

# Are attachment dimensions associated with infertility-related stress in couples undergoing their first IVF treatment? A study on the individual and cross-partner effect

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**STUDY QUESTION:** Are attachment anxiety and avoidance dimensions in female and male partners in couples seeking infertility treatment associated with her and his infertility-related stress?

**SUMMARY ANSWER:** Attachment dimensions are significantly associated with several aspects of infertility stress in couples undergoing IVF treatment.

**WHAT IS KNOWN AND WHAT THIS PAPER ADDS:** Attachment dimensions of anxiety and avoidance (where highly anxious individuals fear rejection and are preoccupied with maintaining proximity to their partner and highly avoidant individuals are uncomfortable with intimacy and prefer to maintain distance from their partner) may influence the well being of individuals undergoing IVF/ICSI treatment. This study showed that one partner's attachment dimensions had a direct effect on the infertility-related stress of the other partner.

**DESIGN:** Cross-sectional study of consecutive couples before starting their first IVF/ICSI treatment in 2009–2011 at the ANDROS clinic in Palermo, Italy.

**PARTICIPANTS AND SETTING:** Three hundred and fifty-nine couples undergoing fertility treatments were invited to participate in the research. The final sample comprised 316 females and 316 males who filled out the psychological questionnaires (Experiences in Close Relationships; Fertility Problem Inventory; State scale of State-Trait Anxiety Inventory). The participants included patients who had a primary infertility diagnosis and were about to undergo their first IVF or ICSI treatment.

**DATA ANALYSIS METHOD:** Paired *t*-tests were used to examine gender differences on the study variables (attachment anxiety, attachment avoidance, infertility stress, state anxiety, etc.). Associations between infertility-related stress and the study variables were explored using hierarchical stepwise multivariate linear regression analyses.

**MAIN RESULTS AND THE ROLE OF CHANCE:** Attachment anxiety and attachment avoidance were significantly associated with global infertility stress in both women ( $\beta = 0.24$ ,  $P < 0.01$  and  $\beta = 0.27$ ,  $P < 0.01$ ) and men ( $\beta = 0.23$ ,  $P < 0.01$  and  $\beta = 0.37$ ,  $P < 0.01$ ). Regarding the cross-partner effects, men's infertility stress and relationship concerns were associated with their partners' attachment avoidance ( $\beta = 0.10$ ,  $P < 0.05$  and  $\beta = 0.12$ ,  $P < 0.05$ ); and the infertility stress of women and the scores for need of parenthood were associated with their partners' attachment anxiety ( $\beta = 0.14$ ,  $P < 0.05$  and  $\beta = 0.16$ ,  $P < 0.05$ ).

**BIAS, CONFOUNDING AND OTHER REASONS FOR CAUTION:** The study data are cross sectional, and specifically focus on associations between adult attachment style and infertility stress. Treating the data from couples as independent observations may be a limitation of the analysis. Potential moderators of such relationships (e.g. coping strategies, stress appraisal) are not included in this study.

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**Key words:** fertility-related stress / attachment / partner concerns / IVF/ICSI / cross-partner effect

## Introduction

Psychological factors involved in the infertility experience are well described in literature (Domar et al., 1990; Boivin and Takefman, 1995; Verhaak et al., 2001; Greil et al., 2011), and it has been established that the powerlessness to conceive children leads individuals and couples to have very high and multifaceted stress (Cousineau and Domar, 2007). Most of the studies on the psychological consequences of infertility present infertility as an intense experience, especially for women (Lechner et al., 2007). Research has shown that the first IVF attempt is a stressful emotional experience and its failure seems to be associated with a deterioration of emotional well being, with greater anxiety among women than men (Slade et al., 1997). Boivin and Takefman (1995) found the highest levels of distress in women who did not get pregnant after assisted reproductive technology (ART), and Verhaak et al. (2001) established that high levels of distress in women after the first unsuccessful treatment are linked to a high level of emotional strain before the start of the second treatment and represent a risk for developing depression, a risk that increases with repeated cycles.

Researchers have also examined the impact of patient anxiety on the infertility experience (Mori et al., 1997; Verhaak et al., 2001; Greil et al., 2011) especially during the treatment. However, the evidence for an association between anxiety and pregnancy rate after ART is weak (Matthiesen et al., 2011). Previous studies have found that high levels of state anxiety, and not trait anxiety, are associated with pregnancy rate (Smeenk et al., 2001), and a link between anxiety and strain in the sexual relationship of the couple was found (Peterson et al., 2007). Moreover, anxiety was found to increase during IVF treatment in women (Verhaak et al., 2007) and infertility stress and non-specific anxiety were negatively associated with a positive pregnancy outcome after IVF (Gourounti et al., 2011). Previous research suggested that the infertility-related stress is a multidimensional construct (Newton et al., 1999), which includes different and relatively independent infertility-related domains, such as social concern, sexual concern, relationship concern, need for parenthood and rejection of childfree lifestyle. However, few studies have explored the associations between these infertility-related domains and the psychological characteristics of patients.

Because infertility is recognized as a shared experience, it is important to study the interactions of partners (Holter et al., 2006) and to explore how each partner's reaction to infertility may impact his or her partner's adjustment (Peterson et al., 2006a, 2011).

Many studies found that women reported higher levels of anxiety and depression than their partners (Beaurepaire et al., 1994; Beutel et al., 1999; Hjelmstedt et al., 1999; Newton et al., 1999; Lee and Sun, 2001; Verhaak et al., 2005b). However, the emotional impact of fertility problems in men is still insufficiently investigated. Many studies have not taken men into account (Hynes et al., 1992; Visser

et al., 1994; Lok et al., 2002; Verhaak et al., 2005a,b), although several other studies have shown a lower emotional impact of fertility problems on men compared with women (Newton et al., 1990; Slade et al., 1997; Verhaak et al., 2001; Lund et al., 2009).

Earlier studies also reported conflicting results concerning experiences of the marital relationship related to infertility and treatment. Slade et al. (1997) found women to be less positive than men about their marital and sexual relationship, at the beginning of an ART cycle. Peterson et al. (2007) found similarities in how men and women experience anxiety and sexual infertility stress but men tend to report less anxiety than women. Other studies found that women's and men's reactions after IVF treatment are dependent on whether they achieved a pregnancy: women who become pregnant were less depressed and more positive about their relationship (Slade et al., 1997), whereas those who did not get pregnant rated their emotions as worse than before treatment started (Holter et al., 2006), and men reacted in the same way. Hammarberg et al. (2001) found no difference in marital satisfaction between women who had a successful outcome and those who did not during a follow-up study 2–3 years after treatment, and 37% reported that IVF treatment had had a positive impact on their marriage.

Furthermore, a substantial body of research has emphasized the importance of personality dimensions to the couples' transition to parenthood (e.g. Fraley and Shaver, 2000). In particular, an individual's attachment style is considered to affect how the subject responds to emotionally distressing situations (Mikulincer and Shaver, 2007). Given that a growing body of research considers infertility as a stressor that has the capacity to activate attachment patterns (Feeney, 1999; Lowyck et al., 2009), the aim of the current study was to examine the connections between infertility-related stress and attachment patterns in couples undergoing their first IVF treatment.

During the past 30 years, attachment theory (Bowlby, 1980) has emerged as one of the most important conceptual frameworks for understanding human relationships. According to this theory, early experiences with a sensitive or insensitive attachment figure provide a person with either positive working models of the self as worthy of the care of others, or negative working models of the self as unworthy of the care and attention of others (Fraley and Shaver, 2000). A large body of research has documented that attachment working models affect whether, and how, people selectively interact with and perceive their romantic partners (Hazan and Shaver, 1994; Collins et al., 2004). Furthermore, research has repeatedly confirmed that two relatively uncorrelated dimensions, attachment avoidance and attachment anxiety, underlie individual differences in adult romantic attachment (Feeney, 2008).

Attachment anxiety is defined as involving a fear of interpersonal rejection or abandonment, an excessive need for approval from others, and distress when one's partner is unavailable or unresponsive. The interpersonal style of individuals with greater attachment anxiety is

characterized by attempts to control their anxiety by minimizing emotional distance and soliciting constant displays of support and love from others. Attachment avoidance is defined as involving fear of dependence and interpersonal intimacy, an excessive need for self-reliance, and reluctance to self-disclose. In terms of interpersonal style, individuals with greater attachment avoidance believe that others cannot be trusted to care for them without hurting them. Therefore, such individuals tend to avoid needing others in order to maintain independence and control (Shaver and Mikulincer, 2002). Bartholomew and Horowitz (1991) pioneered the development of multi-item, continuous scales pertinent to close relationship experiences, which led to the later development of several self-report measures of adult attachment (Brennan *et al.*, 1998), with dimensional measures being favoured owing to their efficiency, reliability and sensitivity (Mikulincer and Shaver, 2007).

However, until recently little attention has been given to an exploration of the role of attachment dimensions in couples dealing with infertility. The few studies on this topic indicate that attachment dimensions may influence the well being of individuals undergoing IVF/ICSI treatment. For example, Amir *et al.* (1999) found that a secure attachment style (low levels of both anxiety and avoidance attachment dimensions) was a moderator for psychological well being and an important resource for individuals in an infertility sample. In addition, Lowyck *et al.* (2009) demonstrated that romantic attachment to the partner was positively associated with the well being of men and women undergoing IVF/ICSI. Furthermore, Bayley *et al.* (2009) found that attachment anxiety in men and women correlated with infertility stress, and Van den Broeck *et al.* (2010) suggested that attachment anxiety is a predictor of psychological distress in couples starting their first IVF and ICSI treatment.

However, one significant limitation of these studies is that the samples used were restricted in size (Bayley *et al.*, 2009) and that they also used different outcome measures, and reported individual-based findings rather than results analysed within the couple (Peterson *et al.*, 2008; Van den Broeck *et al.*, 2010). Although these studies have made a contribution to the literature on attachment style and psychological stress in infertile couples, further studies are required to investigate the impact of attachment dimensions on infertility-related stress in couples undergoing IVF treatment, and whether cross-partner effects may be evident in these clinical populations.

These observations led to a conceptual framework that includes both the individual's attachment anxiety and avoidance dimensions, as well as the high levels of state anxiety associated with the infertility-related stress, and the cross-partner effect within the couple, i.e. one partner's attachment dimensions are associated with infertility stress of the other partner. It could also be considered that only the time of infertility and the woman's age are associated with infertility-related stress and not to attachment dimensions.

Based on this formulation, the goals of the present study were as follows: (a) to examine the impact of biomedical characteristics, age and state anxiety levels on infertility stress, (b) to examine the impact of patient's attachment dimensions on his/her infertility-related stress, (c) to investigate the link between one partner's infertility-related stress and the attachment characteristics of the other partner (cross-partner effects). It was hypothesized that a high level of both the anxiety and avoidance dimensions would be associated with greater infertility stress, and that the partner's high level of

both the anxiety and avoidance dimensions would be associated with the high infertility-related stress of the other partner.

Since the current study aimed to examine the association between psychological characteristics and infertility stress, and not the effect of treatment, these variables were measured prior to commencement of the IVF cycle (Boivin *et al.*, 2011). Only participants starting their first IVF treatment were included because research showed that the first IVF attempt is a highly stressful emotional experience, and negative emotions were found to increase during IVF treatment (Verhaak *et al.*, 2007; Mahajan *et al.*, 2010).

Moreover, couples experience an increased level of emotional burden during the period of ovarian response to stimulation (because of blood tests or transvaginal ultrasound scans) or at the moment of oocyte retrieval, and therefore could bias and/or confuse the psychological ratings.

## Materials and Methods

### Study setting

This study is a part of a larger, prospective, longitudinal study in which couples were followed during their first IVF treatment. Patients were recruited at the private clinic ANDROS Day Surgery, Reproductive Medicine Unit, Palermo, Italy, between March 2009 and May 2011.

Entire treatment costs are paid by couples because reimbursement by the National Health Service is not available at the present time.

### Participants

Women and men were eligible for the study if they met the following inclusion criteria:

- (i) starting a first IVF or ICSI treatment;
- (ii) diagnosis of primary infertility.

Exclusion criteria were as follows: (i) having had previous IVF or ICSI treatment, (ii) insufficient knowledge of Italian to fill out the questionnaires, (iii) second marriage, in which one member already had offspring with another partner.

Three hundred and fifty-nine couples undergoing fertility treatments were consecutively recruited and invited to participate in the research. Seventeen (4.7%) refused because they were not interested, and 26 (7.2%) have been excluded because questionnaires were incomplete and their data could not be used for statistical analysis. Only socio-demographical data from these 43 couples were available for descriptive analyses. The final sample comprised 316 females and 316 males who filled out the questionnaires, with a response rate of 88%.

### Procedure

Participation in the study was voluntary. Couples were asked to complete a questionnaire, which included three standardized and validated self-report measures, when they signed the informed consent-form for their first IVF or ICSI treatment. The envelope containing only the psychological measures (one for the female and one for the male partner) was given to the couples by the physician of the clinic, who outlined the importance of the research, aimed at a deeper understanding of patients' needs and to help couples achieve a better adjustment to infertility. Each partner was asked to separately fill out this questionnaire and return it to the physician at the following scheduled pretreatment appointment with programme staff. The questionnaire (102 items in total) took ~15–25 min to complete.

Each participant signed an informed consent document approved by the Palermo University Research Ethics Committee.

## Measurements

### Attachment in the partner relationship

The Experiences in Close Relationships (ECR) scale (Brennan et al., 1998; Italian translation: Picardi et al., 2000) is a 36-item self-report measure and is designed to assess how individuals generally experience relationships. The results of a factor analysis by Brennan et al. (1998) identified two relatively orthogonal continuous attachment dimensions labelled Anxiety (18 items) and Avoidance (18 items). The questionnaire is scored on a seven-point Likert-type scale ranging from 1 'completely disagree' to 7 'completely agree'. The scale has been found to be highly reliable and to have high construct and predictive validity (Shaver and Mikulincer, 2002). The alpha reliability coefficients for the study population are 0.79 men, 0.78 women for the anxiety subscale and 0.77 men, 0.79 women for the avoidance subscale.

### Infertility-related stress

The Fertility Problem Inventory (FPI; Newton et al., 1999) is a 46-item questionnaire measuring levels of infertility stress. All items are scored using a six-point Likert scale ranging from 1 (I do not agree) to 6 (I totally agree). The subscales are: social concerns, sexual concerns, relationship concerns, rejection of childfree lifestyle and need for parenthood. The FPI demonstrates good discriminant and convergent validity (Newton et al., 1999). In the current study, the Cronbach's alphas for the subscales are: social concerns: 0.75 men, 0.80 women; sexual concerns: 0.81 men, 0.74 women; relationship concerns: 0.77 men, 0.77 women; rejection of childfree lifestyle: 0.70 men, 0.74 women; and need for parenthood: 0.77 men, 0.83 women. The Cronbach's alpha for the FPI overall score were 0.84 and 0.86 for women and men, respectively.

### State anxiety

The Italian version of State scale of State-Trait Anxiety Inventory (STAI-S) (Spielberger et al., 1983; Italian translation: Pedrabissi and Santinello, 1989) was used to assess participants' State anxiety. The STAI state anxiety scale comprises 20 items, and refers to the anxiety level of an individual at a given moment. The score for each item ranges from 1 to 4, with higher scores indicating greater anxiety. Thus, total scores range from 20 to 80. The Chronbach's alpha coefficient was 0.83 and 0.86 for women and men, respectively.

## Statistical analysis

Means and SDs were computed for demographical and medical information as well as for psychosocial variables. Paired *t*-test was used to find significant differences between women and men on the following variables: age, level of infertility stress measured by FPI overall and subscale scores, ECR attachment dimensions scores and state anxiety scores. Pearson correlation coefficients were calculated to examine the bivariate associations among study variables.

In order to test the associations between infertility-related stress and the study variables, hierarchical stepwise multivariate linear regression analyses were performed. Two separate regression models were conducted for women and men for each of the six specific stress dimensions to test the association between high level of attachment dimensions and greater infertility stress (hypothesis 1) and the association between the partner's high level of anxiety and avoidance dimensions and high infertility-related stress of the other partner (hypothesis 2) (Kenny et al., 2006).

In the first regression model women's biomedical, demographical and psychological characteristics were entered in Step 1. In Step 2 men's

biomedical, socio-demographical and psychological characteristics were added as predictors. In the second model, men's predictors were entered in Step 1 and women's predictors were added in Step 2. For women, the predictors were age, a diagnosis of female-factor infertility, duration of infertility, state anxiety and the two attachment anxiety and avoidance dimensions. For men, the predictors were age, a diagnosis of male-factor infertility, state anxiety and the two attachment anxiety and avoidance dimensions. Diagnosis was entered as a dichotomous variable (the presence of the diagnosis of infertility is indicated by the code '1', the absence by the code '0'). Ordinary regression analysis is the simplest but least general approach to research with dyads. The multiple regression method allows for an evaluation of the focus areas of the study: to assess the magnitude of the two partners' effect on the outcome and their statistical significance. All statistical analyses were conducted using PASW Statistics version 18.0 (SPSS Inc., Chicago, IL, USA) with a significance level of 0.05.

## Results

Participating couples had been trying to have a child for an average of 3.90 ( $\pm 2.60$ ) years. All participants were married or had been living together with their partners for 4.50 ( $\pm 2.20$ ) years. Infertility was unexplained in 16.1% of the cases. In 58.9% of the cases the cause of infertility was attributed to the male partner, another 18% was attributed to the females and the remaining 7% to both members of a couple. Demographical characteristics of the sample are illustrated in Table 1.

No differences were found between the 43 patients who were not included in the study and the 316 included for age ( $P = 0.43$ ), diagnosis of infertility ( $P = 0.18$ ), duration of infertility ( $P = 0.20$ ) and socio-economic status ( $P = 0.25$ ).

Separate multiple analyses of variance for females and males did not show significant differences among the four infertility conditions (unexplained, male cause, female cause and both members) on the FPI scales ( $F(3, 316)$  ranges from 0.40 to 2.38), ECR scales ( $F(3, 313)$  ranges from 0.03 to 0.61) and STAI ( $F(3, 313)$  ranges from 0.07 to 0.19).

## Gender comparisons

Men were significantly older than women, with a mean age of 37.01 ( $\pm 5.33$ ) versus 33.97 ( $\pm 4.84$ ) years, respectively ( $t = 12.20$ ;  $P < 0.01$ ). The women's scores for reported infertility stress were

**Table 1 Demographical data of the study population with infertility who were about to undergo IVF/ICSI at a private clinic.**

	Males [n = 316; % (n)]		Females [n = 316; % (n)]	
Educational level				
Secondary school degree	3.8	(12)	5.7	(18)
High school degree	45.3	(143)	46.6	(147)
Higher education or university	50.9	(161)	47.7	(151)
Professionally active/paid employment	96.5	(305)	44.3	(140)
Unemployed	3.5	(11)	55.7	(176)



higher than the men's on overall infertility stress ( $t = 3.92$ ;  $P < 0.01$ ), on social concerns ( $t = 5.06$ ;  $P < 0.01$ ), sexual concerns ( $t = 3.74$ ;  $P < 0.01$ ) and need for parenthood ( $t = 2.65$ ;  $P < 0.01$ ) scales, whereas scores on relationship concerns ( $P = 0.21$ ) and rejection of childfree lifestyle ( $P = 0.33$ ) scales were the same for women and men. Women scored higher than men on the attachment-related anxiety scale ( $t = 5.17$ ;  $P < 0.01$ ). No differences between women and men were found in the ECR-avoidance and STAI-S-State anxiety scores.

## Correlation analyses

Correlations between partners are presented in Table II (shaded diagonal). All correlations were statistically significant and positive, indicating a high-to-moderate level of similarity between partners in age ( $P < 0.01$ ), in the level of state anxiety ( $P < 0.01$ ), in attachment-related anxiety and avoidance scales ( $P < 0.01$ ) and in infertility-related stress ( $P < 0.01$ ).

Table II also shows correlations between intrapersonal variables for women and men (above and below the diagonal, respectively). Results revealed that infertility stress, overall score and all the FPI subscale scores, with the exception of rejection of childfree lifestyles, were positively associated with both the anxiety and avoidance dimensions of attachment for women and for men ( $P < 0.01$ ). Finally, in both women and men significant associations were found between one partner's overall infertility stress and the other partner's attachment anxiety and avoidance scores (the correlations range from  $r = 0.23$  to  $0.30$ ;  $P < 0.01$ ; data not shown).

## Regression analyses

The results are presented in Tables III and IV. The first step of the regression equations examined the effect of women's variables on their own infertility stress (Table III). Analyses revealed that relationship attachment dimensions made significant contributions to all the infertility

stress domains. Beta coefficients showed that the attachment anxiety was significantly associated with the overall level of infertility stress ( $P < 0.01$ ), and all specific stress scales ( $P < 0.01$ ) with the exception of rejection of a childfree lifestyle. In addition, the attachment avoidance was significantly associated with the overall level of infertility stress ( $P < 0.01$ ), sexual concerns ( $P < 0.01$ ) and relationship concerns ( $P < 0.01$ ). Regressions also showed that age was negatively associated with overall infertility stress ( $P < 0.01$ ), rejection of a child-free lifestyle ( $P < 0.01$ ) and the need for parenthood ( $P < 0.05$ ), whereas STAI-S predicted social concerns ( $P < 0.01$ ), relationship concerns ( $P < 0.01$ ) and the need of parenthood ( $P < 0.01$ ). Overall, the findings confirmed the association between both attachment anxiety and avoidance and infertility-related stress.

The cross-partner effect was tested through the addition in Step 2 of men's biomedical, socio-demographical and psychological characteristics. As can be seen in Table III, attachment anxiety in men was associated with women's overall infertility stress ( $P < 0.05$ ) and the need of parenthood ( $P < 0.05$ ). None of the other men's characteristics were found to be associated with women's infertility stress.

A second regression model examined the impact of the study variables on men's infertility-related stress (Table IV). Results from Step 1 confirmed the findings from the analysis of the female partners, showing that attachment dimensions made significant contributions to overall infertility stress, social concerns, sexual concerns, relationship concerns and need of parenthood dimensions. Indeed, regression coefficients revealed that attachment anxiety was significantly associated with overall infertility stress ( $P < 0.01$ ) and for all the specific stress scales ( $P < 0.01$ ) with the exception of rejection of a childfree lifestyle. Attachment avoidance, however, was positively associated with the overall level of infertility stress ( $P < 0.01$ ) and all the infertility stress scale (all  $P < 0.01$ ) with the exceptions of rejection of childfree lifestyle and the need for parenthood.

Diagnosis of male-factor infertility was significantly associated with the need for parenthood ( $P < 0.05$ ). Age was negatively associated

**Table II** Correlations among the study variables for women, men and partners.

	Age	STAI-S	ECR Anx	ECR Avo	FPI Tot	FPI Soc	FPI Sex	FPI Rel	FPI Rej	FPI Nee
Duration	0.198**	-0.059	-0.012	0.090	-0.011	-0.030	0.062	0.089	-0.091	-0.068
Ages	0.626**	-0.029	0.003	0.067	-0.154**	-0.056	0.022	0.023	-0.289**	-0.225**
STAI-S	-0.224**	0.365**	0.318**	0.346**	0.432**	0.317**	0.331**	0.388**	0.121*	0.292**
ECR Anx	0.014	0.236**	0.386**	0.390**	0.427**	0.349**	0.351**	0.397**	0.025	0.306**
ECR Avo	0.038	0.251**	0.400**	0.396**	0.441**	0.268**	0.477**	0.541**	0.032	0.181**
FPI Tot	-0.191**	0.407**	0.509**	0.413**	0.608**	0.698**	0.730**	0.687**	0.522**	0.761**
FPI Soc	-0.122*	0.362**	0.361**	0.365**	0.708**	0.448**	0.469**	0.432**	0.088	0.333**
FPI Sex	-0.099	0.305**	0.394**	0.428**	0.726**	0.498**	0.432**	0.519**	0.147**	0.407**
FPI Rel	-0.083	0.372**	0.466**	0.490**	0.686**	0.472**	0.512**	0.613**	0.046	0.290**
FPI Rej	-0.148**	0.088	0.079	-0.043	0.490**	0.086	0.132*	-0.021	0.488**	0.549**
FPI Nee	-0.188**	0.260**	0.423**	0.194**	0.790**	0.378**	0.432**	0.356**	0.449**	0.560**

Correlations above the diagonal are for women, correlations below the diagonal are for men, correlations in shaded diagonal are between partners.

ECR Anx, Experience Close Relationship—Anxiety subscale; ECR Avo, Experience Close Relationship—Avoidance subscale; STAI-S, State-Trait Anxiety Inventory—State scale; FPI Tot, Fertility Problem Inventory Total score; FPI Soc, Fertility Problem Inventory Social concerns scale; FPI Sex, Fertility Problem Inventory Sexual concerns scale; FPI Rel, Fertility Problem Inventory Relationship concerns scale; FPI Rej, Fertility Problem Inventory Rejection childfree lifestyle scale; FPI Nee, Fertility Problem Inventory Need of parenthood scale; M, Male; F, Female.

\* $P < 0.05$ ; \*\* $P < 0.01$ .

**Table III** Female and male effects of biomedical, demographical and psychological characteristics on the infertility distress of women.

	$R^2$	$R^2$ change	$F$ change	Standardized	
				$\beta$	$t$
FPI total					
I	0.25		26.01**		
Age (F)				-0.17	-3.64**
ECR Anx (F)				0.24	4.77**
ECR Avo (F)				0.27	5.19**
II	0.27	0.02	1.30		
ECR Anx (M)				0.14	2.07*
FPI social concerns					
I	0.18	0.18	**		
STAI-S (F)				0.20	3.53**
ECR Anx (F)				0.24	4.23**
II	0.20	0.02	1.74		
FPI sexual concerns					
I	0.15	0.15	10.79**		
ECR Anx (F)				0.20	3.70**
ECR Avo (F)				0.40	7.41**
II	0.17	0.02	1.76		
FPI relationship concerns					
I	0.37	0.37	29.92**		
STAI-S (F)				0.20	3.97**
ECR Anx (F)				0.18	3.59**
ECR Avo (F)				0.40	7.73**
II	0.38	0.01	0.95		
FPI rejection childfree lifestyle					
I	0.10	0.10	5.66**		
Age (F)				-0.28	-4.95**
II	0.11	0.01	0.68		
FPI need of parenthood					
I	0.19	0.19	14.02**		
Age (F)				-0.18	-2.52*
STAI-S (F)				0.21	3.42**
ECR Anx (F)				0.19	3.11**
II	0.22	0.03	2.02		
ECR Anx (M)				0.16	2.60*

$F$  change: tests that the variables added in subsequent steps significantly improved the prediction.

\* $P < 0.05$ ; \*\* $P < 0.01$ .

with overall infertility stress ( $P < 0.01$ ), rejection of a childfree lifestyle ( $P < 0.05$ ) and the need for parenthood ( $P < 0.05$ ). Results showed also that STAI-S was significantly associated with all infertility stress scales ( $P < 0.05$ ) with the exception of the rejection of a childfree lifestyle.

In Step 2, the addition of the women's variables to the association with overall infertility stress scale in men produced a statistically significant increment in  $R^2$  ( $R^2$  increased from 0.41 to 0.44;  $P < 0.05$ ). The need of parenthood prediction was the only subscale for which the addition of women's predictors was found to

produce a significant increment in  $R^2$  ( $R^2$  increased from 0.24 to 0.29;  $P < 0.01$ ).

Attachment avoidance in women was positively associated with both men's overall infertility stress ( $P < 0.05$ ) and relationship concerns ( $P < 0.05$ ).

Female age was negatively associated with men's overall infertility stress ( $P < 0.01$ ) whereas diagnosis of female-factor infertility was negatively associated with overall infertility stress ( $P < 0.05$ ), sexual concerns ( $P < 0.05$ ) and rejection of a childfree lifestyle ( $P < 0.05$ ).

**Table IV** Male and female effects of biomedical, demographical and psychological characteristics on the infertility distress of men.

	R <sup>2</sup>	R <sup>2</sup> change	F change	Standardized coefficients	
				β	t
FPI total					
I	0.41	0.41	42.05**		
Age (M)				-0.14	-2.99**
STAI-S (M)				0.22	4.40**
ECR Anx (M)				0.23	4.76**
ECR Avo (M)				0.37	7.64**
II	0.44	0.03	2.75*		
Age (F)				-0.16	-2.67**
Cause (F)				-0.12	-2.45*
ECR Avo (F)				0.10	1.98*
FPI social concerns					
I	0.26	0.26	21.33**		
STAI-S (M)				0.23	4.41**
ECR Anx (M)				0.22	4.08**
ECR Avo (M)				0.22	4.04**
II	0.27	0.01	0.90		
FPI sexual concerns					
I	0.283	0.28	24.33**		
STAI-S (M)				0.15	2.88**
ECR Anx (M)				0.24	4.52**
ECR Avo (M)				0.30	5.55**
II	0.301	0.02	1.26		
Cause (F)				-0.11	-1.98*
FPI relationship concerns					
I	0.38	0.38	37.18**		
STAI-S (M)				0.21	4.33**
ECR Anx (M)				0.29	5.82**
ECR Avo (M)				0.32	6.43**
II	0.39	0.02	1.31		
ECR Avo (F)				0.12	2.19*
FPI rejection childfree lifestyle					
I	0.04	0.04	2.38*		
Age (M)				-0.13	-2.16*
II	0.06	0.02	1.27		
Cause (F)				-0.14	-2.12*
FPI need of parenthood					
I	0.24	0.24	19.66**		
Age (M)				-0.14	-2.75*
Cause (M)				0.12	2.30*
STAI-S (M)				0.12	2.27*
ECR Anx (M)				0.39	7.04**
II	0.29	0.05	3.65**		

\*P &lt; 0.05; \*\*P &lt; 0.01.

## Discussion

The present study focused on examining the association between attachment dimensions and the global and specific infertility stress in men and women with fertility concerns before starting their first IVF treatment. In general, results of the current study were in line with expectations showing that attachment dimensions (anxiety and avoidance) were significantly related to several aspects of the infertility stress of these couples. A significant link between both the anxiety and avoidance dimensions and infertility-related stress was expected and is in line with other findings showing an association between an individual's attachment style and psychological stress related to an infertility situation (Lowyck et al., 2009; Van den Broeck et al., 2010). Previous research suggested that attachment style might be an important resource for individuals who are facing infertility (Amir et al., 1999). What is not yet clear is how attachment dimensions are differently associated with infertility stress in women and men. A recent study suggested that only attachment anxiety, and not avoidance, was related to infertility stress in men (Bayley et al., 2009). Other studies (Mahajan et al., 2009) found that attachment avoidance was associated with low levels of emotional adjustment to infertility in women. In the present study, correlation analyses suggested that attachment avoidance, as well as attachment anxiety, were associated with infertility stress in both women and men. This finding is also consistent with the previous result that an insecure type of attachment is associated with psychological stress (Feeney, 1999). Furthermore, the evidence that avoidance in men was correlated with infertility-related stress would be in line with studies showing that men reported a more frequent use of distancing to cope with infertility stress (Peterson et al., 2006a). Therefore, it could be suggested that distancing and avoiding stressful situations may be effective for men in reducing levels of infertility stress.

In addition, one of the most consistent findings of regression analyses in this study was the strength of the relationship between attachment dimensions and infertility stress. In the present study, a substantial amount of the variance in female and male infertility stress was explained by participants' attachment anxiety and avoidance dimensions. Women with greater attachment anxiety reported higher levels of overall infertility stress and more social, sexual and relationship concerns, as well as the need for parenthood. Women with greater attachment avoidance reported more sexual and relationship concerns, and more overall infertility stress. Men with greater attachment anxiety and avoidance reported more social, sexual and relationship concerns, as well as overall infertility stress. Taken together, these findings are the first to suggest that the attachment dimensions of couples undergoing IVF treatment had an impact on overall infertility stress as well as on independent infertility-related domains. This finding is also consistent with Van den Broeck's study (2010) that found anxiety attachment predicted psychological distress in a population of patients attending an IVF clinic. It could also be suggested, consistent with previous research (Bayley et al., 2009), that men and women with high attachment anxiety experienced more infertility-related stress.

It is also noteworthy that both attachment dimensions in men and women were not associated with rejection of a childfree lifestyle, instead this domain of infertility stress was associated with the age of both men and women. The younger the members of the affected

couples are, the higher the stress associated with the possibility of living without children. The findings of the current study contribute to the literature regarding the transition to parenthood among couples that undergo IVF treatment. We found that women and men with greater attachment anxiety reported more stress regarding their need for parenthood. Despite the fact that attachment dimensions are key elements in understanding life changes and transitions of couples (for example, Rholes et al., 2011), very few studies have used an attachment framework for investigating the psychosocial adaptation of parents that underwent IVF treatment. It was suggested that after conception by ART couples seem to be more vulnerable to psychological difficulties in the transition to parenthood (Hammarberg et al., 2008). Current findings suggest that attachment anxiety in women and men, rather than attachment avoidance, seems to be the main factor.

Despite research suggesting that infertility-related stress is a multidimensional construct (Newton et al., 1999), most previous studies only investigated the elevation of global stress in couples undergoing IVF treatment. The results of the current study suggest that both anxious and avoidant patients are likely to experience infertility-related social, relationship and sexual concerns. Given that previous research (Newton et al., 1999) suggested that relationship and sexual difficulties appear central to infertility-related stress, targeting problems in these domains may improve therapeutic benefits with patients with these attachment characteristics. The findings of the present study also show that state anxiety was associated with some domains of infertility stress in men and women, consistent with previous studies which showed that state anxiety was associated with treatment success in men and women pursuing ART (Smeenck et al., 2001).

A key purpose of the present study was to investigate the cross-partner effects, by determining whether one partner's attachment dimensions had a direct effect on the infertility-related stress of the other partner. The results suggested that the addition of the partner's variables into the analyses explained between 2 and 5% of the variance in the other partner's infertility stress. It was found that men's global infertility stress as well as their relationship concerns were associated with their partners' avoidance dimension. It was possible to speculate that the avoidant female partner's lack of comfort with closeness and hostile outlook on others may inhibit compassionate responses to the male partner's plight. Female avoidant and deactivating strategies, such as distancing oneself from threats and suppressing painful thoughts (Shaver and Mikulincer, 2002), may also encourage emotional detachment from the male partner's stress and inhibit empathic compassion. On the other hand, it was demonstrated that the global infertility stress of women and their need for parenthood scores were associated with their partners' anxiety dimension. The attachment literature suggested that anxiously attached people might become emotionally overwhelmed in response to their partner's stress. It could be speculated that male partner's emotion-focused coping strategies may facilitate the associative reactivation of self-focused worries and increase attentional focus on both the partner's suffering and the self's personal stress (Mikulincer and Shaver, 2007).

These results seem to suggest that the attachment dimensions of both partners could interact to generate higher levels of stress or poor adaptation to stressful life events. These are new and interesting findings, given that studies on the effect of couple relationship on the infertility experience have, in the past, produced contradictory results



(Coeffin-Driol and Giami, 2004). Initial support was provided for the hypothesis that partners of secure-attachment persons report higher levels of well being than partners of anxious-ambivalent persons (Mikulincer and Florian, 1998). As far as could be determined, the present study is the first to investigate the effect of partner's attachment anxiety and avoidance on infertility stress. These findings are in line with previous studies which explored interaction effects among partners (Peterson *et al.*, 2008; Lowyck *et al.*, 2009) and the congruence of coping strategies used by partners (Peterson *et al.*, 2011). The current study has provided initial evidence regarding the cross-partner effect of attachment dimensions on the infertility-related stress of the partner.

Regarding the elevation of infertility stress in men and women, results showed that women reported higher levels of infertility stress than men on the global scale of the FPI and on three FPI subscales (social and sexual concerns, need of parenthood), whereas no differences between men and women emerged on the FPI relationship concerns and rejection of childfree lifestyle scores. Previous research reported that women experience infertility as a more stressful life event than men (Peterson *et al.*, 2003, 2006b). On the other hand, the findings of the present study are consistent with other studies (Bayley *et al.*, 2009), which showed no differences between men and women on relationship concerns and rejection of a childfree lifestyle. This finding seems to be in line with clinical experience, which shows that infertile couples pursuing IVF or ICSI treatment tend to present themselves as good parents who are positive about the future of the marital relationship, and believe that future happiness is dependent on having a child. It was also noted (Holter *et al.*, 2006) that infertile patients may give a 'balanced impression' as worthy future parents and as adjusted couples, at least when starting their first treatment, and it could represent a bias in interpreting psychosocial data.

Some limitations must be considered when interpreting the results of this study. First, the interpretation of the impact of attachment on infertility stress is restricted because cross-sectional studies do not establish a cause-effect relationship between variables. The second limitation arises from the fact that there was no control for potentially confounding factors, and that any personal variables (such as coping strategies, appraisal of stressful events, level of self-esteem) as potential moderators in the stress-attachment relationship were not considered. Third, as Cook and Kenny (2005) have highlighted, the score of two 'linked' individuals should not be treated as independent observations, and models which use the dyad as the unit of analysis (i.e. the actor partner interdependence model, APIM) could be adopted to study couples within the infertility settings. As mentioned in the Statistical Analyses section, the multiple regression method is a widely used approach to assess the magnitude of the two partners' effectiveness in predicting infertility stress, whereas the APIM is a method of conceptualizing and measuring interdependence in close relationships, with a special focus on the assessment of bidirectional effects (Cook and Kenny, 2005). Further research would benefit from adopting more sophisticated methods of analysis of couples, and by making a more thorough attempt to identify the specific interpersonal patterns that are most likely to cause infertility stress for couples undergoing their first IVF treatment.

Despite limitations, the findings are consistent with expectations and contribute to knowledge in the area of attachment and

infertility-related stress. Overall, the current study continues to highlight the relationship between attachment dimensions and psychological stress of infertile couples. It adds stronger evidence to earlier literature about the impact of intrapersonal characteristics (specifically the attachment dimensions of anxiety and avoidance in close relationships) on infertility-related stress of couples undergoing their first IVF treatment. Additionally, this study was the first to investigate cross-partner effects and, specifically, the effect of attachment dimensions of one partner on the outcome of the other partner's infertility stress. Other strengths of the study include a larger sample size than previous studies that investigated the role of attachment dimensions in the infertility field, and a higher response rate than other studies on this topic, which minimizes the opportunity for sample bias. Most studies reported that the authors posted the instruments, and asked couples to return these by post before making a pretreatment appointment with the program staff (Newton *et al.*, 1999; Hammarberg *et al.*, 2001; Holter *et al.*, 2006; Peterson *et al.*, 2006a; among others). The favorable response rate in the current study could be attributed to a sincere request made directly by physicians, as well as good compliance between physician and patients, who felt that they were being involved in a common commitment. A further strength of the current study is the level of confidence in the results. The power analysis for multiple regressions indicated a power between 0.80 (for FPI rejection of childfree lifestyle) and 0.99, which was more than adequate. Given that there was adequate power to reliably detect associations if they existed, some confidence can be placed in the results of the present study.

The findings of the current study may have important clinical implications for healthcare professionals working with infertile couples. Physicians and mental health professionals can use the findings to assess patients' ECR, with a focus on attachment anxiety and attachment avoidance, given that high levels of infertility distress are more likely to be experienced by (a) those with greater attachment anxiety, who tend to manage distress by constantly soliciting love and affection from their partners, and (b) those with greater attachment avoidance, who tend to maintain independence from their partners. Although it is likely that short-term counselling (as could happen during an IVF treatment) would not offer most patients an adequate opportunity to alter their basic attachment patterns, a more practical approach may be to assist couples in understanding how their attachment dynamics, and attachment behaviours, are related to how they deal with infertility stress (Wei *et al.*, 2003). Specific early therapeutic counselling, focusing on encouraging the patient to explore his/her relationship with the partner and to reflect on the link between the infertility stress and the experience of the couple's relationship, should be considered. Specific counselling could be useful to help couples to understand that the link between an urgent desire for support (through an anxious attachment) from the partner and/or the tendency to avoid needing the other partner in order to maintain independence and control (avoidant attachment) could amplify the psychological gap between partners, who are both suffering from the infertility. If there is a mismatch in the need for self-disclosure within couples, clinicians could work with both partners to identify other ways to cope with his/her needs to talk/not to talk about their emotions and concerns, and to think about how they could jointly cope with the associated stress. For example, it might be suggested that these needs were extended to involve someone else in

their social network in addition to the partner, or it could be useful to offer the couples the opportunity of group therapy to activate or facilitate confronting skills.

In summary, current findings lend support to the notion that there are significant associations between attachment dimensions and infertility-related stress in couples undergoing IVF treatment, and that one partner's attachment dimensions have an effect on the infertility-related stress of the other partner. It is hoped that the current findings stimulate further research on psychosocial variables linked to infertility stress in order to deepen understanding of the psychological difficulties of couples undergoing IVF treatment. A specific task following this study will be to investigate, in detail, any changes in patients' infertility-related stress in the course of IVF treatment, and how attachment dimensions predict their infertility stress at different stages of treatment. This findings of this study provide support for continued research concerning attachment styles and the experience of infertility or infertility-related stress.

## Authors' roles

Z.D. provided the conception and design of the study and was involved in the acquisition and interpretation of the data. G.L.C. contributed to the analysis and interpretation of data and wrote the article. S.G. participated in the study design and performed the statistical analysis of the data. A.M. and A.V. participated in recruiting subjects and collecting data and participated in the critical revision of the manuscript. A.A. contributed to the study design and to the manuscript's revision and had overall responsibility. All authors have approved the final version of the manuscript.

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## Conflict of Interest

The authors declare no financial or commercial conflicts of interest in this study.

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