Screening for infertility-related stress at the time of initial infertility consultation: psychometric properties of a brief measure

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Screening for infertility-related stress at the time of initial infertilityconsultation: psychometric properties of a brief measure

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ABSTRACT

Aim. To develop and psychometrically test a brief self-report to assess the amount of infertility-related stress; to investigate how infertility-related stress differentiated men and women and was associated to emotional distress.

Background. Infertility exerts a stress effect on both personal and interpersonal areas. Due to the burden of multiple assessments in fertility clinics, there is the need for very brief and easy to administer measures of the stressful impact of infertility on the intrapersonal and interpersonal life domains.

Design. The study had a psychometric, cross-sectional design.

Method. Between January and December 2013, a total of 597 Italian infertile patients (58.6% women), recruited at the time of initial infertility consultation, completed the Infertility-Related Stress Scale. A subsample of 200 participants (50% women) also completed self-reports of anxiety and depression. A subsample of 40 patients completed again the Infertility-Related Stress Scale at a 4-week follow-up visit.

Results. Confirmatory factor analyses supported the proposed two-factor model of infertility stress affecting intrapersonal and interpersonal life domains. Both dimensions showed good reliability and were associated in expected ways with emotional distress. Patients with above-threshold levels of anxiety and depression showed higher infertility stress in both domains and in particularly in the

intrapersonal area. Infertility stress was significantly higher in women than in men in the intrapersonal domain.

Conclusion. The Infertility-Related Stress Scale showed evidence of validity and reliability. This new, brief self-report can assist fertility clinic staff in identifying those patients who need support to overcome the stressful impact of infertility on intrapersonal and interpersonal domains.

Keywords: anxiety, assisted reproductive technology, depression, fertility nurses, infertility stress, instrument development, interpersonal life, intrapersonal life, nursing

SUMMARY STATEMENT

Why is this research needed?

- Worldwide, the experience of infertility has been associated with increased risk of adverse psychological outcomes.

- The infertile condition exerts a stress effect on both intrapersonal (e.g., marriage, physical and mental wellbeing, leisure/enjoyment, life satisfaction) and interpersonal (e.g., relationships with others, work performance) areas of life.

- The burden of multiple assessments for infertility clinic patients highlights the need for very brief and easy to administer tools to assess infertility-related stress in intrapersonal and interpersonal life domains.

What are the key findings?

- The Infertility-Related Stress Scale is a brief, valid, and reliable measure that provides a rapid screening of the burden of infertility in the intrapersonal and interpersonal life domains.

- Infertility stress was higher in the intrapersonal than in the interpersonal area, and women exhibited higher intrapersonal infertility stress than men, regardless of socio-demographic and clinical variables.

- Infertile patients with above-threshold levels of anxiety and depression showed higher infertility stress in both domains of life, and particularly in the intrapersonal area.

How should the findings be used to influence policy/practice/research/education?

- The Infertility-Related Stress Scale is a psychometrically sound measure that is not time consuming and easy to administer and interpret without professional expertise.

- The Infertility-Related Stress Scale may allow elucidating whether the most problematic area of functioning of infertile people is intrapersonal or interpersonal, thus promoting a deeper understanding of the infertility experience.

- The Infertility-Related Stress Scale could assist fertility clinic staff in identifying patients with a greater risk for infertility-related stress and adjustment difficulties, in order to implement tailored support interventions.

Keywords: instrument development; infertility stress; intrapersonal life; interpersonal life; anxiety; depression; assisted reproductive technology; fertility nurses; nursing

INTRODUCTION

Infertility is internationally defined as the inability or failure to conceive within 12 months or more of regular unprotected sexual intercourse (Zegers-Hochschild *et al.* 2009). It affects about 9% of couples worldwide and more than 50% of them seek medical help to resolve fertility problems (Boivin *et al.* 2007). A common practice in the treatment of infertility is assisted reproductive technology (ART), which includes different techniques where both gametes are handled outside the body. Its use seems to be increasing at both public and private fertility clinics, especially in western countries (Sullivan *et al.* 2013).

Infertility seems to exert a stress effect on both intrapersonal and interpersonal areas of life (Greil 1997, Newton *et al.* 1999, Watkins & Baldo 2004, Boivin *et al.* 2007, Cousineau & Domar 2007, Hinton *et al.* 2010, Onat & Beji 2012), although many studies indicate that women report higher levels of infertility-related stress than men (e.g., Anderson *et al.* 2003, Boivin & Schmidt 2005, Peterson *et al.* 2006, Schmidt 2006, Wichman *et al.* 2011, Cserepes *et al.* 2013, Galhardo *et al.* 2013).

Within the clinical context of ART, screening all patients about their level of infertility stress at the time of initial infertility consultation might help to identify those who need support to cope with infertility and its treatment, and, in this way, assist healthcare professionals, especially nurses, in their complex task of caring for infertile clients (Payne & Goedeke 2007).

To address this issue, we designed the Infertility-Related Stress Scale, which measures infertility-related stress in both intrapersonal and interpersonal domains of life.

Background

The experience of infertility has been associated internationally with increased risk of adverse psychological outcomes. For example, the members of couples who are not able to achieve a pregnancy often experience discomfort and frustration due to their inability to accomplish an important personal

goal (Leiblum 1997, Watkins & Baldo 2004, Boivin *et al.* 2007, Cousineau & Domar 2007). In patients seeking help for infertility, this condition has been associated with lower life satisfaction (Abbey *et al.* 1991). Stress related to infertility has been found to reduce quality of life of infertile women (Kim & Shin 2013) and to be influenced by and associated with anxiety (Newton *et al.* 1999, Peterson *et al.* 2007, Gourounti *et al.* 2011, Peng *et al.* 2011, Donarelli *et al.* 2012) and depression (Newton *et al.* 1999, Anderson *et al.* 2003, Peterson *et al.* 2003, Gourounti *et al.* 2011, Peng *et al.* 2011) in both men and women. In addition, infertility-related stress has been found to reduce the chances of achieving a positive ART treatment outcome (for a meta-analysis see Matthiesen *et al.* 2011). Accordingly, couples seeking infertility treatment have expressed needs for support to cope with infertility stress (Read *et al.* 2014). Life satisfaction, quality of life and mental health are among the main intrapersonal aspects of life that are highly affected by infertility and infertility-related stress.

Infertility has also negative interpersonal implications (Greil *et al.* 2010). In fact, the social stigma attached to the infertile condition and the pressure to achieve parenthood can cause deterioration of social relationships, undermine access to social support and lead to social isolation (Imeson & McMurray 1996, Wilson & Kopitzke 2002, Gannon *et al.* 2004, Cousineau & Domar 2007, Slade *et al.* 2007, Hinton *et al.* 2010, Onat & Beji 2012, Mikkelsen *et al.* 2013).

In light of all the above, it seems to be noteworthy to take into account the degree of stress that infertility entails in the intrapersonal and interpersonal domains of life, when assessing adjustment to infertility in both men and women.

In both clinical and research settings worldwide, self-report questionnaires are largely used to assess infertility-related stress. The most comprehensive measure is the 46-item Fertility Problem Inventory (FPI; Newton *et al.* 1999, Moura-Ramos *et al.* 2011), which has proven to be a reliable and valid tool for assessing the impact of infertility on the individual's social, marital and sexual life, and on the importance of parenthood in one's life (e.g., Peterson *et al.* 2007, Slade *et al.* 2007, van der Broeck *et*

al. 2010). Another comprehensive measure is the Fertility Quality of Life Tool (FertiQoL; Boivin *et al.* 2011), a 36-item valid and reliable measure developed to assess the impact of fertility problems and treatment on quality of life.

Despite the wide use of the two above mentioned measures, our experience in medical settings, in which time constraints are present, has brought out the need for using very brief and easy to administer tools to avoid increasing the respondent burden of multiple assessments (e.g., biochemical/diagnostic tests and psychosocial assessment) and questionnaire incompleteness (Nowack 1990).

Two shorter self-reports developed for use in ART clinical settings are the 9-item Fertility Problem Stress Inventory (FPSI; Abbey *et al.* 1991) and its 14-item adaptation (Schmidt *et al.* 2005). The FPSI measures the overall infertility stress and the impact of infertility on various domains of life (e.g., physical and mental health and marriage). Its adaptation assesses the amount of disruption produced by infertility on personal, social, and marital domains, in line with the three-factor model adopted by Boivin and Schimdt (2005). Both scales are short enough to not result in burden to the respondent, and showed good psychometric properties across various adaptations (Schmidt *et al.* 2003, 2005, Boivin & Schmidt 2005, Peronace *et al.* 2007, Peterson *et al.* 2008, 2009, 2014, Rosholm *et al.* 2010, Matthiesen *et al.* 2012, Vassard *et al.* 2010, Aflakseir & Zarei 2013), but neither of the two scales has been validated nor used in Italy. Furthermore, other areas of life that are affected by infertility stress, such as life satisfaction (Abbey et al. 1991), are not addressed by the described tools, and other aspects might be added or removed based on the patient's perspective. Thus, there is the need for a brief but comprehensive self-report measure of the stressful impact of infertility, which would be especially useful in research and clinical settings. In the present study, we propose a bidimensional model of infertility-related stress that distinguishes between intrapersonal and interpersonal dimensions. Although the boundaries between the intrapersonal and interpersonal domains are blurred, this distinction is worthwhile. We intended the intrapersonal realm as focused on our relationship to

ourselves, our interior awareness and identity, self-direction and purpose in our life. The interpersonal realm is focused on our relationships with others and includes our roles, rights and responsibilities with others.

THE STUDY

Aims

The primary goal of the present study was to develop and psychometrically test a brief self-report to be used in ART clinical settings to measure infertility-related stress at both the intrapersonal and interpersonal levels. For this purpose, we developed and tested the psychometric properties of the Infertility-Related Stress Scale (IRSS) as inspired by previous measures and based on infertile patients' experience.

As a second goal, we investigated whether socio-demographics, causes of infertility, and anxiety and depression were associated with infertility stress domains.

Methodology

This study has a psychometric, cross-sectional design. As an observational study, it follows the STROBE statement (von Elm *et al.* 2007). The development and testing of the instrument was conducted in three phases. In the first phase of scale development and pilot testing, a focus group was conducted with ten ART patients (50% female) attending a private fertility clinic, in order to identify the areas of life most affected by infertility stress. Participants were asked to select relevant items from existing measures of infertility-related stress (Abbey *et al.* 1991, Schmidt *et al.* 2005), modify or exclude ambiguous and/or non-relevant ones, and suggest any other domain impaired by their infertility problem. At the end of the focus group, we composed the IRSS and piloted it with the same participants to assess readability. Content and face validity were evaluated and approved by three

clinical psychologists working in ART settings. In the second phase, we tested the IRSS internal consistency reliability and construct and criterion-related validity. Data were collected by a questionnaire that included, in addition to the IRSS, socio-demographic data (i.e., gender, age, educational attainment, and employment status), and information on the cause of infertility. Due to time constraints at the fertility clinics involved in the study, only the first 200 questionnaires, equally distributed across genders and clinics, contained also the State-Trait Anxiety Inventory (STAI; Spielberger 1983) and the Beck Depression Inventory-II (BDI-II; Beck *et al.* 1996). The STAI is a well-validated tool comprised of two 20-item scales assessing state and trait anxiety. In the present study, only the state anxiety scale was used to measure how participants were feeling at the time of being questioned. The BDI-II is a widely used 21-item self-report describing cognitive, motivational, affective, and somatic symptoms of depression. Both measures demonstrated good validity and reliability in their Italian versions used in this study (Pedrabissi & Santinello 1989, Ghisi *et al.* 2006). In the third phase, we assessed the IRSS temporal stability over a 4-week period, using data from a subsample of study participants.

Sample

Participants were recruited at three private and three public fertility clinics in northern and central regions of Italy between January and December 2013. Inclusion criteria were being 18 years or older; seeking ART treatment for infertility problems; having reported failure to conceive after a period of at least 12 months of unprotected intercourse; attending the first visit to the clinic; and being Italian speaking. Of the 800 patients who attended the clinics during the recruitment period, 748 (50% male) met all inclusion criteria and were invited to participate in the study. Of them, 626 (58% female) agreed to participate, thus the response rate was 83.7%. One hundred twenty-two patients (90.2% male) declined participation, with the most common reason being "not interested in surveys/research in

general". For the second phase of instrument testing, data from the total final sample were used to test the construct validity and internal consistency reliability of the IRSS, while data from a subsample of 200 participants were used to assess criterion-related validity. For the third phase, 50 randomly selected participants were asked to answer the IRSS again at a 4-week follow-up visit and 40 (80%) agreed to complete the retest.

Instrument

The IRSS is composed of 12 items rated on a 7-point scale (from 1 = "no stress at all" to 7 = "a great amount of stress") to assess the impact of infertility on the intrapersonal and interpersonal domains of life. Building on findings from the focus group, four items (i.e., marital satisfaction, sexual pleasure, physical wellbeing, and mental wellbeing) were inspired from Abbey *et al.* (1991) and Schmidt *et al.* (2005), four (i.e., relatives, in-laws, friends, and colleagues) were based on Schmidt *et al.* (2005) and four were newly developed. The last four items, proposed by the focus group participants, included global satisfaction with life, leisure/enjoyment, neighbors, and performance of work/housework. Infertility has been shown to be associated with a reduced global life satisfaction (Abbey *et al.* 1991) and to have a constraining influence on people's leisure activities (Parry 2004). Neighbours were suggested as an important relational category and source of social support, as emerged in previous studies conducted in urban, suburban and rural contexts, in both western and eastern countries (e.g., Thoits 1985, Nation *et al.* 2010, Wang *et al.* 2015). Finally, the impact of the infertile condition on performance of work/housework was proposed by participants because a reduction or lack of interest in work or household chores might result from the burden of infertility as linked to social isolation (Imeson & McMurray 1996, Hinton *et al.* 2010) and depression (Newton *et al.* 1999, Anderson *et al.* 2003, Peterson *et al.* 2003, Gourounti *et al.* 2011, Peng *et al.* 2011).

We assumed that the six items referring to perceived mental and physical health, sexual pleasure, marital satisfaction, leisure/enjoyment, and global life satisfaction represented the intrapersonal domain, whereas the six items referring to work performance and the relational contexts of relatives/family of origin, in-laws, friends, colleagues/acquaintances, and neighbours were assumed to be indicators of the interpersonal domain. Noteworthy, we assigned the perceived impact of infertility-related stress on marital satisfaction to the intrapersonal rather than to the interpersonal domain. This choice was based on the strong links among personal identity, intimacy and marital bond and satisfaction implied in Erickson's theoretical model (Erickson, 1968).

Ethical considerations

The investigation conforms to the principles outlined in the Declaration of Helsinki and was approved by the Regional Health Research Ethics Board. All participants agreed to voluntarily take part in the study, signed informed consent, and responded autonomously to the research questionnaire.

Statistical analyses

Sample size was determined following recommendations for confirmatory factor analysis (CFA) requiring at least 10-20 observations for each freely estimated model parameter (Kline 2005). CFAs were performed on the IRSS to assess the validity of our proposed two-factor model of infertility-related stress (see Instrument section), and to obtain evidence of the IRSS construct validity. The proposed model was compared to a one-factor model, in order to exclude that infertility stress is best represented as a single latent factor. It was also compared to a three-factor model inspired by Boivin and Schmidt (2005), where, in addition to the interpersonal domain, strictly personal (i.e., perceived mental and physical health, leisure/enjoyment, and global life satisfaction) and marital (i.e., sexual pleasure and marital satisfaction) aspects were further distinguished.

Model parameters were estimated using the robust maximum likelihood method, which corrects for non-normal data, since the test for multivariate symmetry and kurtosis detected some deviation from multivariate normality. The closeness of the hypothesized model to the empirical data was evaluated through multiple goodness-of-fit indices: Satorra-Bentler scaled χ^2 statistic (S-B χ^2) (Satorra & Bentler 2001); root mean square error of approximation (RMSEA, cut-off < 0.08; Browne & Cudeck 1993); standardized root mean square residual (SRMR, cut-off < 0.08; Hu & Bentler 1999) and non-normative fit index and comparative fit index (NNFI and CFI, respectively, cut-off ≥ 0.95; Hu & Bentler 1999). The above mentioned indices were examined for the three tested models, whose goodness-of-fit was compared by a S-B χ^2 difference test with the correction needed when the S-B scaled χ^2 is used (Δ S-B χ^2; Satorra & Bentler 2001).

Internal consistency reliability was assessed by calculating Cronbach's alpha (cut-off ≥ 0.70; Nunnally 1978) and corrected item-total correlations (cut-off ≥ 0.30; Streiner & Norman 2008). Test-retest reliability over a 4-week period was assessed by calculating the intra-class correlation coefficient (ICC) with a two-way random effects (absolute agreement) model (cut-off ≥ 0.70; Streiner & Norman 2008) in a subsample of 40 subjects. This sample size was established a priori to detect an expected large effect size with a power 0.85 or greater and alpha = 0.05 (two-tailed).

As evidence of criterion-related validity, zero-order correlations were calculated between the IRSS and standardized measures of anxiety and depression in a subsample of 200 patients. Expecting correlations with a moderate effect size, this sample size was considered adequate to have approximately 95% power (alpha = 0.05, two-tailed) to reject the null hypothesis.

Multivariate Analysis of Variance (MANOVA) was computed to test for gender differences in infertility-related stress, using the two sub-scales of the IRSS as the dependent variables, and sex and other characteristics (i.e., age, education, employment status, and cause of infertility) as factors or covariates.

MANOVA followed by Bonferroni post-hoc multiple comparisons was performed to compare patients who scored above the thresholds for the STAI and/or the BDI-II and patients with below-threshold anxiety and depression scores in relation to their level of infertility stress. Threshold scores were > 40 for the Italian STAI (Pedrabissi & Santinello 1989) and > 11 for males and > 14 for females for the Italian BDI-II (Ghisi *et al.* 2006).

In the evaluation of estimates, we based conclusions on both statistical significance (significant level set at $p < 0.05$) and standardized measures of effect, with Cohen's *d* of 0.2 considered small, 0.5 medium, and 0.8 large, and Pearson's *r* of 0.10 small, 0.30 medium, and 0.50 large (Cohen 1988). Sample sizes were calculated a priori with the statistical software G*Power 3 (Faul *et al.* 2007). CFAs were performed using LISREL 8.80 (Scientific Software International, Lincolnwood, IL); all other analyses were performed with IBM SPSS 20 (SPSS Inc., Chicago, IL).

RESULTS

Participants' characteristics

The study sample initially comprised 626 patients. After examining completeness of the questionnaires, 29 subjects (4.6%) were excluded from analyses because they failed to respond to at least 10% of the IRSS items. They were 17 men (58.6%) and they did not differ from included respondents as to mean age [37.90 ± 7 years; F(1,624) = 0.002, $p = 0.97$, $d = 0.02$], education [$\chi^2(2) = 0.52$, $p = 0.77$] and employment status [$\chi^2(1) = 0.87$, $p = 0.35$]. A proportion of about 5% of incomplete questionnaires indicates a good degree of acceptance of the IRSS.

The final sample was formed by 597 participants (58.6% females), whose characteristics are shown in Table 1. Men were significantly older and less educated than women. With regard to the cause of infertility, 19.3% of patients were not assigned a specific diagnosis because all tests included in a

standard infertility evaluation (American Fertility Society 1992) were not completed at the time of the first visit. Definitive diagnosis were classified as female cause, male cause, female and male cause, or unexplained infertility.

The subsample of 200 participants who completed also the STAI and the BDI-II was composed of 50% male and other characteristics are shown in Table 1. Men were significantly older and less unemployed than women. The subsample who agreed to answer the IRSS again over a 4-week period (n = 40) was also composed by 50% male.

Construct validity of the IRSS

Means, standard deviations, and univariate skewness and kurtosis for the individual IRSS items are reported in Table 2, as well as CFA fit indices. Indices for the one-factor model did not meet the pre-established criteria, indicating that a model with a single dimension was not a good representation of the IRSS structure, whereas those for both the two and three-factor models suggested adequate fit to the data. The S-B scaled chi-square difference test was then performed to determine whether the competing nested models were equivalent. There was no significant corrected chi-square difference [Δ S-B $\chi^2(2) =$ 3.711, $p = 0.16$] between the three- and two-factor models; hence, we chose the two-factor as it was the most parsimonious model with fit statistics in the desired range (Kelloway 1998). All indicators of infertility-related stress loaded significantly ($p \leq 0.001$) with standardized factor loadings ≥ 0.60 on their hypothesized domain (Figure 1).

An intercorrelation of 0.72 between the two factors indicates that approximately 50% of the variance of each factor is unique, thus the IRSS was indeed measuring two separate, although highly related, dimensions. On the other hand, this large correlation effect makes it appropriate to calculate also a global score. The IRSS and scoring instructions are presented in Appendix.

Criterion-related validity of the IRSS

As shown in Table 3, the observed correlations between the IRSS domains and anxiety and depression were in the expected direction and medium to large in effect size. Men and women who reported higher infertility stress also reported higher levels of state anxiety and depression. The intrapersonal domain was more highly associated with anxiety and depression than the interpersonal domain in both men and women.

Reliability of the IRSS

Internal consistency of the IRSS was good, with Cronbach's α coefficients of 0.91 for the total IRSS and 0.89 and 0.87 for the intrapersonal and interpersonal domain, respectively. Corrected item-total correlations were in the 0.56-0.74 range for the total IRSS, between 0.57 and 0.82 for the intrapersonal domain, and between 0.63 and 0.75 for the interpersonal domain. Test-retest reliability over a 4-week period ($n = 40$) was acceptable, with an ICC of .89 (CI 95% = .82-.93) for the intrapersonal domain and an ICC of .86 (CI 95% = .74-.92) for the interpersonal domain. The ICC for the total IRSS was .88 (CI 95% = .78-.92)

Associations of socio-demographic characteristics and causes of infertility with infertility stress

Descriptive statistics of the IRSS dimensions, in men and women separately, are presented in Table 4. Preliminary partial correlations were calculated between age and IRSS dimensions after removing the common effect of gender, since both age and IRSS were presumed to be linearly related to gender. Partial correlation coefficients were $r = -0.02$ and $r = -0.07$, respectively, indicating that the relationships among age and the IRSS dimensions were inconsistent, after removing the effect of gender.

With regard to group differences on the IRSS dimensions, main effects of and interactions between level of education, employment status and cause of infertility were non-significant. Gender showed a significant main effect on the IRSS dimensions taken together; however, univariate analyses showed that the effect of gender was significant for the intrapersonal domain ($d = 0.64$), but non-significant for the interpersonal domain ($d = 0.46$). Thus, infertility stress was significantly higher in women than in men in the intrapersonal domain of life, regardless of education, employment status and cause of infertility.

As shown in Figure 2, a difference between IRSS domains was present and primarily arose from the higher scores of women on the intrapersonal scale. The effect size of the difference between the two domains was medium in women ($d = 0.59$) and small in men ($d = 0.43$).

Association between emotional distress and infertility stress

With the use of the thresholds for anxiety and depression mentioned above, four groups were identified (Table 4): group A included patients with low levels of anxiety or depression (44%); group B was formed by patients with above-threshold levels of anxiety and depression (27.5%); group C referred to patients with low levels of anxiety and above-threshold levels of depression (3%), and group D included patients with above-threshold levels of anxiety and low levels of depression (25.5%). No significant interaction was found between gender and distress [Wilks' $\lambda = 0.98$; $F(6,382) = 0.71$, $p = 0.64$], while a multivariate main effect emerged for distress. As to the univariate effect on the intrapersonal domain, post-hoc multiple comparisons indicated that group B reported significantly higher infertility stress than group A ($d = 1.84$), group C ($d = 1.27$), and group D ($d = 1.01$). With respect to the univariate effect on the interpersonal domain, group B and group D reported a significantly higher burden of the infertile condition than group A ($d = 0.98$ and 0.60, respectively). As

before, results showed that the infertility-related stress was higher in the intrapersonal than in the interpersonal domain.

Gender had a univariate main effect on the interpersonal domain ($d = 0.58$), with women reporting higher infertility stress than men.

DISCUSSION

The first objective of the present study was to validate a brief self-report that provides a rapid screening for stress related to infertility in infertile patients who turns to ART. The Infertility-Related Stress Scale (IRSS) was developed based on infertile patients' experiences and existing measures (Abbey *et al.* 1991, Schmidt *et al.* 2005) to assess the perceived impact of infertility-related stress on the intrapersonal and interpersonal domains of life. Confirmatory factor analyses supported both our proposed two-factor model and a previously used three-factor model of infertility stress (Boivin & Schmidt 2005); however, we preferred the two-factor model because it was more parsimonious. Associations with standardized measures of anxiety and depression provided evidence of criterion-related validity. All correlations were moderate in size, supporting the view that the IRSS was not simply measuring anxious or depressive symptomatology. Internal consistency reliability estimates were high for both IRSS domains and the global score and somewhat higher than those emerged for the infertility stress self-reports on which the IRSS is partly based (Abbey *et al.* 1991, Schmidt *et al.* 2003, Boivin & Schmidt 2005). Temporal stability estimates over a 4-week period were also adequate. Altogether, the IRSS appeared to be a not time-consuming tool, readily acceptable to respondents, easy to administer and interpret, and provided with evidence of validity and reliability when applied to Italian samples of infertile people turning to ART.

As to the second objective of the present study, the impact of infertility was significantly higher in women, regardless of age, education, employment status, and cause of infertility, although this gender

disparity was stronger in the intrapersonal than in the interpersonal domain. This was generally in line with previous international research on infertility-related stress (Anderson *et al.* 2003, Schmidt *et al.* 2003, Peterson *et al.* 2003, 2006, 2007, 2008, Boivin & Schmidt 2005, Wichman *et al.* 2011, Cserepes *et al.* 2013), although some authors (Anderson *et al.* 2003, Schmidt *et al.* 2003, Boivin & Schmidt 2005) found that women were more affected than men by infertility-related stress in all domains except for the marital domain. Such a gender effect may be explained by the crucial role played by gender expectations (McMahon 1995), where motherhood is seen as a central life goal and a source of self-fulfilment (Abbey *et al.* 1991, Reitzes & Mutran 2003, Moura-Ramos *et al.* 2011).

In contrast with previous studies (Newton *et al.* 1999), where higher education appeared to act as a buffer for women but not for men, IRSS scores were virtually identical across education levels. Different from McQuillan, Stone, and Greil (2007), who found that being employed improves the association between infertility and life satisfaction in women, in this study employment was not associated the perceived burden of infertility. The IRSS scores were not associated either with infertility diagnosis, in contrast with Newton *et al.* (1999), who found that male infertility was more stressful than female infertility, and Lykeridou *et al.* (2009), who found that women with male factor infertility perceived higher social stress than women with female factor, mixed, or unknown infertility. Nevertheless, our results are in line with another Italian study (Donarelli *et al.* 2012), which reported no gender differences in infertility-related stress according to the cause of infertility. These differences may be due to cultural issues and diversity; therefore cross-cultural studies would be of interest. Another noteworthy finding is that the intrapersonal domain was more affected by infertility-related stress than the interpersonal one, as previously found by Peterson *et al.* (2008). Thus, the implications of infertility seem to mainly concern the domain of self, affecting psychological and physical wellbeing, personal realisation, intimacy, and life satisfaction, more than social life.

As to the associations between infertility stress and anxiety and depression, regardless of gender, highly depressed or anxious infertile individuals showed higher levels of infertility stress in both the intrapersonal and interpersonal domains, again with a stronger effect of infertility on the intrapersonal area. As to anxiety, our findings are only partially consistent with previous results. Indeed, state anxiety was found to be associated with social and relationship concerns in a similar way among infertile men and women (Donarelli *et al.* 2012) and with sexual infertility stress among men more than women (Peterson *et al.* 2007). As to depression, our results support previous evidence that severe depressive symptoms are associated with higher infertility-related stress for both infertile men and women (Peterson *et al.* 2014), and that depressive symptoms are more strongly associated with intrapersonal concerns than with interpersonal infertility stress (Newton *et al.* 1999, Peng *et al.* 2011).

Limitations

Limitations of this study included, firstly, a lack of assessment of clinical characteristics such as infertility duration, previous failed treatment cycles, or current medical treatment approach. Second, all participants were heterosexual since, according to the Italian law, only stable heterosexual couples are admitted to ART treatment. Third, gender differences in infertility-related stress may have been partially inflated by self-selection, since patients who declined participation were mostly male. Nevertheless, this was in line with evidence that women are more willing than men to participate in research studies (e.g., Dunn *et al.* 2004, Feveile *et al.*, 2007). Finally, because data were collected cross-sectionally, we cannot infer whether infertility stress preceded or was a consequence of a patient's level of anxiety and depression.

CONCLUSION

A thorough understanding of the sources of stress in the infertile condition is an internationally relevant issue (Greil, 1997). Our interest in conducting this psychometric study arose from the need to understand how this stressful experience may disrupt the individual's major domains of life. This paper and the proposed questionnaire have implications for the clinical practice of healthcare professionals, especially nurses, who come into contact with infertile people in clinical settings worldwide, because collecting this information can help them to plan effective counselling interventions to reduce negative affect in couples who turn to ART (Allan 2013, Arslan-Özkan, Okumuş, & Buldukoğlu 2014) The availability of a very short but reliable self-report to screen for infertility-related stress appears to be especially useful in ART settings, where individuals undergo several biochemical, medical and psychosocial evaluations. The IRSS may represent a useful and feasible tool to help the staff of fertility centres to identify men and women who are at greater risk for adjustment difficulties to both infertility and treatment. Although both dimensions of the IRSS contribute to the measurement of the global burden of infertility, the bidimensionality of this tool can be useful because the two proposed domains may reflect different levels of stress related to the infertility experience, one more focused on the areas of the self and the other more related to social life.

Patients identified by means of the IRSS could then be evaluated with more comprehensive assessment tools (e.g., clinical interview) to reach a deeper understanding of the infertile experience, as wished for by several researchers (Greil *et al.* 2011, Moura-Ramos *et al.* 2011), and foster the implementation of tailored support interventions. Trying to alleviate infertility-related stress through counselling and psychosocial support has indeed been strongly recommended (Schmidt *et al.* 2003) and where this approach has been implemented, the results have been promising (Boivin 2003, de Liz & Strauss 2005).

In conclusion, the findings of the present study offer a valuable contribution to the internationally relevant issue of supporting and assisting ART patients to deal with the personal and interpersonal

stress associated with infertility and its treatment (e.g., Watkins & Baldo 2004, Cousineau & Domar 2007). Future cross-cultural studies using the IRSS may help to elucidate to what extent the distinction between intrapersonal and interpersonal areas of life being affected by infertility stress is indeed a common pattern across nations/cultures. Future studies should also test longitudinally the validity of the IRSS in predicting distress, as well as behaviour change and psychological adjustment to treatment.

APPENDIX

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IRSS

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Stress produced by infertility affects various aspects of life far more commonly than many people realise. Please, rate how much stress your infertility problem places on each of the 12 domains of your life you will find in this questionnaire using a 7-point scale from 1 = "not at all" to 7 = "a great deal".

1.	Physical well-being	1	2	3	4	5	6	7
2.	Relatives	1	2	3	4	5	6	7
3.	In-laws	1	2	3	4	5	6	7
4.	Leisure and enjoyment	1	2	3	4	5	6	7
5.	Marital satisfaction	1	2	3	4	5	6	7
6.	Mental well-being	1	2	3	4	5	6	7
7.	Performance at work / housework	1	2	3	4	5	6	7
8.	Close friends	1	2	3	4	5	6	7
9.	Sexual pleasure	1	2	3	4	5	6	7
10.	Colleagues	1	2	3	4	5	6	7
11.	Neighbours	1	2	3	4	5	6	7
12.	Global life satisfaction	1	2	3	4	5	6	7

Scoring instructions

To obtain the score of the Intrapersonal domain compute the sum of the following items: 1, 4, 5, 6, 9, and 12. To obtain the score of the Interpersonal domain compute the sum of the following items: 2, 3, 7, 8, 11, and 10. The total 12-item scale score is obtained by summing all items.

Note. The original IRSS was translated from Italian into English and then independently back-translated by two bilingual psychologists for the purpose of this paper.

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Table 1. Characteristics of participants

	Total sample ($n = 597$)			Subsample ($n = 200$)		
	n	%	Gender difference	n	%	Gender difference
Female	350	58.6		100	50	
Age[a]	37.8	5.6	$F(1,595) = 94.9^{**}$	40.4	6.1	$F(1,198) = 52.1^{**}$
Level of education						
lower secondary	80	13.4	$\chi^2(2) = 8.4^{*}$	23	11.5	$\chi^2(2) = 2.3^{ns}$
higher secondary	257	43.0		75	37.5	
tertiary	260	43.6		102	51	
Employment status						
unemployed	86	14.4	$\chi^2(1) = 0.11^{ns}$	18	9	$\chi^2(1) = 15.63^{**}$
employed	511	85.6		182	91	
Cause of infertility						
undiagnosed	115	19.3		-	-	
diagnosed	482	80.7		200	100	
female factor only	110	18.4		76	38	
male factor only	145	24.3		53	26.5	
female and male factors	124	20.8		41	20.5	
unexplained	103	17.3		30	15	

[a] M, SD; $^{*}p < 0.05$; $^{**}p < 0.001$; $^{ns}p > 0.05$

Table 2. Descriptive statistics of IRSS and goodness-of-fit indices for one-, two-, and three-factor

models

Item	*M*	*SD*	Skewness[a]	Kurtosis[b]
1	3.65	1.77	0.16	-0.93
2	2.66	1.77	0.87	-0.31
3	2.70	1.86	0.90	-0.28
4	2.55	1.72	0.91	-0.25
5	2.28	1.67	1.28	0.67
6	2.17	1.62	1.40	1.10
7	2.38	1.64	0.98	-0.10
8	2.75	1.82	0.74	-0.56
9	2.67	1.84	0.86	-0.43
10	2.76	1.84	0.78	-0.55
11	3.30	1.90	0.44	-0.97
12	3.76	1.84	0.22	-0.95

Fit indices	One-factor model	Two-factor model	Three-factor model
S-B χ^2	762.20 [c] *	250.72 [d] *	247.913 [e] *
RMSEA (CI 90%)	0.15 (0.14-0.16)	0.08 (0.07-0.09)	0.08 (0.07-0.09)
SRMR	0.08	0.05	0.05
CFI	0.93	0.98	0.98
NNFI	0.91	0.97	0.97

Note. [a] SE = 0.10; [b] SE = 0.20; [c] $df = 54$ [d] $df = 53$; [e] $df = 51$; * $p < 0.001$

Table 3. Correlations between IRSS scores and measures of depression and anxiety

|	Anxiety		Depression	
	Women ($n = 100$)	Men ($n = 100$)	Women ($n = 100$)	Men ($n = 100$)
Intrapersonal domain	0.54**	0.54**	0.43**	0.55**
Interpersonal domain	0.40**	0.29*	0.34*	0.36**
Global score	0.52**	0.47**	0.42**	0.51**

*$p < 0.01$; **$p < 0.001$

Table 4. Comparisons between groups in IRSS dimensions

	Intrapersonal domain			Interpersonal domain			Multivariate effect
	M	SD	Univariate effects	M	SD	Univariate effects	
Gender							Wilks' $\lambda = 0.98$
women ($n = 350$)	21.08	9.08	$F(1,544) = 11.52^{**}$	16.12	8.34	$F(1,544) = 2.75^{ns}$	$F(2,543) = 6.01^{*}$
men ($n = 247$)	15.76	7.51		12.79	7.17		
Education							Wilks' $\lambda = 0.99$
lower secondary ($n = 80$)	18.40	8.73	$F(2,544) = 0.42^{ns}$	14.50	7.73	$F(2,544) = 0.21^{ns}$	$F(4,1086) = 0.83^{ns}$
higher secondary ($n = 257$)	19.48	9.03		14.74	8.23		
tertiary ($n = 260$)	18.44	8.72		14.82	7.97		
Employment Status							Wilks' $\lambda = 1.00$
unemployed ($n = 86$)	19.49	9.13	$F(1,544) = 0.04^{ns}$	14.35	7.46	$F(1,544) = 0.10^{ns}$	$F(2,543) = 0.05^{ns}$
employed ($n = 511$)	18.78	8.82		14.81	8.14		
Cause of infertility							
undiagnosed ($n = 115$)	17.90	8.21		14.37	7.29		
female factor only ($n = 110$)	19.10	9.06	$F(4,544) = 1.80^{ns}$	14.92	8.69	$F(4,544) = 0.19^{ns}$	Wilks' $\lambda = 0.98$
male factor only ($n = 145$)	17.18	8.49		13.49	7.94		$F(8,1086) = 1.38^{ns}$
female and male factors ($n = 124$)	19.78	8.65		15.59	8.11		
unexplained ($n = 103$)	21.06	9.60		15.71	8.05		
Gender							Wilks' $\lambda = 0.98$
women ($n = 100$)	21.42	10.13		13.31	7.43	$F(1,192) = 4.01^{*}$	$F(2,191) = 2.05^{ns}$
men ($n = 100$)	13.71	6.85		9.52	5.47		
Distress							
A. Not anxious or depressed ($n = 88$)	12.13^b	6.78		8.81^d	4.30		Wilks' $\lambda = 0.72$
B. Clinically depressed and anxious ($n = 55$)	26.13^a	8.87	$F(3,192) = 23.57^{**}$	14.85^c	8.41	$F(3,192) = 6.29^{**}$	$F(6,382) = 11.58^{**}$
C. Depressed, not anxious ($n = 6$)	15.33^b	6.12		13.50	7.18		
D. Anxious, not depressed ($n = 51$)	17.98^b	7.31		11.96^c	6.59		

Note. Means with different letters are significantly different ($p < 0.05$, Bonferroni post-hoc paired comparisons); $^{*}p < 0.05$; $^{**}p \leq 0.001$; $^{ns}p > 0.05$

Figure 1. Measurement model of the two-factor IRSS with standardized parameters
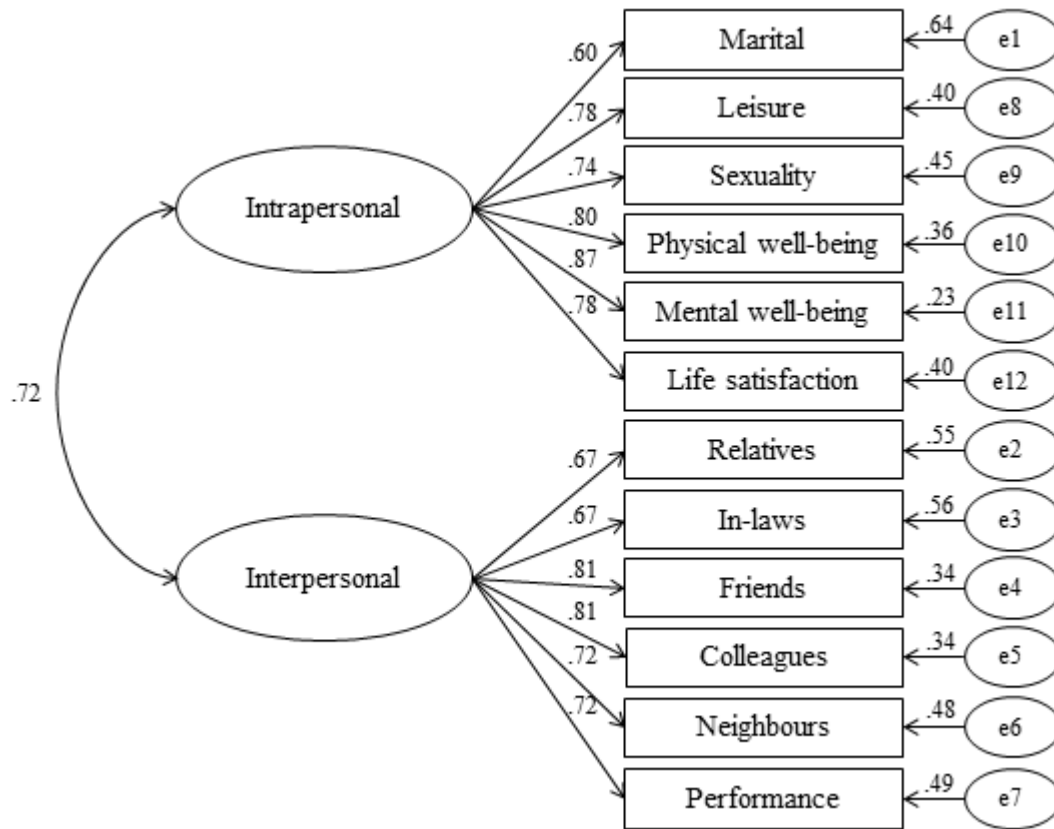
Figure 2. Mean scores of IRSS domains by gender (n = 597)