from family or peers; (e.g. 'I can't help comparing myself with friends who have children'; 'When I see families with children I feel left out');

Sexual concern: Diminished sexual enjoyment or sexual self-esteem, scheduled sexual relations difficult (e.g. 'I find I've lost my enjoyment of sex because of the fertility problem'; 'Having sex is difficult because I don't want another disappointment');

Relationship concern: Difficulties in talking about infertility, understanding/accepting sex differences, concerns about impact on relationship (e.g. 'My partner doesn't understand the way the fertility problem affects me'; 'When we try to talk about our fertility problem, it seems to lead to an argument');

Need for parenthood: Close identification with the role of parent, parenthood perceived as primary or essential goal in life; ('I will do just about anything to have a child'; 'I have often felt that I was born to be a parent');

Rejection of childfree lifestyle: Negative view of childfree lifestyle or status quo, future satisfaction or happiness dependent on having a child (or another child) (e.g. 'Couples without a child are just as happy as those with children'; 'I could visualize a happy life together, without a child');

Global stress: Total score, composed of all the previous factors, measuring overall infertility-related stress.

According to the authors, these scales present good reliability, with Cronbach's *alpha* coefficients ranging from .77 (sexual concern) to 0.87 (social concern). The global stress scale Cronbach's *alpha* was .93.

To estimate the concurrent validity of the FPI subscales, psychopathological symptoms (depression and anxiety) and marital relationship (marital satisfaction and

sexual relationship) were assessed with the Portuguese versions of the Brief Symptom Inventory and the ENRICH Marital Inventory and strength of desire to achieve pregnancy was assessed by a one item scale.

Psychopathologic symptoms: Depression and anxiety (BSI) (Derogatis, 1982; Portuguese version by Canavarro, 1999). In this 53 items scale, participants were asked to evaluate the frequency to which they experienced specific depressive (e.g. 'Feeling no interest in things') and anxiety (e.g. 'Nervousness or shakiness inside') symptoms during the past week on a 5-point Likert scale ranging from 0 (*Never*) to 4 (*Very often*). Ratings were averaged for final scores on each subscale. In the present sample, Cronbach *alpha* coefficients for these subscales were .82 (Anxiety) and .87 (Depression).

Marital relationship: Marital relationship was assessed with the ENRICH marital inventory (Olson, Fournier & Druckman, 1983; Portuguese version by Lourenço, 2006). The ENRICH is a 109 item inventory with a 5-point Likert scale ranging from 1 (*Strongly disagree*) to 5 (*Strongly agree*) that provides summed scores of the women's and men's evaluation of their relationship in eleven dimensions. In the present study, only marital satisfaction (e.g. 'I am very happy with how we handle role responsibilities in our marriage'), sexual relation (e.g. 'our sexual relationship is satisfying and fulfilling to me') and family and friends (e.g. 'I do [not] enjoy spending time with some of our relatives or in-laws') subscales were used, in order to estimate construct validity of different subscales. In the present sample, Cronbach *alpha* coefficients ranged were .77 (Marital Satisfaction), and .76 (Sexual relationship) and .76 (Family and friends).

Strength of desire to achieve pregnancy: One item addressing strength of desire to achieve pregnancy was developed by the authors to assess how much infertile men and women wished to achieve pregnancy. In this item, participants were asked 'compared to

most women [men], how much do you want [your female partner] to achieve pregnancy'? Response scale ranged from 1 (*Much less*) to 5 (*Much more*).

### **Data analysis**

To study the factor structure of the FPI a confirmatory factor analysis (CFA) using AMOS, v. 18.0 was performed. Preliminary analysis on data and correlations among factors were performed using SPSS, v.18.0.

Items were inspected for frequency of endorsement. No item had extreme responses.

Items were parcelled to reduce items in the model and to improve fit (Bandalos, 2002). For each of the 5 subscales, three parcels were created to which the items were randomly assigned (Little et al., 2002).

**Model identification:** In the identification of the model, it was assumed that each observable variable would load only on the factor it was intended to measure, and would not load on the other factors. Two models were tested. In model 1 (original factor structure), it was estimated that all covariance between each of the first order factors would be explained by a higher-order factor, named infertility global stress. In model 2 (proposed factor structure), it was estimated that the five first-order factors would load reliably on two second-order factors, which in turn would load on a third-order factor, the infertility global stress.

The method of estimation was Maximum Likelihood. To assess overall model fit, evaluation of the chi-square statistic is recommended. However, because chi-square is sensitive to moderate discrepancies from normality in the data (West et al., 1995), other goodness of fit indices were used: the comparative fit index (CFI), the standardized root-mean-square residual (SRMR) and the root mean square error of approximation

(RMSEA). A model is considered to have very good fit if the Chi-Square statistic is nonsignificant, the CFI is greater than 0.95, the SRMR is below .08 and the RMSEA is below 0.06 (Hu and Bentler, 1998). Hu and Bentler (1998) recommended the use of a two index presentation strategy in the maximum likelihood approach, namely the SRMR, supplemented by either indices like CFI or RMSEA.

## **Results**

### **Participant characteristics**

Final sample was constituted by 209 participants, 111 women and 98 men. Sample characteristics are presented in Table I.

According to the results, men were significantly older than women. On average, study participants had about 11 to 12 years of education, were married or cohabiting for 7 years and had medium socioeconomic status. Regarding clinical information, participants were trying to get pregnant for about five years and had undergone one previous ART treatment.

**Table I.** Sample characteristics: Sociodemographic and clinical variables (N= 209 participants)

	<b>Women (n = 111)</b>	<b>Men (n = 98)</b>	<b>t-value /<math>\chi^2</math></b>
	Mean $\pm$ SD or n (%)		
<b>Groups</b>			
Group 1. Before undergoing ART	81 (79.0%)	68 (69.4%)	.646
Group 2. After a failed ART cycle	30 (27.0%)	30 (30.6%)	
<b>Sociodemographic</b>			
Age (years)	32.68 $\pm$ 3.87	34.82 $\pm$ 4.77	-3.53*
Years of education	12.13 $\pm$ 3.81	11.07 $\pm$ 4.57	-1.79
Years in relationship (range 2-19)	7.13 $\pm$ 3.46	6.95 $\pm$ 3.10	-.36
Socioeconomic status (SES)			
Low	31 (27.9%)	30 (30.6%)	.761
Medium	80 (71.2%)	68 (69.4%)	
<b>Clinical</b>			
Duration of infertility (range 1-16)	5.29 $\pm$ 3.37	5.25 $\pm$ 3.34	-.09
Previous treatments (range 0-5)	1.26 $\pm$ 1.29	1.15 $\pm$ 1.72	-.52

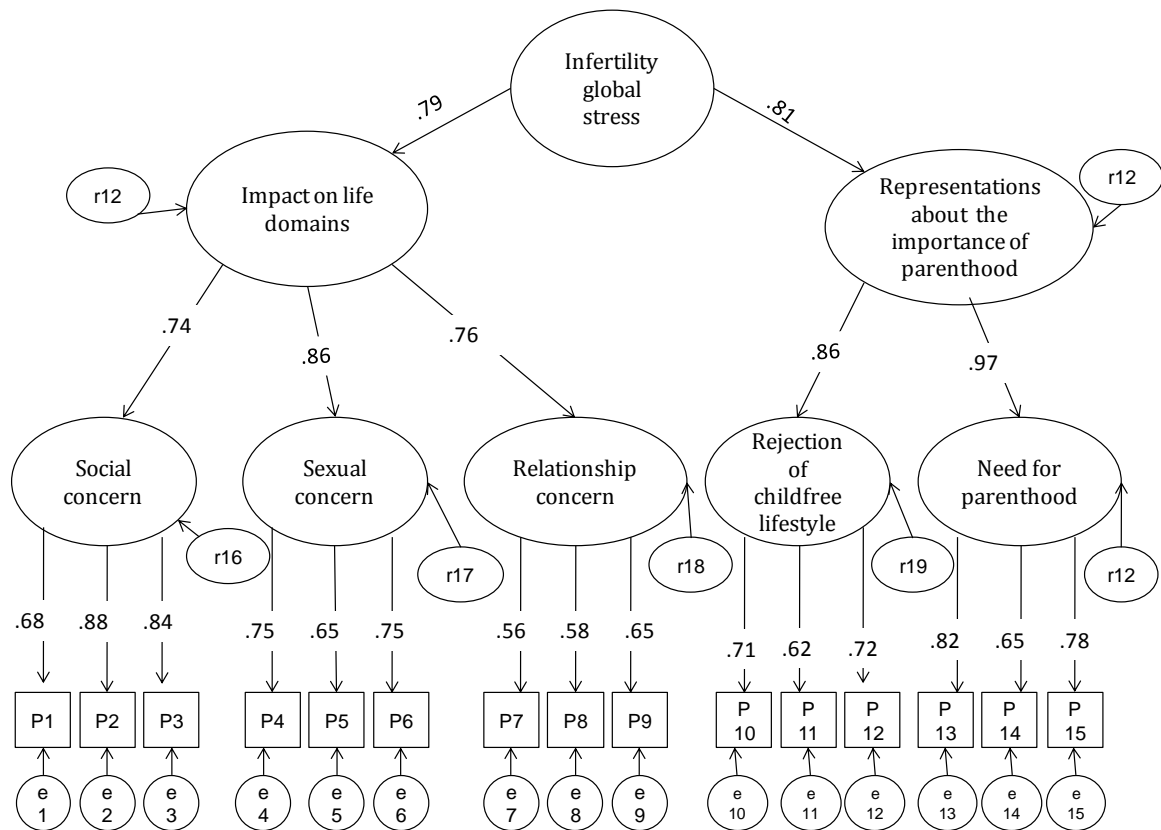
\*  $p = .001$

### Confirmatory factor analysis of the FPI factor structure

The Chi-Square value of the Model 1, representing the original factor structure, overall fit was significant [ $\chi^2_{85} = 193.94, p < .001$ ]. Examination of other fit indexes indicated a moderate fit between the theoretical model and the data, with CFI = .91; RMSEA = .08 (CI 90% Confidence interval .06-.09); SRMR = .08. All the standardized factor loadings of the items parcels into their correspondent latent construct were statically significant ( $p < .001$ ).

Model 2 showed better fit, improving the adjustment fit indexes [ $\chi^2_{84} = 147.89, p < .001$ ; CFI = .95, RMSEA = .06 (CI 90% Confidence interval .04 - .08); SRMR = .06]. All the standardized factor loadings of the items parcels into their correspondent latent construct were statically significant ( $p < .001$ ). Additionally, all the first-order factors loaded significantly in their respective second-order factors, which in turn loaded

significantly in the third-order factor, representing infertility global stress. That is, infertility global stress accounted for the variability of the second-order factors, which in turn each accounted for the covariance of their respective first-order factors. Figure 1Figure 1 depicts standardized estimates for model measurement and structural paths.



**Figure 1.** Standardised regression weights of factor loadings in the third-order model.

Note: e = error, r = residual; P = Parcel

The difference from Model 1 to Model 2 was statistically significant ( $\Delta\chi^2_1 = 46.05$ ,  $p < .001$ ), indicating that our proposed framework showed a significant better fit to the theoretical model than the original model.

***Testing model invariance across gender and across group of participants***

To test whether the FPI is a valid measure to assess infertility related stress across different groups, Model 2 was tested for model invariance (measurement and structural invariance) across gender and across the two groups of participants.

To evaluate invariance in the model, it is recommended that chi-square differences among models tested is non-significant and minimal changes occur in the other goodness of fit indexes. Model comparison is presented in Table II.

**Table II.** Summary of fit statistics for testing measurement invariance of the Fertility Problem Inventory higher-order factor model (Model 2)

	$\chi^2$	df	RMSEA	CFI	SRMR	$\Delta\chi^2$	$\Delta df$
<b>Gender</b>							
Unconstrained	221.35	169	.04	.95	.07	-	-
Measurement invariance	240.14	179	.04	.95	.07	18.79*	10
Structural invariance	241.71	182	.04	.95	.07	20.36	13
<b>Group</b>							
Unconstrained	280.51	168	.06	.91	.07	-	-
Measurement invariance	285.92	178	.05	.91	.07	5.14	10
Structural invariance	287.38	181	.05	.91	.07	6.87	13

\* $p < .05$

The analysis of the results reported in Table II confirmed the invariance across groups and gender in the FPI. More specifically, the measurement invariance indicates that the factor loadings of indicator variables on their respective latent factors do not differ significantly across groups. Regarding gender differences, a significant difference was found in chi-square measurement invariance results ( $p = .043$ ). However, all the other fit statistics remained unchanged and suggested good fit of the models, thus confirming the invariance of factor loadings across men and women.



Regarding structural invariance, which assesses invariance in the paths of the structural models, results also confirmed the invariance across gender and across group of participants.

*Construct validity of the Fertility Problem Inventory*

Construct validity of the FPI was assessed by testing criterion validity of its subscales. Table III reports descriptive statistics (means and standard deviations) of depression, anxiety, marital satisfaction, sexual relationship satisfaction and strength of desire to achieve pregnancy scores and correlations between these and FPI subscales scores. Correlations between the FPI subscales are also presented.

Results show that depression and anxiety were positively correlated with all the FPI subscales and the global score, suggesting that all the FPI subscales are assessing distress related with fertility problems.

**Table III.** Descriptive statistics and correlations between the FPI subscales and BSI and ENRICH subscales and strength of desire to achieve pregnancy

	Mean	<i>SD</i>	SocC	SexC	RC	RJL	NP	IGS
Social concern (SocC)	22.63	8.89	1					
Sexual concern (SexC)	14.27	5.92	.52**	1				
Relationship concern (RC)	19.28	5.97	.47**	.43**	1			
Rejection childfree lifestyle (RJL)	33.22	6.98	.31**	.38**	.26**	1		
Need for Parenthood (NP)	42.35	8.31	.38**	.48**	.30**	.64**	1	
Infertility global stress (IGS)	131.76	26.51	.76**	.75**	.64**	.71**	.78**	1
Depression	.80	.70	.52**	.48**	.39**	.28**	.46**	.59**
Anxiety	.81	.65	.48**	.44**	.26**	.27**	.41**	.51**
Marital satisfaction	4.18	.49	-.31**	-.44**	-.45**	-.11	.12	-.37**
Sexual relationship	4.03	.60	-.40**	-.56**	-.53**	-.13	-.18*	-.48**
Family and friends	3.95	.59	-.46**	-.32	-.39	-.04	-.15	-.38
Strength of desire to achieve pregnancy	4.16	.75	.07	.11	.05	.35**	.41**	.29**

\*  $p < .05$ ; \*\* $p < .001$ ; *SD* = Standard Deviation

The social, relational and sexual concern are associated with other measures of adjustment, namely the ENRICH Marital satisfaction, Sexual relationship, and Family and friends subscales, but are not related with the strength of desire to achieve pregnancy. Conversely, Need for parenthood and Rejection of childfree lifestyle are not related with those adjustment measures (with the exception of a weak association between sexual relationship and need for parenthood), but are moderately associated the strength of desire to achieve pregnancy, suggesting that, although all these scales are contributing for the measurement of infertility related stress, they are tapping two different dimensions of this distress. As hypothesized by Model 2, the stronger correlations among FPI subscales were found between social concern, sexual concern and relationship concern, as referring to the problematic infertility life dimensions; and between need for parenthood and rejection of childfree lifestyle, both related to the representations about importance of parenthood and children in one's life.

### **Discussion**

The aim of the present study was to evaluate the factor structure of the Fertility Problem Inventory in sample infertile patients. To our knowledge, this is the first study dedicated to test the factor structure of the FPI, contributing to confirm the measurement model of the instrument. Two higher-order models were tested. The first was based on the conceptual model proposed by the authors of the FPI, which considers that all the first-order factor are contributing to a common underlying construct of infertility stress (i.e. the original Model). The first model tested the original framework proposed by the authors, with five first-order factors presumably correlated and loading on a second-order factor named infertility global stress. The second (the proposed

model) included an intermediate level of two latent variables. According to this third-order model, the five first-order factors loaded reliably on two second-order factors, consisting on the latent variables, which reflect 1) the problematic infertility domains, and 2) representations about the importance of parenthood in men and women's life. These two latent variables loaded significantly in the scale overall score, the infertility global stress.

The findings indicated that the best fitted model was Model 2, suggesting that the five proposed dimensions of infertility stress are structurally related, although independent, and are consistent indicators of a higher level construct, infertility stress. As such, results suggest that two distinct dimensions of infertility global stress are tapped by the FPI: One, designated as the impact in life domains, includes the areas of the participants life that are affected by the infertility experience, e.g. the social, marital and sexual dimensions of infertile couples; the other, designated by the representations about the importance of parenthood concern the beliefs regarding parenthood and childlessness in couples' lives.

This two dimensional approach was confirmed by the improved fit of the model but also by the study of validity of the FPI. In general, there are stronger intercorrelations between the social, sexual and relationship concerns subscales and between the need for parenthood and rejection of childfree lifestyle. Additionally, the strength of desire to achieve pregnancy was positively and moderately related with the rejection of childfree and need for parenthood subscales, but not with the other subscales of the FPI. Together, these results suggest that the two FPI subscales evaluate different issues.

All FPI subscales were associated with depression and anxiety, confirming that the experience of infertility is a stressful experience that threatens men and women well being. The results also confirmed those obtained by Newton et al. (1999), who found

that all subscales were related to depression and anxiety, with lower associations found in the rejection of childfree lifestyle.

In summary, the FPI adopts a comprehensive approach taking into account different domains of one's life namely considering marital, sexual and social domains but also the importance of parenthood and children in a couples' life and the difficulties in accepting a future life without the parental role. These constructs have demonstrated to be structurally independent, although related, contributing to a more comprehensive approach to infertility stress.

The two domain approach expands the utility of the Fertility Problem Inventory by capturing the impact of infertility experience in specific dimensions of individuals' life while assessing representations of the importance of parenthood in their life infertility, both of these not assessed by any other standardized measures (Greil, 1997; McQuillan et al., 2003; Newton et al., 1999; Wilson and Kopitzke, 2002). Additionally, the FPI demonstrated to be an adequate measure to assess infertility stress in men and women and in different stages in the infertility and ART experience. Although scores are expected to be different (Newton et al., 1999), the instrument revealed to have measurement and structural invariance, meaning that remains equally valid to assess participants in different situations.

Some limitations and future directions should also be considered when analysing the presented findings. First of all, to confirm the theoretical model underlying the FPI, more studies using confirmatory factor analysis should be conducted in different languages other than Portuguese. Even considering that no changes were made to the original instrument, contextual and social variables can, potentially, influence constructs assessed by this questionnaire, like the importance of parenthood in one's life and identity and social concerns; therefore, similar studies using different populations

should be used. Secondly, infertile patients that were assessed were already involved in ART treatments, but they may not be representative of all infertile couples (Brandes et al., 2009; Greil et al., 2010). Therefore, it may not be concluded that this model is applicable to all infertile patients.

### **Implications for future research and clinical practice**

This study has important implications for research. By assessing both the impact of fertility problems on several life domains and the representations about the importance of parenthood in the individual's life, the FPI allows for the integration of two distinct research traditions in infertility research (Greil et al., 2010), by accounting for the impact of the infertility experience in the individuals' life but also for the assessment of the personal meaning that is attributed to parenthood and childlessness of infertile men and women.

Although both dimensions contribute to the measurement of infertility global stress, this approach can be useful by addressing two different needs: the assessment of problematic functioning of infertile patients (the three life dimensions considered) and the assessment of beliefs and representations that shape the subjective experience of infertility. It is of foremost importance to develop a deeper understanding of the experience of infertility, namely the meaning of parenthood and childlessness, which may be responsible for the variability found in the infertile patients adjustment (Greil et al., 2011; Moura-Ramos et al., in press).

The proposed model has also some important implications for clinical practice. The two domains of infertility stress may reflect different levels of distress related to the infertility experience, one more focused on the areas of the individuals' life that are affected by the experience of infertility and the other highly related with the construction of the meaning of parenthood and infertility, which can be assessed as two

separate subscales, depending on the therapeutic goals. Indeed, in the review of the literature on women's adjustment to IVF, Verhaak et al. (2007) highlighted the importance of pretreatment cognitions of helplessness and acceptance of childlessness in predicting the emotional response to treatment failure, suggesting that the meaning of childlessness should be addressed in psychological intervention. The use of the subscales Need for parenthood and Rejection of a childfree lifestyle may contribute to identify those patients that report more difficulties in accepting childlessness and thus have higher risk of emotional difficulties during the experience of infertility.

Additionally, the use of the three subscales on the impact of infertility on infertile life dimensions can be used to assess the dimensions mostly affected by the infertility experience, and thus to guide the therapeutic intervention that aim to reducing burden.

In summary, the Fertility Problem Inventory seems to be an adequate instrument to measure infertility related stress, by providing an exhaustive and comprehensive assessment of the stress associated with infertility across different areas. It may also be useful in clinical context for screening purposes, identifying areas of major difficulties and risk of emotional difficulties in men and women facing the infertility experience.

### **Authors' roles**

M.M.-R, S.G., M.C.C. and I. S. made substantial contributions to the conception and design of the study. M. M.-R. was involved in the data collection, analysis and interpretation of data. All authors were involved in drafting/revising and giving final approval of this paper.

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