PATIENT-CENTERED INFERTILITY CARE: CURRENT RESEARCH AND FUTURE PERSPECTIVES ON PSYCHOSOCIAL, RELATIONAL, AND COMMUNICATION ASPECTS

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PATIENT-CENTERED INFERTILITY CARE: CURRENT RESEARCH AND FUTURE PERSPECTIVES ON PSYCHOSOCIAL, RELATIONAL, AND COMMUNICATION ASPECTS

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EDITORIAL
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Editorial: Patient-Centered Infertility Care: Current Research and Future Perspectives on Psychosocial, Relational, and Communication Aspects

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Editorial on the Research Topic

Patient-Centered Infertility Care: Current Research and Future Perspectives on Psychosocial, Relational, and Communication Aspects

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WHY PATIENT-CENTERED INFERTILITY CARE MATTERS

Infertility affects a large number of couples worldwide. The use of assisted reproductive technology (ART) to address infertility problems has dramatically increased. However, the context of ART poses challenges at different levels to both patients and clinicians. Key challenges for patients include the low treatment success rates, the psychological distress due to the diagnosis of infertility, and the emotional and physical demands of treatments. Not least, under these circumstances, relational bond problems might arise. The ART context also poses challenges to clinicians. Clinicians have frequently to communicate bad news to patients, manage complex interactional consultations with two persons as a patient, address patients' emotions and frequent complaints, and handle couple's treatment discontinuation. Given these complexities, monitoring and improving the quality of fertility care is a priority.

Centering the consultation and care process on the patients' needs and values (i.e., patient-centered care) is one of the key elements for improving quality of care. Good clinician-patient communication and caring relationships are crucial for providing patient-centered care. In the ART field, preliminary research has defined what "patient-centered care" is from the patients' perspective (van Empel et al., 2010) and some studies have identified the main characteristics of clinician-couples' verbal communication during clinical consultations (Leone et al., 2018). However, important knowledge gaps remain in this field, concerning the psychological status of couples undergoing ART treatment, clinician-patient communication, and relational specificities featuring ART care. Such knowledge may help clinicians and healthcare organizations providing patient-centered care to couples affected by infertility problems and receiving ART treatments.

ENSURING PATIENT-CENTERED INFERTILITY CARE BY TAKING CARE OF THE COUPLES' PSYCHOLOGICAL NEEDS

In the scientific literature, it is frequently reported that infertility care can easily bring distress and anxiety to couples (De Berardis et al., 2014). Efforts have been made to explore and better understand the psychological needs of patients who undergo ART treatments (Dancet et al., 2010).

As the contributions in the current Research Topic testify, the psychological well-being, suffering, and adjustment of couples who undergo ART treatments or become parents after a successful ART therapy are crucial areas to explore in order to enable the psychological world of these couples to become visible. In the brief research report in this issue, Zurlo et al. ascertained the protective role of couples' coping strategies in moderating the association between infertility-related stress and anxiety symptoms. In the same issue, Molgora et al. pointed out the importance of considering individual needs as well as enhancing a sense of partnership to improve couples' well-being, taking also into account the gender-related differences that men and women may bring. The importance of taking into account the complexity of the psychological needs of couples has been also underlined by Vasta and Girelli in their perspective paper in the present issue. They propose an approach for addressing couples' needs based on a "matterpsychic" perspective: a model epistemologically close to the biopsychosocial approach suggesting that psychological care should be integrated in a multidisciplinary work.

Two other contributions in this issue rise attention on other crucial but often neglected psychological characteristics of specific groups of ART patients. Di Mattei et al. focus on a specific population of women who might possibly undergo ART treatments: women with cancer who want to access oncofertility preservation. The authors provide indications about particularly resilient psychological characteristics of this group of patients, with functional personality traits and defensive styles. Paterlini et al. performed a longitudinal investigation of parental mental representations during pregnancy and in the post-partum; they revealed that the parental representations of couples who conceived after ART treatments differed and were in general more positive compared to spontaneous conceiving parents.

SUPPORTING PATIENT-CENTERED INFERTILITY CARE THROUGH ATTENTION ON CLINICIANS' CHALLENGES

As anticipated, clinicians working in the ART field possibly deal with a variety of psychological, communication and interactional challenges. In previous studies, the attention has been mostly placed on helping clinicians dealing with difficult communication like delivering bad news (Leone et al., 2017). In this issue, Facchin et al. provide an in-depth exploration of difficulties that clinicians experience when caring for couples with infertility problems: from challenges in team working, to difficulties in offering complex therapies that evoke "omnipotence" and that may make errors or failure be often neglected, or in being able to empathically relate with couples.

PATIENT-CENTERED INFERTILITY CARE IS A MATTER OF GOOD CLINICIAN-PATIENT COMMUNICATION

Poor communication and relationships with ART clinicians is a cause of dissatisfaction for patients and a reason for discontinuing treatments or changing clinic (Gameiro et al., 2012). Different communication aspects may affect ART care, like insufficient or poor explanations of fertility problems (Gameiro et al., 2012), inadequate information provision and coordination of care (Haagen et al., 2008), or lack of empathy and poor ability to handle psychological distress (Olivius et al., 2004). In this issue, some of these dimensions are explored from new perspectives.

Mosconi et al. performed a literature review on studies tackling the communication of the diagnosis of infertility, as one of the bad news ART doctors have to deliver. They found that this is a quite unexplored topic, with only four studies addressing it in some collateral way. Three articles in this issue analyzed videos of doctor-couple interactions, and highlighted communication specificities in ART visits. Menichetti et al. explored the communication of uncertainty in ART consultations by analyzing the doctors' expression "I don't know". They revealed how ART doctors may frequently express lack of knowledge, especially about costs and treatment-related aspects, and how patients actually contribute to these expressions by eliciting them and, in some cases, following up. Poli et al. considered another fringe topic in ART dialogues: the presence of laughs and jokes. They found that laughs and jokes are frequently used during ART visits, covering topics related to health status, infertility treatment, organizational aspects, and the doctor-patient relationship. Rossi et al. explored problems of understanding in ART triadic consultations, and concluded that misunderstandings are particularly frequent, especially during the history-taking moments of first visits. Misunderstanding during follow-up consultations, while less frequent, may unveil residual doubts from the couple, especially concerning treatments.

THE WAY FORWARD

The variety of contributions included in this Research Topic testifies the complexity of psychological, interactional, and communication aspects in the care of couples who undergo ART treatments. This highlights the need to systematize such knowledge in evidence-based indications and training for clinicians working in ART care to handle this multiplicity of needs. There has still a lack of studies focused on psychosocial and communication challenges involved in the heterologous fertilization and gamete donation for oocyte recipients. The few studies on the topic reported inconsistent results regarding the emotional distress experienced by those women (Bracewell-Milnes et al., 2016).

Future studies may be needed to explore the emotional experience of couples who specifically undergo heterologous fertilization. Similarly, clinicians' challenges and clinician-patient communication in the field of heterologous fertilization should be addressed.

AUTHOR CONTRIBUTIONS

LB, JM, and EV conceived the idea, manage the topic, and wrote the manuscript. All authors contributed to the article and approved the final version.

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BRIEF RESEARCH REPORT
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Individual and Relational Well-Being at the Start of an ART Treatment: A Focus on Partners' Gender Differences

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Infertility and ART treatments represent stressful experiences for the couples, impacting on the overall psychological well-being of partners as well as on their couple adjustment. Several variables were analyzed as risk factors for infertility-related distress. The impact of these experiences has been well-documented in both women and men, reporting important gender differences. The aim of this study was to assess gender differences in individual and relational well-being in infertile couples. Gender differences for psychological and medical variables predicting psychological distress were investigated. Two hundred and thirty couples who entered an ART program at a public hospital in Milan were recruited. Each partner completed the following scales: ScreenIVF, Dyadic Adjustment Scale, and Experience in Close Relationship Questionnaire. Findings revealed several gender differences with women reporting higher levels of both anxiety and depressive symptoms, anxiety and avoidance attachment, and helplessness, but lower levels of acceptance than men. Differences emerged also in factors predicting well-being: poor support predicted anxiety in men and depression in women. Furthermore, individual well-being was predicted only for men by attachment anxiety and previous treatment. Finally, in the women subsample, couple's adjustment was predicted by anxiety attachment, while in men predictors were helplessness and type of diagnosis. These results suggest the importance of implementing support interventions for couples which take into consideration the specific needs and fragility of each partner as well as focusing on enhancing a sense of partnership.

Keywords: infertile couple, assisted reproduction, gender differences, individual well-being, relational well-being, couple adjustment

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INTRODUCTION

Infertility defines a wide range of conditions that impact the possibility for a couple to have a baby through natural conception (Zegers-Hochschild et al., 2017). Although total consensus on the percentage of infertile couple is lacking, it is estimated that globally 15% of couples in the fertile life stage – corresponding to almost 190 million people worldwide – have an infertility problem (Inhorn and Patrizio, 2015; Sun et al., 2019). Important differences in this percentage were found

between countries (Sun et al., 2019). For example, the American National Survey of Family Growth (NSFG) data report that about 7% of married women aged 15–44 years are infertile (Somnath, 2018). Meanwhile, the prevalence of infertility among couples of reproductive age in China was found to be 25% (Zhou et al., 2018). In Italy, it is estimated that approximately 15% of couples are infertile (Fertility Europe and Eshre, 2017). The difference in these percentages can be explained by several factors, including age of partners when they try to conceive a baby naturally; indeed, fertility declines with age both in men, more gradually, and in women, with a significant decline of conception possibility after the age of 35 (Dunson et al., 2004; Pfeifer et al., 2017).

In recent years, an increasing number of infertile couples have decided to undergo assisted reproductive technology (ART) treatments to have the possibility of becoming parents, leading to an increase of babies born by means of these techniques; currently the percentage of these newborns is around 2.4%, reaching 3% among Italian newborns (European IVF-monitoring Consortium [EIM] et al., 2017; Ferraretti et al., 2017; Scaravelli et al., 2017). Specifically, considering reporting from around the world, it was calculated that, in 2013, there were 5 million babies conceived through ART, and it is estimated that at the end of this century, 157 million babies – corresponding to 1.4% of global population – will be born through ART (Faddy et al., 2018). Furthermore, it was reported that in Italy, in 2017, 78,366 couples were treated with ART techniques (Scaravelli et al., 2017).

ART includes several techniques that involve different levels of medicalization. In particular, the most widely used technique is intracytoplasmic sperm injection (ICSI, which is the direct injection of a man's sperm into the woman's egg) with a percentage of 46.6%, followed by frozen embryo replacement (FER, which is the thawing of frozen embryos that are replaced in the uterine cavity), and *in vitro* fertilization (IVF, wherein the man's sperm and the woman's egg are put in a culture dish in laboratory), accounting for, respectively, 24.7 and 18.8% of the total treatment cycles (De Geyter et al., 2018).

Infertility and ART treatments represent critical and stressful experiences for the affected couples (De Berardis et al., 2014; Koert and Daniluk, 2018). Although the nature of the association between stress and infertility is debated, data found that individuals, especially women, with infertility problems report high levels of stress, suggesting that infertility predicts (causes) stress (Rooney and Domar, 2018). Specifically, research has well recognized how these experiences, exposing partners to an unexpected crisis, can lead to negative changes in both psychological well-being and social relationships.

Considering the psychological well-being of partners, several studies found that the infertility experience has an impact on overall psychological health and the quality of life of both women and men (Schmidt, 2006; El Kissi et al., 2013; Maroufizadeh et al., 2015; Martins et al., 2016; Péloquin et al., 2018). Specifically, this condition leads to a loss or a deterioration of self-esteem as well as a negative change in one's own identity with a risk of failure in adult identity building (Wischmann et al., 2014; Alamin et al., 2020). Furthermore, findings of previous studies reported higher levels of anxiety and depressive symptoms among infertile individuals/couples compared to fertile ones (Lakatos et al., 2017; Fallahzadeh et al., 2019). The presence of those symptoms is also related to negative cognition about infertility and with feelings of helplessness, lack of control, and lack of acceptance of the infertile condition (Patel et al., 2018).

As for relational outcomes, literature focused specifically on the impact of infertility on marital satisfaction and couple's adjustment, with contrasting findings (Tao et al., 2012; Van Der Merwe and Greeff, 2015; Chaves et al., 2018). Indeed, while some authors found that the infertility experience leads to a decrease in couple relationship and quality (Van Der Merwe and Greeff, 2015; Gana and Jakubowska, 2016), others reported that infertility does not reduce couple satisfaction and even increases it, strengthening the communication between partners (Monga et al., 2004; Schmidt et al., 2005; Amiri et al., 2016). This difference can be explained by methodological issues as well as the role of several variables in mediating or moderating the association between infertility and marital adjustment (Ghafouri et al., 2016; Pasha et al., 2017; Greil et al., 2018).

The impact of infertility and ART has been well-documented in both women and men; in this direction, it is important to notice that important gender differences on individual and relational well-being have been reported (Bayley et al., 2009; Davidovà and Pechovà, 2014; Ying et al., 2015; Bai et al., 2019).

Specifically, women seemed to be more emotionally distressed and presented higher levels of stress, anxiety, and depressive symptoms and lower levels of self-esteem and overall quality of life than men (Berghuis and Stanton, 2002; Agostini et al., 2017; Kroemeke and Kubicka, 2018; Patel et al., 2018; Meléndez et al., 2019). Furthermore, gender differences emerged about infertility-related cognitions and, specifically, for perception of helplessness and acceptance of infertility (Patel et al., 2018); in particular, women accept ART to a greater extent than men, but men can accept childlessness more often than women (Nagórska et al., 2019). This finding suggests that women are more committed, but, at the same time, they are more distressed and emotionally concerned by their infertility problem than men, suggesting a possible explanation for the different impact of infertility diagnosis and ART treatments on male's and female's psychological well-being (Nagórska et al., 2019).

Significant differences between males and females also emerged for relational well-being, although findings are contrasting. For example, Peterson et al. (2011) reported higher levels of marital benefit as a positive consequence of the infertility experience among women compared with their partners. A similar result was found by Greil et al. (2018), who reported that women were more satisfied with their relationship than men, when neither partner self-identified as having a fertility problem. On the contrary, Lee and Sun (2000) found that women were less satisfied than their husbands with the couple relationship. And again, Yazdani et al. (2016) did not find any difference in marital satisfaction and adjustment between wives and husbands. These contrasting results can be partially explained considering the specific dimensions of couple relationships investigated in those studies. For example, considering the sexual dimension of the relationship specifically, experiencing sexual coercion during intercourse for conception was associated with psychological distress and poor relationship

adjustment only for men, representing a threat to their masculine identity (Peterson and Buday, 2020). In any case, gender-related consequences of infertility and ART on couple's relationships needs to be further investigated.

Several variables (e.g., socio-demographic factors, personality characteristics, fertility-related characteristics, social variables, etc.) were analyzed as risk factors in leading to infertility-related distress. For example, age was associated with sexual functioning in infertile couples, with individuals younger than 40 years old reporting a higher sexual impact than older subjects (Winkelman et al., 2016).

Furthermore, as to personality traits, neuroticism and self-criticism as well as dysfunctional romantic attachment styles (anxiety and avoidance) were found to be positively associated with global emotional infertility stress in both women and men (Lowyck et al., 2009; Donarelli et al., 2012; Rockliff et al., 2014; Theodoridou et al., 2016; Molgora et al., 2019a). With reference to fertility-related dimensions, duration of infertility, frequencies of treatments, and infertility diagnosis (that is, the cause of infertility, which can be male factor, female factor, mixed factor, or idiopathic/unexplained factor) were found to be associated with different levels of distress (Patel et al., 2016, 2018; Ma et al., 2018). In particular, Patel et al. (2018) found that distress increased after previous treatments' failure. And again, unexplained infertility was found to be associated with the highest sexual impact (Winkelman et al., 2016). A similar result was reported by Warchol-Biedermann (2019), who found that participants with a mixed or idiopathic factor of infertility reported higher levels of distress.

Another variable that has been examined in relation to infertility and medical treatments was social support. Findings revealed that receiving and providing support had positive effects in both men and women (Kroemeke and Kubicka, 2018). Moreover, it seems that partner's support has a protective role in facing infertility-related stress, whereas support provided by people outside the dyad has an adverse effect (Casu et al., 2019).

Gender differences also emerged for variables predicting psychological distress (Zurlo et al., 2019). For example, Donarelli et al. (2016) found that women's distress was predicted by their own and their partner's attachment avoidance, whereas men's distress was predicted by their partner's attachment anxiety. Furthermore, longer duration of infertility, higher frequencies of treatments, and female factor infertility were considered as risk factors for depression in women (Ma et al., 2018); on the other hand, Patel et al. (2018) found that men reported higher levels of distress when they were responsible for the couple's inability to have a baby. Gender differences also emerged for social support: women benefited more from support, and their well-being was more dependent on perceived support (provided and received) than men (Kroemeke and Kubicka, 2018).

To face infertility and ART treatments, gender-specific coping strategies have been identified: specifically, women reported more emotion-focused coping strategies, while men preferred problem-focused coping strategies (Peterson et al., 2006). Moreover, women's typical coping mechanisms were seeking professional support and social support, and taking responsibility, while men's elective coping mechanisms were found to be distancing and self-control (Peterson et al., 2008; Pásztor et al., 2018). Finally, both partners spent time on tasks related to family-building before starting treatment and, in this case also, gender differences in the amount of time spent on these tasks emerged (Cusatis et al., 2019). Findings revealed that women's mechanisms tended to be more successful – that is, were connected with lower levels of infertility-related psychological distress – compared to those of men (Shapiro, 2009; Pásztor et al., 2018). Coping strategies can be considered another type of predictive factors of individuals' adjustment to infertility and ART techniques (Rockliff et al., 2014; Patel et al., 2018).

The aim of the present study was to assess gender differences in couples facing an ART experience, focusing on both individual (anxiety and depression) and relational (couple's adjustment) well-being as well as on some psychological dimensions that can be considered as risk/protective factors of well-being (infertility-related cognitions of helplessness and acceptance, adult romantic attachment, social support). Specifically, according to previous studies, we assume that women reported higher levels of emotional distress (anxiety symptoms and depressive symptoms) and helplessness than men, but lower levels of acceptance. Although many studies have previously focused on gender differences within couples dealing with an infertility diagnosis and an ART treatment, the results were sometimes mixed, and findings focused only on individual or relational dimensions. This study considered both individual and interpersonal dimensions of psychological well-being and predictors of well-being in an attempt to better understand and articulate these differences.

Moreover, we aimed to investigate gender differences in predictors of psychological distress; in particular, three psychological variables (infertility-related cognitions of helplessness and acceptance, adult romantic attachment, and social support) and two medical variables (type of infertility diagnosis and previous ART treatment) were analyzed for their association with psychological well-being of both men and women.

METHODS

Participants

Eligible participants were all couples who were starting an ART program at a public hospital in Milan. No exclusion criteria were put in place. From January 2018 to December 2018, a total of 230 couples (460 subjects) were recruited to participate in this study. The mean age of participants was 36.0 (SD = 3.8; range = 25–44) for women and 38.5 (SD = 5.5; range: 26–57) for men. 59.6% of women and 43.5% of men had a degree; 32.4% of women and 40.7% of men had a high-school diploma. 58.5% of women and 38.1% of men were white-collar workers. The mean duration of the marital relationship was 9.5 years (SD = 4.6).

Regarding infertility diagnosis, 35.1% were female factor, 13.7% were male factor, 9.5% were mixed factor, and 41.7% were idiopathic/unexplained factor. It should be noted that this high percentage can be explained considering that the information was not obtained from medical records, but from the self-report

questionnaire that couples have completed, so it was based on their knowledge. Furthermore, 78.9% of the couples had not previously underwent an ART cycle, 72.1% of the couples were involved in IVF treatment, and 17.6% in ICSI treatment.

Measures

Each partner completed a questionnaire that included the following scales:

ScreenIVF (Verhaak et al., 2010). This scale, composed of 34 items, was developed to assess the emotional condition of infertile couples before the start of treatments. In particular, the instrument assessed five different dimensions: pretreatment anxiety (10 items, 5 for state anxiety, and 5 for trait anxiety, on a 4-point Likert scale; range 10–40), pretreatment depression (7 items, on a 4-point Likert scale; range 0–21), cognitions regarding fertility problems in terms of helplessness (6 items, on a 4-point Likert scale; range 6–24), lack of acceptance (6 items, on a 4-point Likert scale; range 6–24), and lack of perceived social support (5 items, on a 4-point Likert scale; range 5–20). Patients were considered at risk when their scores on one or more of the five dimensions were above the clinical cut-off, that is, 24 or higher for anxiety, 4 or higher for depression, 14 or higher for helplessness, 11 or lower for acceptance, and 15 or lower for social support. For each risk factor the scale produces a dichotomous score: 0 if the subject scored below the cut-off value, and 1 if he/she scored above or equal to the cut-off value, for a total score ranging from 0 (no risk factors are present) to 5 (all five risk factors are present). The instrument showed good internal consistency for both men (with Cronbach's alpha ranging from 0.65 for depression to 0.87 for acceptance) and women (with Cronbach's alpha ranging from 0.64 for depression to 0.88 for acceptance).

Dyadic Adjustment Scale (DAS) (Spanier, 1976; Gentili et al., 2002). This scale measures couple's adjustment through 32 items: 31 items are related to specific aspects of the couple's relationship, and one item assesses overall happiness with the relationship. The higher the score, obtained by summing the 32 items, the greater is the perceived couple's adjustment. The instrument showed very good internal consistency for both men (Cronbach's alpha = 0.90) and women (Cronbach's alpha = 0.89).

Experience in Close Relationship Questionnaire (Brennan et al., 1998; Picardi et al., 2002). This instrument measures the adult romantic attachment style through 36 items on a 7-point Likert scale. Specifically, it is composed of two different subscales, each composed of 18 items and measuring, respectively, attachment anxiety (e.g., "I worry about being abandoned") and avoidance (e.g., "I prefer not to show a partner how I feel deep down"). The higher the score in each dimension is, obtained by summing the item (some reversed), the higher the levels of insecurity perceived with reference to these two attachment dimensions. The instrument showed good internal consistency for both the attachment anxiety subscale (Cronbach's alpha = 0.89 for men and 0.88 for women) and the avoidance subscale (Cronbach's alpha = 0.85 for men and 0.82 for women).

Finally, socio-demographic (age, educational level, job situation) and clinical (diagnosis, number of previous treatments, type of treatment) information was collected.

Procedure

This project was approved by the Institutional Review Board of the Catholic University of the Sacred Heart. Data were collected at the beginning of the assisted reproductive technology procedure. In particular, both partners were recruited at the outpatient hospital while they were undergoing preliminary exams before entering treatment (e.g., hormonal stimulation). Each partner was asked to complete an on-site questionnaire independently from the other partner, after being informed about the research aim and signing the written informed consent form. Anonymity and data confidentiality were guaranteed.

Data Analysis

Descriptive statistics were conducted for each instrument. Bivariate correlation among variables was performed. Differences between males and females were investigated with paired-samples *t*-test. Furthermore, the chi squared test was performed to compare men and women regarding their risk status for the ScreenIVF subscale. To investigate the impact of psychological variables (infertility-related cognitions, romantic attachment, and support) and medical variables (type of infertility diagnosis and previous ART treatment) on psychological well-being (anxiety and depressive symptoms, and couple's adjustment) in both men and women, a series of multiple linear regression analyses were performed. When predictors were dichotomous, they were recoded as dummy variables (Frazier et al., 2004).

Given the heterogeneity of subgroups' dimensions with reference to diagnosis conditions, infertility diagnosis was recoded as a dichotomous variable: one group comprising idiopathic and both partners' diagnosis (BPD group; 51.2%) and another group comprising one partner's (male or female) factors diagnosis (OPD group; 48.8%), assuming that there may be a difference depending on whether or not a single partner was identified as responsible for the infertility. Indeed, while contrasting findings were reported about the differentiating impact of male vs. female factor on men's and women's well-being, previous studies found that individuals with a mixed factor or an idiopathic/unexplained infertility showed higher levels of distress (Winkelman et al., 2016; Warchol-Biedermann, 2019).

RESULTS

Descriptive statistics of the measures for both women and men are reported in **Table 1**. In particular, we reported mean and SD for each scale and the percentage of subject at risk for the ScreenIVF subscales.

Table 2 presents the bivariate associations between variables for the two genders.

As reported in **Table 2**, several significant correlations emerged with some gender-specific patterns. In particular, in the men's subsample, anxiety was found to be associated with all the other variables, while depression was correlated with the other variables except for acceptance. Furthermore, support was positively correlated with couple's adjustment and negatively associated with romantic attachment, but no correlation was found with infertility-related cognitions. These

cognitions were negatively associated each other; furthermore, helplessness was positively associated with the anxiety dimension of attachment, while acceptance was negatively associated with anxiety attachment. On the contrary, no correlations were found with the avoidance dimension of attachment and couple's adjustment. Finally, the two dimensions of romantic attachment were also negatively correlated with each other, and the anxiety dimension was negatively associated with couple's adjustment.

In the women's subsample, both anxiety and depression as well as support were correlated with all other variables except for avoidance. Helplessness and acceptance were negatively associated, and helplessness was also positively correlated with the anxiety dimension of romantic attachment while acceptance was negatively correlated with this dimension of attachment and positively associated with couple's adjustment. Finally, anxiety and avoidance were positively correlated with each other, and both were negatively associated with couple's adjustment.

As reported in **Table 1**, paired sample *t*-test analyses revealed several statistically significant differences between partners' well-being. In particular, women in the sample reported higher levels of both anxiety symptoms and depressive symptoms than men. In contrast, no differences were detected for couple's adjustment. Gender differences also emerged for some variables considered as potential predictors of psychological well-being. Specifically, women reported higher levels of helplessness than men, but lower levels of acceptance than their partners; moreover, women reported higher levels of both anxiety and avoidance dimensions of romantic attachment than men. No differences were detected for the support dimension of the ScreenIVF.

Furthermore, the chi squared test revealed differences between men's and women's risk status for all the subscales of ScreenIVF. In particular, women were at greater risk for anxiety symptoms, depressive symptoms, helplessness, and lack of acceptance, while men were at greater risk for lack of support.

Considering the second aim, which was to analyze differences between partners in psychological and medical factors predicting their psychological (individual and relational) well-being, the multiple regression analysis revealed that, in the women's subsample, anxiety is predicted by helplessness [$F_{(7,\ 140)} = 10.222$; $R^2 = 0.350$; $p < 0.001$], as reported in **Table 3**. On the other hand, no significant relationship was found for the other variables.

Furthermore, as shown in **Table 4**, depression was predicted by helplessness and lack of support [$F_{(7,\ 143)} = 13.741$; $R^2 = 0.414$; $p < 0.001$].

Finally, couple's adjustment was predicted by support and the anxiety dimension of romantic attachment, in the latter case with a negative association [**Table 5**; $F_{(7,\ 132)} = 5.070$; $R^2 = 0.295$; $p < 0.001$].

In the men's subsample, on the other hand, anxiety was predicted by helplessness, lack of support, and anxiety attachment [$F_{(7,\ 137)} = 9.225$; $R^2 = 0.332$; $p < 0.001$], as reported in **Table 6**.

TABLE 1 | Descriptive statistics of the scales.

	Women		Men			
	M (*SD*)	% Risk	M (*SD*)	% Risk	T-test	χ2 test
ScreenIVF-Anxiety	19.31 (5.0)	20.0	18.50 (4.8)	16.6	2.05*	6.99**
ScreenIVF-Depression	1.01 (1.5)	7.6	0.56 (1.1)	3.6	4.31***	20.57***
ScreenIVF-Support	16.55 (3.1)	40.2	16.25 (4.0)	46.8	1.04	
ScreenIVF-Helplessness	9.39 (3.2)	12.0	8.22 (3.0)	5.9	−3.57***	19.47***
ScreenIVF-Acceptance	16.48 (3.8)	7.8	17.66 (3.8)	5.0	4.55***	
ECR-Anxiety	52.95 (16.2)		47.79 (16.4)		3.63***	5.29*
ECR-Avoidance	51.78 (20.0)		44.80 (19.6)		4.82***	7.27**
DAS	127.56 (11.6)		128.83 (11.7)		−1.47	

*$p < 0.05$, **$p < 0.01$, and ***$p < 0.001$.*

TABLE 2 | Bivariate correlations between variables for men and women.

	Variables	1	2	3	4	5	6	7	8
1.	ScreenIVF-Anxiety	0.34***	0.52***	−0.37***	0.34***	−0.17*	0.39***	0.17*	−0.51***
2.	ScreenIVF-Depression	0.50***	0.36***	−0.21**	0.22***	−0.14	0.24***	0.18*	−0.24**
3.	ScreenIVF-Support	−0.34***	−0.35***	0.36***	−0.05	0.09	−0.25***	−0.30***	0.41***
4.	ScreenIVF-Helplessness	0.46***	0.48***	−0.22**	0.33***	−0.24***	0.35***	0.14	−0.18
5.	ScreenIVF-Acceptance	−0.39***	−0.31***	0.31***	−0.48***	0.27***	−0.19*	−0.09	0.09
6.	ECR-Anxiety	0.29***	0.26***	−0.19*	0.27***	−0.22**	0.36***	−31***	−0.33***
7.	ECR-Avoidance	0.97	−0.01	−0.03	0.00	−08	0.18*	0.53***	−13
8.	DAS	−0.44***	−0.35***	0.32**	−0.11	0.31***	−0.42***	−0.21*	0.68***

*$p < 0.05$, **$p < 0.01$, and ***$p < 0.001$. Men correlations are reported above the diagonal, women scores are reported below. On the diagonal, correlations between men and women for each variable are reported.*

As shown in **Table 7**, depression was predicted by helplessness and previous treatments: those who had already undergone treatments in the past were more depressed than those who were on the first attempt [M = 0.76, *SD* = 1.43 vs. M = 0.50, *SD* = 0.98; $F_{(7,\ 141)} = 4.669$; $R^2 = 0.196$; $p < 0.001$].

To conclude, as reported in **Table 8**, couple's adjustment was predicted by support and lower levels of helplessness; furthermore, the type of diagnosis was found to be significantly associated with men's couple's adjustment: those who had a mixed factor or an idiopathic infertility reported lower levels of couple's adjustment than men with male or female infertility factor [*M* = 127.42, *SD* = 10.96 vs. *M* = 130.49, *SD* = 11.52; $F_{(7,\ 132)} = 3.963$; $R^2 = 0.270$; $p = 001$].

TABLE 3 | Multiple linear regression: effect of psychological and medical variables on anxiety in women.

Predictors	b	SE b	β	*t*	*p*
ScreenIVF-Helplessness	0.675	0.130	0.436	5.203	0.000***
ScreenIVF-Acceptance	−0.104	0.109	−0.081	−0.960	0.339
ScreenIVF-Support	−0.225	0.130	−0.131	−1.736	0.085
ECR-Anxiety	0.042	0.024	−0.134	1.778	0.078
ECR-Avoidance	0.008	0.019	0.030	0.400	0.690
Infertility diagnosis	−0.178	0.714	−0.018	−0.250	0.803
Previous treatments	0.357	0.889	0.030	0.401	0.689

*$p < 0.05$, **$p < 0.01$, and ***$p < 0.001$.

TABLE 4 | Multiple linear regression: effect of psychological and medical variables on depression in women.

Predictors	b	SE b	β	*t*	*p*
ScreenIVF-Helplessness	0.251	0.036	0.541	6.919	0.000***
ScreenIVF-Acceptance	0.049	0.031	0.127	1.599	0.112
ScreenIVF-Support	−0.115	0.036	−0.227	−3.194	0.002**
ECR-Anxiety	0.013	0.007	0.138	1.955	0.053
ECR-Avoidance	0.003	0.005	0.045	0.655	0.513
Infertility diagnosis	−0.258	0.200	−0.086	−1.291	0.199
Previous treatments	−0.349	0.247	−0.098	−1.416	0.159

*$p < 0.05$, **$p < 0.01$, and ***$p < 0.001$.

TABLE 5 | Multiple linear regression: effect of psychological and medical variables on couple's adjustment in women.

Predictors	b	SE b	β	*t*	*p*
ScreenIVF-Helplessness	0.320	0.409	0.088	0.782	0.436
ScreenIVF-Acceptance	0.506	0.337	0.166	1.499	0.137
ScreenIVF-Support	0.901	0.390	−0.221	2.309	0.023*
ECR-Anxiety	−0.286	0.073	−0.394	−3.925	0.000***
ECR-Avoidance	−0.089	0.057	0.057	0.057	0.057
Infertility diagnosis	−0.233	2.236	−0.010	−0.104	0.917
Previous treatments	3.353	2.236	0.125	1.302	0.196

*$p < 0.05$, **$p < 0.01$, and ***$p < 0.001$.

TABLE 6 | Multiple linear regression: effect of psychological and medical variables on anxiety in men.

Predictors	b	SE b	β	*t*	*p*
ScreenIVF-Helplessness	0.461	0.121	0.301	3.804	0.000***
ScreenIVF-Acceptance	−0.080	0.095	−0.063	−0.8449	0.400
ScreenIVF-Support	−0.282	0.084	−0.258	−3.336	0.001***
ECR-Anxiety	0.049	0.023	0.181	2.138	0.034*
ECR-Avoidance	0.022	0.019	0.092	1.160	0.248
Infertility diagnosis‘	0.444	0.687	0.047	0.647	0.519
Previous treatments	−1.096	0.818	−0.098	−1.341	0.182

*$p < 0.05$, **$p < 0.01$, and ***$p < 0.001$.

DISCUSSION

Many couples worldwide have to face a diagnosis of infertility and, subsequently, then undergo medical treatments to become parents, although differences in the percentages among countries have been reported (Inhorn and Patrizio, 2015; Sun et al., 2019). As pointed out in the Introduction, infertility and ART treatments represent critical and potentially stressful experiences, which can lead to individual and relational distress for both partners (De Berardis et al., 2014; Koert and Daniluk, 2018). However, literature has highlighted gender differences in coping with these experiences and in their impact on individual and relational well-being (Bayley et al., 2009; Davidovà and Pechovà, 2014; Ying et al., 2015; Bai et al., 2019). Given that several aspects could be the cause of these differences, the aim of the present study was to assess gender differences in couples undergoing medical treatment for conception, focusing on both partners' individual and relational well-being as well as on psychological

TABLE 7 | Multiple linear regression: effect of psychological and medical variables on depression in men.

Predictors	b	SE b	β	*t*	*p*
ScreenIVF-Helplessness	0.094	0.031	0.261	3.041	0.003**
ScreenIVF-Acceptance	−0.002	0.024	−0.005	−0.065	0.949
ScreenIVF-Support	−0.033	0.022	−0.127	−1.526	0.129
ECR-Anxiety	0.007	0.006	0.102	1.122	0.264
ECR-Avoidance	0.007	0.005	0.124	1.469	0.144
Infertility diagnosis	0.143	0.175	0.064	0.817	0.415
Previous treatments	−0.413	0.209	−0.156	−1.979	0.050*

*$p < 0.05$, **$p < 0.01$, and ***$p < 0.001$.

TABLE 8 | Multiple linear regression: effect of psychological and medical variables on couple's adjustment in men.

Predictors	b	SE b	β	*t*	*p*
ScreenIVF-Helplessness	−0.978	0.438	−0.252	−2.229	0.029*
ScreenIVF-Acceptance	0.189	0.302	0.069	0.624	0.534
ScreenIVF-Support	0.581	0.245	−0.267	2.367	0.021*
ECR-Anxiety	−0.042	0.076	−0.064	−0.549	0.585
ECR-Avoidance	−0.048	0.061	−0.087	−0.789	0.433
Infertility diagnosis	4.799	2.241	−0.218	2.141	0.036*
Previous treatments	−2.255	2.704	−0.086	−0.834	0.407

*$p < 0.05$, **$p < 0.01$, and ***$p < 0.001$.

factors that could be considered as risk/protective factors for well-being. Moreover, we investigated differences between men and women in psychological and medical variables predicting personal well-being.

As hypothesized, findings revealed several gender differences both in partners' psychological well-being and in some psychological dimensions related to well-being. Furthermore, gender differences were found for the patterns of association among the investigated variables. In particular, regarding individual well-being, women reported higher levels of both anxiety symptoms and depressive symptoms than men, and were at greater risk of belonging to the clinical group (that is, with scores above the cut-off) for anxiety and depression, confirming findings of previous studies suggesting that women are generally more emotionally distressed than men and presented an overall lower quality of life when they undergo ART treatments (Berghuis and Stanton, 2002; Agostini et al., 2017; Kroemeke and Kubicka, 2018; Patel et al., 2018; Meléndez et al., 2019). On the other hand, no difference was found between husbands and wives for couple's adjustment. This result is in line with a previous study (Yazdani et al., 2016) reporting the absence of any difference in marital adjustment between partners. Indeed, although other studies (Lee and Sun, 2000; Peterson et al., 2011; Greil et al., 2018) found gender differences within couples for relational well-being, it should be noted that these differences are in opposite directions, suggesting that they are not so clear-cut.

Furthermore, as expected, women presented higher levels of helplessness and lower levels of acceptance than men and were at greater risk of being above the clinical cut-off score for negative infertility-related cognitions. This finding is in line with previous studies that found greater acceptance of the condition of infertility and childlessness in men, although women reported accepting treatments to a greater extent than men, showing more commitment and higher involvement than their partners (Patel et al., 2018; Nagórska et al., 2019). We can speculate that men and women have different reasons for having a child, and motherhood and maternal identity development are very important for a woman, explaining her lower level of acceptance (van Balen and Trimbios-Kempoer, 1995). And again, women reported higher levels of both anxiety and avoidance dimensions of romantic attachment than men, partially confirming findings of previous studies that found gender differences in adult romantic attachment. In particular, the meta-analysis by Del Giudice (2011) reported males having lower levels of anxiety than females but higher levels of avoidance, although important differences among the involved studies emerged. In this direction, for example, another study (Schmitt, 2003) reported that men were not significantly more avoidant than women across all culture. Finally, although no difference between men and women was found for support, a higher percentage of men were at greater risk of perceiving lack of support, partially confirming findings of another study that found lower levels of benefit from support among men (Kroemeke and Kubicka, 2018; Casu et al., 2019).

Gender differences also emerged for factors predicting individual and relational well-being. In particular, although both women's and men's anxiety and depressive symptoms were predicted by helplessness, confirming the central role of infertility-related cognitions for adjustment to infertility (Patel et al., 2018), poor support predicted only anxiety in men and only depression in women, suggesting a gender-specific pattern for support impact on individuals' mental health (Kroemeke and Kubicka, 2018). Furthermore, individual well-being was also predicted only for men by attachment anxiety and having or not having had a previous treatment; specifically, attachment anxiety was associated with anxiety symptoms, confirming findings of a previous study that found a relationship between attachment anxiety and infertility-related stress in men (Donarelli et al., 2016), while the factor related to previous treatments predicted depressive symptoms, confirming findings of other studies that found how the failure of previous treatments increased distress (Patel et al., 2018).

As for relational well-being, support turned out to predict couple's adjustment both in men and women, confirming the above-mentioned protective role of support for partners' well-being, both individual and relational (Kroemeke and Kubicka, 2018). However, differences between men and women also emerged for predictors of relational well-being. Specifically, in women, couple's adjustment was also predicted by anxiety attachment, while in men other predictors of couple's adjustment were helplessness and type of diagnosis. In particular, husbands who had a mixed or idiopathic infertility factor reported lower levels of marital adjustment compared with other men, confirming results of other studies which underlined the role of diagnosis type in moderating the impact of infertility on individual and interpersonal well-being (Winkelman et al., 2016; Warchol-Biedermann, 2019).

This research has several limitations. First, it is a cross-sectional study that assesses partners' well-being only at the beginning of ART treatment. This is a specific moment for the couple, because a partner's desire to become parents is still possible; thus, although medical treatments represent a distant and uncertain outcome, starting down this path gives partners new hope of being able to fulfill their desire for parenting (Koert and Daniluk, 2018). Future studies should include different assessment points in order to better understand the trajectories of adjustment not only to an infertility diagnosis but also to medical treatment. In particular, it could be interesting to assess partners' psychological well-being at the end of treatment, considering the role of successful vs. unsuccessful treatment on their mental health. Moreover, information about partner's psychological well-being could be connected with the outcome of the medical treatment. Indeed, some studies underlined the impact of emotional reactions in achieving pregnancy after ART treatments, reporting an association between stress and the failure of treatment (Zhou et al., 2019; Gabnay-Nagy et al., 2020).

Second, in the present study only self-reporting instruments were administrated. Although these measures offer several advantages, it could be useful for a deeper understanding of the infertility experience to also have qualitative measures (e.g., an interview) that allow one to capture the nature of an individual's experience. Third, some potentially important variables (e.g., the presence of other children) were not investigated; thus, future research should include these variables in order to better capture their role in shaping the experience of infertility and

medical treatments and to understand the complexity of these experiences. Moreover, in this direction, it would be interesting to differentiate the impact of male factor and female factor infertility, according to the partner's gender. Fourth, although we have investigated predictors of distress both in women and men, finding important gender differences, these differences were not explored with moderations. Thus, future studies should introduce moderation models in order to assess whether predictors have a different impact on individual and relational distress according to gender. Finally, it could be important for further investigations to carry out dyadic analysis in order to better understand the impact of treatment on the couple itself, beyond gender-related differences between partners (e.g., reciprocal influences).

Despite these limitations, the present results highlight important differences in men's and women's adjustment after a diagnosis of infertility. In particular, although there were some common predictive factors of individual and relational well-being across partners (that is, helplessness, support, and attachment anxiety), differences emerged with reference to patterns of prediction. Furthermore, medical factors turned out to predict individual and relational well-being only for men. This finding is partially congruent with previous studies that reported that the distress experienced by the partners does not depend on ART techniques (Lowyck et al., 2009; Sina et al., 2010; Van Der Merwe and Greeff, 2015). It is possible to surmise that the higher commitment of women in ART treatments and their greater acceptance of these treatments gives a lower weight to the medical variables directly related to the treatments, compared to other variables (Nagórska et al., 2019). These findings suggest the importance of implementing support interventions for couples which take into consideration the specific needs and fragility of each partner (Kroemeke and Kubicka, 2018) as well as focusing on maintaining and enhancing a sense of partnership. Indeed, it appears that the couple in this specific moment (i.e., the beginning of an ART treatment), can function as an important resource for partners' distress and fatigue (Molgora et al., 2019b). Psychological support should be offered to all infertile couples, given that most couples desired to be supported but only about one in two couples actively seeks and asks for support, which could also be because of a lack of information about support services (Read et al., 2014). Indeed, these results emphasize the usefulness of maintaining and improving support between partners for strengthening their abilities to cope with the infertility experience and to reduce their negative effects and cognitions (Wischmann, 2008).

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation, to any qualified researcher.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Institutional Review Board of the Catholic University of the Sacred Heart. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

SM contributed to developing the study design, to perform data analysis and to writing the entire manuscript. MB contributed to the data collection. GT contributed to writing the introduction, to perform analyses, and interpreting the results. EdS contributed to developing the study design and to supervising the research project. EmS contributed to developing the study design, to supervising the research project, and to writing the discussion section. All authors contributed to the article and approved the submitted version.

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Working With Infertile Couples Seeking Assisted Reproduction: An Interpretative Phenomenological Study With Infertility Care Providers

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Although most studies investigated the impact of infertility and its treatment on the couple, a small body of evidence suggested that infertility care providers may experience different sources of stress related for instance to excessive workload, the complexity of the technique, and relational difficulties with patients. The current study aimed at providing further insight into the understanding of the subjective experience of infertility care providers by highlighting their feelings and emotions, personal meanings, challenges, and opportunities. Following the methodological guidelines of Interpretative Phenomenological Analysis, we conducted individual semi-structured interviews with 23 members of two different fertility units. Interviews were audiotaped and transcribed verbatim. Textual analysis was then conducted to identify emerging dominant themes and subthemes. Three main themes were extracted: (i) *dealing with infertile patients and their specificities*, (ii) *performing assisted reproductive technology (ART)*, (iii) *being part of a team*. These themes related to participants experiencing: (i) difficulties in establishing an empathic connection and communicating with couples, such that women were sometimes perceived as "particular patients" and men as poorly involved in the process; (ii) difficulties in dealing with a complex procedure in which errors are not allowed (as reported by embryologists), with a growing number of women aged > 40 seeking assisted reproduction, despite the risks for their health; (iii) being part of a team as a resource, although the huge amount of time spent together can involve conflicts and organizational problems. These findings suggested that patients' overpersistence (rather than just dropout) represents an important source of stress for infertility care providers. At the same time, the concept of particular or difficult patient derives from the combination of multiple factors, including providers' own history and subjective experience. The presence of mental health professionals in fertility units is essential to help providers improve the quality of doctor-patient communication and relieve the stress related to organizational issues and conflicts.

Keywords: assisted reproductive technology, fertility team, infertility care providers, interpretative phenomenological analysis, lived experience, qualitative research

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INTRODUCTION

Nowadays, 9–15% of couples worldwide have difficulties conceiving (Boivin et al., 2007), and an increasing number of infertile couples have been seeking assisted reproductive technology (ART) to have a child (Laganà et al., 2017). According to the definition used by the Centers for Disease Control and Prevention (CDC), ART includes a variety of procedures aimed at treating infertility. All these procedures involve handling both eggs and embryos. In general, eggs are surgically removed from women's ovaries, combined with sperm in the laboratory, and then reintroduced into women's body or donated to another woman[1].

Research has largely demonstrated that infertility and its treatment are associated with psychological distress, anxiety, and depression (Donarelli et al., 2016; Lakatos et al., 2017), as well as with sexual dysfunction, especially in women (Facchin et al., 2019). Couples undergoing ART experience a physically and psychologically demanding procedure, with low success rates (around 30% per cycle) (Ferraretti et al., 2013).

In the context of ART, dropout—which occurs when couples abandon treatment after a failed cycle, despite a favorable prognosis and absence of economic difficulties—depends on the complex interaction of patient factors (such as fear, negative attitudes to treatment, emotional, and relational strain), treatment factors (such as physical burden), and clinic factors related to organizational problems, as well as to difficult patient-provider interactions—see the interesting model, i.e., "Integrated Approach to Fertility Care", presented by Boivin et al. (2012). Moreover, negative experiences of care are often mentioned by infertile patients as a reason for discontinuing treatment (Gameiro et al., 2012).

As regards this third set of factors, several studies have indicated that ART providers, and thus not only patients, have to cope with multiple sources of stress (Boivin et al., 2012), deriving for instance from organizational difficulties, with time pressure and work overload (Gerson et al., 2004; Klitzman, 2018). In a qualitative study by Simpson and Bor (2001), obstetric sonographers—who were interviewed to explore their experiences of giving bad news to women during ultrasound scans—reported that shortage of time, which did not allow for providing adequate support to patients and was associated with excessive workload, was perceived as stressful. On the other hand, less difficulties were experienced when a protocol providing clear indications on how to proceed following the communication of bad news was available in the workplace. In this regard, communicating with patients, which also involves dealing with their negative emotional reactions, especially in case of bad news, represents another significant source of stress for ART providers (Grill, 2015). As highlighted by Leone et al. (2017) in their qualitative study, these professionals may experience bad news as related to their own failure as clinicians, with feelings of disappointment, also associated with the fact that, in the context of ART, treatment success is still far from being guaranteed. In addition, the procedure is complex and involves high levels of responsibility, also considering the type of material (i.e., gametes and embryos) manipulated by ART professionals (Fitzgerald et al., 2013). These challenges may lead to frustration (and even to burnout) among providers, especially when the team is not able to guarantee the desired optimal standards of care (Grill, 2015).

This small body of qualitative research indicates that investigating the subjective experience of infertility treatment providers may be very important to improve professionals' psychological conditions, with subsequent greater overall quality of care and patient satisfaction. However, this issue has been addressed by a small number of studies, and most research is still focused on the impact of ART on couples.

As suggested by the literature cited above (e.g., Simpson and Bor, 2001; Fitzgerald et al., 2013; Leone et al., 2017), qualitative methods can be particularly useful for researching the subjective experience of infertility care providers. Thus, we conducted the current qualitative study to explore in depth the characteristics of the lived experience of working in the context of ART as members of the clinic staff. Specifically, the shared meaningful experience explored in this study had two main components (i.e., being infertility care providers and being members of a fertility team), and our research question was: how do infertility care providers make sense of their experience of working in the context of ART as members of a fertility team? What are their feelings and emotions, perspectives and personal meanings, challenges and opportunities?

MATERIALS AND METHODS

In this article, our study is reported following the Standards for Reporting Qualitative Research (O'Brien et al., 2014; see, also, Hammarberg et al., 2016). The study was designed according to the theoretical and methodological principles of Interpretative Phenomenological Analysis (IPA) as described by Smith et al. (2009). IPA is a qualitative inductive approach aimed at providing in depth exploration of individuals' lived experience, which also involves understanding personal meanings and perspectives (Smith and Osborn, 2015; Smith, 2019). IPA has been largely used in health research, especially in studies investigating patients' subjective illness experience (see, for example, Smith et al., 2017; Larsson et al., 2019), but there are also IPA studies focused on caregivers (Hunt and Smith, 2004; Oliver et al., 2020), as well as on the lived experience of professionals working in stressful environments (Beryl et al., 2018; Volpato et al., 2018; Schaad et al., 2019).

We combined a sampling technique of convenience (such that we recruited those team members who were available when researchers were present) and purposive sampling to recruit participants of different professions, because we were interested in exploring the perspectives of all team members (gynecologists, biologists, midwives, nurses, and healthcare assistants). We did not apply any restriction regarding professionals' nationality

[1] www.cdc.gov/art/whatis.html

and age, or time since the beginning of their professional activity. Exclusion criteria were (1) not being able to understand and speak Italian and (2) not being a member of a fertility team (e.g., external collaborators of a fertility center). Following these criteria, final participants were 23 members of two fertility units recruited at two different public hospitals located in Northern Italy.

Ethical approval was obtained by the ethics commission of the Department of Psychology at the Catholic University of the Sacred Heart (Commissione Etica per la Ricerca in Psicologia; CERPS). Face to face semi-structured interviews were conducted in 2018 in a private room at the hospital by the first author and three young psychologists with an expertise in the area of ART. Written informed consent was provided by all participants, who received complete information regarding study objectives and procedures, including confidentiality protection strategies. Interviews were conducted using a storytelling approach, because we wanted our participants to narrate their personal experience as freely as possible. For this reason, each interview started with an open-ended question ("Could you start by telling me about your work experience in a fertility team?") and continued in the form of a dialogue with questions aimed at exploring professionals' lived experience in terms of feelings about their job, meanings, expectations, work challenges, and resources. Participants were also encouraged to disclose their personal ideas about ARTs. Field notes were taken by the interviewers. All interviews were tape recorded and subsequently transcribed verbatim. The duration of the interviews ranged between approximately 30 min and 1 h. All participants' identifying details were omitted from transcriptions to protect confidentiality.

Data Analysis

Textual analyses were conducted independently by two authors (FF, DL), but findings were constantly shared and discussed by the whole team throughout the analytic process (i.e., an iterative reflective process rather than a linear process). Consistently with the approach described by Smith et al. (2009), data analysis started with line-by-line reading of each interview with an exploratory attitude, and initial notes were taken to underline and summarize relevant topics, describe the language used by the participants, and provide preliminary interpretations when possible. The second step involved aggregating these initial codes to identify emergent themes for each participant (which moved the analytic process to a higher level of abstraction). When similar themes emerged from different interviews, we repeated the same theme title. In the third step, analyses were conducted across all participants looking for connections between the emergent themes identified in step two, which involved the creation of a conceptual map. Some of these themes were further clustered in superordinate concepts to capture the main components of participants' lived experience. At the end of the process, we discussed our findings with the two fertility teams in two separate group meetings, and the feedbacks received by these professionals were used to improve our interpretation of the results and enhance the trustworthiness of our study. All discrepancies were discussed until full consensus was reached.

RESULTS

Twenty-five professionals were initially invited to participate in the study. All of them accepted our invitation, but 2 (a midwife and a psychologist) subsequently declined for lack of time. The sample was composed of 23 professionals [8 biologists and embryologists (35%), 5 gynecologists (22%), 5 nurses (22%), 4 healthcare assistants (17%), and one midwife (4%)]. Participants' age ranged between 32 and 63 years (mean = 48.7; standard deviation = 7.9). Fifteen participants (65%) were married, 5 (22%) were in a relationship, and 3 (13%) were divorced. The majority of the interviewees [16 (69%)] had children (adopted, in one case). As a result of the analytic process described above, we identified 3 superordinate themes characterizing participants' lived experience of working with infertile couples seeking ART: (i) *dealing with infertile patients and their specificities*, (ii) *performing ARTs*, (iii) *being part of a team*. These superordinate themes and their subthemes are represented in **Figure 1**.

Dealing With Infertile Patients and Their Specificities

Most participants recounted difficulties working with infertile patients, and patient-related factors were described as a source of stress for providers, as well as an important obstacle in establishing a positive, empathic provider-patient relationship. This superordinate theme involved three subthemes that allowed to clarify how and why dealing with infertile couples was sometimes stressful for our interviewees. These subthemes were: (i) *infertile women as "particular patients"*; (ii) *men's involvement in the assisted reproduction process*; (iii) *communicating with infertile couples*.

Infertile Women as "Particular Patients"

Infertile women overall—although with remarkable individual differences—were experienced as *"particular patients"* due to their intense feelings of anguish and depression, often translated into frustration, as well as into impatient demands, sometimes with a lack of trust in doctors and a tendency to blame them for unsuccessful treatments:

> *"Infertile women are particular patients. They tend to be extremely anxious, worried; they feel like things will always go wrong for them; many women seem like they have the need to control everything"* (biologist).

Several participants used the words *"a child at all costs"* to describe these women's particular *"need for a child"* (especially as regards older patients). On the one hand, all providers were fully aware of the psychological pain caused by infertility. Patients' emotional labor was considered as an inevitable component of the IVF process, and all professionals tried their best to provide personalized, good quality care (which also entailed recommending psychological treatment, when necessary). On the other hand, it was difficult for them to deal with extreme situations, in which for instance severely distressed women claimed their *"right to have the belly"* despite multiple previous unsuccessful IVF cycles, with very limited chances of pregnancy

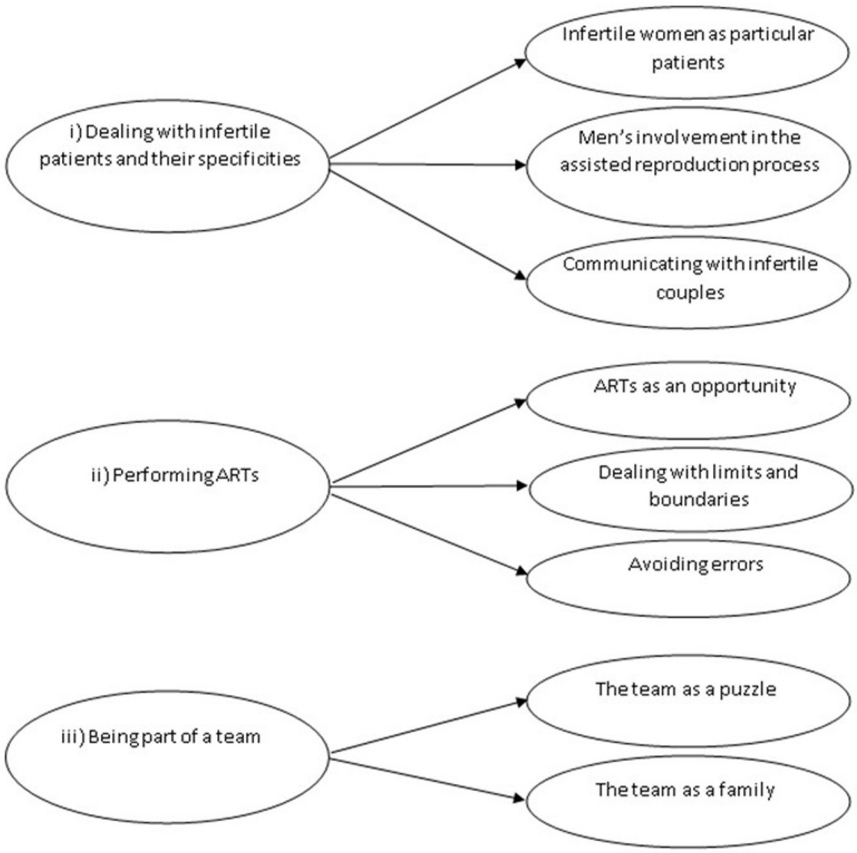

FIGURE 1 | Dominant themes and subthemes extracted from textual analyses.

(this situation was referred to as *"obsessive IVF"* by a nurse). These patients' feelings and positions, combined with very high expectations and hostile attitudes, were difficult to understand by our participants, especially by those who recounted previous professional experiences in oncology units. These professionals (especially nurses) struggled to comprehend how and why such a great deal of psychological suffering could be related to the fact of having infertility, which is not a life-threatening condition:

> *"I acknowledge the emotional burden, but no one is going to die, it's not like in oncology units or intensive care"* (nurse).

Several interviewees stated that such intense feelings of distress might be due to cultural pressures (e.g., *"a woman must be a mother"*), as well as to painful comparisons with pregnant friends and in general with women who have been able to conceive:

> *"Patients often say: why did she have her baby while I can't?"* (gynecologist).

Men's Involvement in the Assisted Reproduction Process

This issue was raised by almost all participants, although with different positions. All professionals acknowledged that partners represent an important source of support for women throughout IVF. In this regard, a positive intimate relationship, characterized by good communication, sexuality, and care, was consistently identified as a fundamental factor that may significantly affect IVF psychological outcomes. Although most participants underlined the important role of partners and referred to IVF as a couple-centered process, a few providers described assisted reproduction as an unbalanced process, with women as protagonists in terms of decision-making, physical, and emotional involvement. These participants recounted situations in which men were completely absent, to the point of being defined as *"ghosts"* by an embryologist. In these situations, male partners' involvement was experienced by the interviewees as a challenge in their relationship with the couple:

> *"In general, I think men are less involved than women. [. . .] 20% of male partners are on top of it, but 50% of them undergo the procedure like ghosts, leaving no traces. For other men, it seems like they are doing something unconceivable, a terrible effort. Then you remind them that their spouse is under anesthesia in the other room"* (embryologist).

> *"Sometimes the husband is physically there, but mentally absent"* (nurse).

> *"[. . .] I told her she had to come here with her husband, who had to sign the informed consent form. And she said, «My husband has to take three hours off work to come». I asked, «Is he going to be here with you on the transfer day?» and she answered, «No! I am coming with my mother!» [. . .]"* (gynecologist).

When these findings were further discussed with both fertility teams at the end of the study, infertility etiology, and especially male factor infertility, was identified as an important variable associated with men's lack of involvement. Participants hypothesized that a silent withdrawal may be the way in which men deal with negative feelings, such as shame about not being fertile, as well as embarrassment when providing semen samples.

Communicating With Infertile Couples

For all the professionals in the study, a fundamental component of provider-patient communication was represented by pre-intervention counseling, whose aim was to guarantee comprehensiveness of treatment information (including rates of success, effects of pharmacological and surgical interventions, psychological implications of assisted reproduction, IVF-related risks, and causes of failure) and thus mentally prepare patients to possible negative results. However, this strategy was not considered as sufficiently effective in preventing patients' overly high (or overly low) expectations, with negative psychological consequences in case of failure. This discrepancy was particularly challenging for providers, especially embryologists, who emphasized the importance of presenting technical aspects of IVF procedures and outcomes *("the ratio of the technique,"* reporting the words of an embryologist). In case of unsuccessful interventions, embryologists can be required to provide very specific explanations regarding oocytes and embryos, which often occurs on the telephone. Detailing such a complex procedure to patients is extremely difficult and requires an accurate choice of type and number of words. The embryologists in the study acknowledged that working on language has been an important aspect of their professional growth:

> *"I noticed that, when I started, I used to talk to patients as if I was giving a conference presentation. I think they were able to understand less than zero. Then I realized it would have been more functional to avoid technicism and thus use a simpler approach [. . .]. Simplification made things easier, although I am still having difficulties explaining the procedure"* (embryologist).

Theme 2: Performing ARTs

All participants perceived ARTs as an important opportunity to help couples become parents, but at the same time performing ARTs entails multiple stressful challenges and raises psychological and ethical issues that were discussed by our participants. This superordinate theme comprises three subthemes: (i) *ARTs as an opportunity*?; (ii) *dealing with limits and boundaries*; (iii) *avoiding errors*.

ARTs as an Opportunity?

Our participants described ARTs as a fundamental resource that may allow infertile individuals realize their dream of becoming parents, despite the presence of pathologies that would have been a definitive impediment 20 years ago. In this regard, patients' happiness and satisfaction represented a major source of reward for providers:

> *"I think ARTs give a great chance to infertile people, which has been revolutionary in our society. It is not comparable to lifesaving procedures such as transplants, but in some ways ARTs are mind-saving because you can touch these couples' happiness when the child arrives"* (gynecologist).

Interestingly, several participants—especially those who had directly experienced infertility—expressed ambivalent feelings by saying that ARTs are indeed a great opportunity, but at the same time they would not seek assisted reproduction to have a child, for instance to avoid the negative consequences of the procedure on their intimate relationship:

> *"The psychological burden of ARTs is huge [. . .]. I am not sure I would seek ARTs in case of infertility problems [. . .], I would probably prefer adoption. [. . .] Based on my experience, there is a remarkable impact on the couple relationship [. . .]. I would be worried about the relationship with my partner [. . .]. For instance, sexuality may become a mechanical, unpleasant activity"* (embryologist).

Dealing With Limits and Boundaries

Although ARTs allow to overcome infertility, the low rates of success indicate that nature still sets boundaries of which our participants were fully aware. *"Nature can't be pushed beyond a certain limit,"* claimed a biologist. Women's age remains a major limit that should be clearly explained to patients:

> *"I would never recommend ARTs to a 48-year-old woman, the risks for her health are very high. [. . .] Let me give you an example. I received a phone call by a patient, whose 49-year-old sister in law underwent heterologous fertilization and got pregnant. She has now been hospitalized with severe hypertension, physicians are not able to treat it and thus suggested pregnancy interruption"* (gynecologist).

Consistently with these considerations, our participants underlined the importance of not perceiving themselves as *"creators of life"* in case of achieved pregnancy by the couple, or as *"failures"* after an unsuccessful cycle. The potential oscillation between these two positions was referred to as a dangerous psychological dynamic. Considering their own work as a small part of a more complex process was indicated as an effective protective strategy:

> *"You really need to avoid getting too caught up in your feelings of guilt [. . .], like, you know, I transferred the embryos and she's not pregnant, it's my fault [. . .], but at the same time you can't triumph when the woman shows up with the baby, as though you made it. [. . .] This grandiosity is not appropriate. [. . .] We are not failures and we are not*

creators of life. We are just well trained professionals who do their best together as small parts of the whole process that leads a couple to have a baby" (embryologist).

Avoiding Errors

This subtheme specifically captured the subjective experience of embryologists, who discussed the importance of avoiding mistakes. These scientists highlighted the need for being constantly focused, which entails *"avoiding the theatre of emotions,"* as claimed by an embryologist. *"We don't manipulate normal cells,"* stated another embryologist, *"each embryo represents a hypothetic future individual."* Therefore, embryologists need to have *"a hundred eyes and a hundred hands."* How to deal with this extremely high responsibility? Team work is very important: as reminded by almost all these participants, embryologists never operate alone. Some interviewees underlined the need for disconnecting from work at the end of the day by taking care of themselves and having a good time with their partner and children. Acknowledging that scientists are human beings with their own feelings and emotions was identified by a young embryologist as an important protective factor: being aware of one's own limitations allows to ask for help and assistance when needed, rather than trying to make excessive efforts. This scientist quoted some Latin: "*Errare humanum est.*"

Theme 3: Being Part of a Team

All participants, regardless of their function, perceived themselves as part of a group with specific dynamics, and the outcome of assisted reproduction was described as the product of a joint effort. The fertility team was described: (i) *as a puzzle* and (ii) *as a family*. Each representation led to specific consequences in terms of participants' subjective experiences, resources, and challenges.

The Team as a Puzzle

Participants described the fertility team as a combination of differences, especially as regards members' personalities. Like pieces of a puzzle, team members had complementary roles and personality traits. Such a combination was perceived as a fundamental resource in everyday practice:

> *"Our team comprises multiple emotional worlds. We have the most anxious and the least anxious, the most courageous and the most prudent individual. This combination leads to a sort of mutual emotional correction"* (embryologist).

At the same time, dealing with diverse individuals, with different functions and work positions, was identified as a challenge and a potential source of organizational stress. For instance, the fact of having different types of contracts (which involved a different amount of work) was perceived as problematic in terms of work distribution.

The Team as a Family

> *"I spend more time with my colleague than with my girlfriend,"* claimed a young biologist. Many other participants stated something similar while describing the significant amount of time spent at work with their colleagues. In this regard, the team was described as a family, and families have internal conflicts:
>
> *"It becomes a sort of second family, or maybe even the first. Sometimes we fight, we may have conflicts"* (biologist).

DISCUSSION

To the best of our knowledge, this is one of the very few studies aimed at exploring the lived experience of working in a fertility team as reported by different professionals. Specifically, we used an IPA approach to explore in depth the characteristics of such an experience as narrated by 23 professionals working in two different fertility clinics. The themes and subthemes extracted led to the identification of sources of stress and vulnerability for professionals, as well as resources.

The first theme confirmed that infertile patients, and especially women, may be perceived as difficult due to their intense negative feelings of anxiety, pessimism, and frustration, such that communicating with these patients was experienced as particularly challenging by the professionals included in this study, as also reported by other authors (Fitzgerald et al., 2013; Grill, 2015; Boivin et al., 2017). For example, Fitzgerald et al. (2013) reported that embryologists can experience some patients as more difficult than others due to excessively high expectations, or simply due to being given inadequate information. In this regard, the embryologists included in our study underlined the importance of the quality of the information provided, suggesting that giving a great deal of technical details and statistics is not helpful, as previously underlined by Klitzman (2018). Therefore, our findings suggest that the type of information conveyed matters in the complex process of communicating with infertile patients, who are exposed to high levels of stress that may interfere with their understanding.

Our participants also addressed the importance of men's involvement during treatment. In some cases, men were described as mentally and emotionally uninvolved, which seems to confirm the findings of Leone et al. (2018), who reported that in their study, focused on doctor-patient communication during ART visits, females talk accounted for 67% of overall patient talk. Taken together, these results highlight that the couple, rather than the woman, should be the real protagonist in the treatment of infertility.

Moreover, our findings offer further insight into the understanding of professionals' difficulties with these patients by clarifying that providers' own history and representations of infertility may hinder the development of an empathic doctor-patient connection. For instance, professionals with experience of cancer care may not fully understand the emotional burden of ARTs on infertile patients, because infertility is not a life-threatening disease. Therefore, as previously underlined by Grill (2015), the concept of "difficult patient" derives from the complex interaction of multiple factors that are not exclusively related to patient characteristics and behaviors.

Theme 2 explored interesting aspects related to participants' perceptions of ARTs, with further indications regarding sources of difficulties and protective strategies used to relieve stress. The accounts revealed that the interviewees were fully aware of both the potential and the limits of the technique. Indeed, ARTs represent an important opportunity, but nature still sets boundaries and women's advanced age remains an essential clinical issue. In fact, it is well known that women aged > 40 years seeking ARTs have high risks of health problems such as preeclampsia, gestational age, gestational diabetes, and preterm/very preterm delivery (Le Ray et al., 2012). As interestingly demonstrated by Klitzman (2016), the decision-making process in this situation entails dealing with a medical, psychological, and ethical dilemma, for instance regarding who decides and how the decision should be made. Our findings suggest that contemporary clinical practice with infertile patients seeking ARTs involves dealing not only with patients' dropout, but also with overpersistence (which was referred to in our study as *"obsessive IVF"*), especially considering the increasing number of women aged 40 and above seeking ARTs (Klitzman, 2016).

On the other hand, fear of making mistakes has been acknowledged as a major source of stress by the embryologists in the study, who highlighted the importance of taking care of themselves by disconnecting from work and enjoying some time with their loved ones. In this regard, the embryologists included in a study by Fitzgerald et al. (2013) also emphasized the importance of avoiding errors with such irreplaceable material and discussed the importance of care of the self, which is not that common among other categories of health care workers. In our study, considering themselves as part of a more complex process, as an alternative to an individualistic approach, was described as another protective strategy.

In this regard, our study also demonstrated the importance of the team, which was perceived as a source of stress and a protective factor, at the same time. On the one hand, dealing with individual differences (also related to work functions) could be tiresome and generate conflicts, especially if one considers the significant amount of time that the team members spend together. The fact that organization and team dynamics may cause stress in fertility care providers has been underlined by other authors (Fitzgerald et al., 2013; Boivin et al., 2017). On the other hand, our findings also revealed that working in a group composed of people with different personalities can be helpful, since it facilitates the management of everyday stress, especially among embryologists.

The positive aspects of our study are related to the methodology used, which allowed for in-depth exploration of the participants' experience, and to the novelty value of our findings, especially considering the paucity of research on this neglected topic. However, the generalizability of these findings is scarce, which should be acknowledged as a limitation. In fact, consistent with the IPA methodological guidelines, our sample was small (although quite large for an IPA study) and did not allow for systematic comparisons between different professional categories (e.g., gynecologists vs. embryologists), also considering the influence of other variables, such as participants' age and years of experience in a fertility unit.

Because of these limitations, our results can open new research questions, rather than lead to firm conclusions. For instance, the individual, relational, socio-cultural and environmental factors that may lead to the concept of "difficult patient" in the context of ARTs require further investigation: there is need to clarify how and why some patients are perceived as more difficult than others, which would be very useful for clinical practice. Moreover, patients' overpersistence—rather than just dropout—deserves further attention in order to identify the psychological processes and sociocultural influences underlying this complex mechanism. In addition, investigating doctor-patient communication in the context of infertility remains essential.

Our findings also have interesting clinical implications, since they underline the importance of mental health professionals in fertility units, not only to support patients, but also to work with fertility care providers. As also acknowledged by other authors (e.g., Grill, 2015), mental health professionals have the responsibility to help fertility care providers manage "difficult patients" and improve their capacity of establishing an empathic connection with them. In this regard, mental health professionals can work with providers to enhance their communication skills, as well as their understanding of the negative feelings related to infertility (fear, anguish, frustration, sense of inadequacy) underneath patients' expressions of anger, lack of trust, and controlling behaviors (Patel et al., 2018). As suggested by Smorti and Smorti (2013), psychologists may also help providers understand more in depth the pathways to parenthood of couples who underwent ART, considering the specificities of this transition in the context of infertility (for instance, as regards to challenges and obstacles, sense of victory when the pregnancy is achieved, medicalization, and controlling behaviors). Moreover, psychologists can help providers understand whether their own history and subjective experience interferes with their clinical practice, especially in terms of doctor-patient communication. Mental health professionals can also provide useful interventions in case of work stress related to team dynamics, which may help providers better understand and avoid the negative group mechanisms that lead to tension, with improved ability to manage conflicts.

CONCLUSION

In conclusion, national health care policies in the context of infertility should consider the findings provided by the small body of literature focused on fertility care providers to further enhance the presence of mental health professionals in the fertility staff.

DATA AVAILABILITY STATEMENT

The full texts of the interviews and participant information cannot be publicly shared due to privacy and ethical restrictions. Requests to access the study data should be directed to federica.facchin@unicatt.it.

ETHICS STATEMENT

This study was reviewed and approved by the Commissione Etica per la Ricerca in Psicologia (CERPS), Department of Psychology, Catholic University of the Sacred Heart. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

FF, DL, GT, EC, and EV conceptualized the study. EV was also the supervisor. FF and DL analyzed the data. FF, DL, GT, and EC wrote the first draft of the manuscript, with suggestions from all authors. MC and PS supervised the findings of this study and edited the final version of the manuscript. All authors discussed the results and commented on the manuscript.

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Psychological Aspects Associated With Fertility Preservation in Oncology: An Exploratory Study

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Objective: Gonadotoxicity is considered one of the most distressing side effects of cancer treatment. Although fertility preservation can be a valid solution, it also involves a challenging process. A clear understanding of the features of women who decide to pursue fertility preservation after cancer diagnosis is missing. The purpose of the present study was therefore to analyze the personality profile of female patients referred to oncofertility prior to gonadotoxic treatment.

Methods: Fifty-two female cancer patients took part in the study. The Temperament and Character Inventory-Revised (TCI-R), the Response Evaluation Measure-71 (REM-71), the Beck Depression Inventory (BDI-II), and the State-Trait Anxiety Inventory-Y Form (STAI-Y) were administered to examine personality characteristics, defense mechanisms, depression and anxiety symptoms.

Results: Compared with reference data of the Italian population, our sample reported significantly lower scores in Harm Avoidance and trait anxiety, and significantly higher levels of mature defense mechanisms. Most of the patients reported low scores in immature defense mechanisms, depression, and trait anxiety, and medium scores in state anxiety.

Conclusions: Our findings suggest that these women display functional personality traits and defensive style, in association with low levels of depression and trait anxiety. These features may enable a proactive attitude to cancer and the ability to make long-term plans. This may favor psychological adjustment to cancer and a projection toward the future.

Keywords: anxiety, defense mechanisms, depression, fertility preservation, oncology, personality, REM-71, TCI-R

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INTRODUCTION

Remarkable advancements in cancer diagnosis and treatment have redefined oncologists' focus from a treatment-based strategy to a wider view that includes survival and quality of life. Women consider potential loss of fertility as one of the most distressing late effects of cancer treatment (Crawshaw, 2013). Indeed, ovarian reserve may be impaired by surgical removal of reproductive

organs, gonadotoxic chemotherapy treatments, or radiotherapy over reproductive organs. In order to compensate these negative consequences, cryopreservation of embryos, oocytes, or ovarian tissue is proposed to women to preserve their fertility.

The possibility of having children after cancer can be a powerful stimulus for recovery (Hershberger et al., 2013b), as it symbolizes the opposite of cancer, representing at first glance a promising option (Tschudin and Bitzer, 2009). However, fertility preservation can be a challenging process, as it can take up to 3 weeks in female patients, delaying oncological treatment (Logan et al., 2018). Indeed, an adequate organization of an Oncofertility Unit can reduce the time required by the procedure, encouraging consultants and patients to preserve fertility before gonadotoxic treatments (Sigismondi et al., 2015; Mangili et al., 2017) to shorten the time for oocyte cryopreservation and start anticancer treatment on time. In addition, women may be overwhelmed by all the difficult decisions and medical procedures they are required to undergo while fighting cancer. Thus, it is not surprising that fertility preservation rates remain quite low (Hershberger et al., 2013b). The literature points out several factors that influence this decision-making process, including personal factors (e.g., Peate et al., 2011; Hill et al., 2012; Kim et al., 2012; von Wolff et al., 2016), cancer-related clinical variables (e.g., Kim et al., 2012; von Wolff et al., 2016), childbearing attitudes (e.g., Hill et al., 2012; Hershberger et al., 2016) and cryopreservation-related factors (e.g., Kim et al., 2013; Baysal et al., 2015; Panagiotopoulou et al., 2018). However, the studies mentioned have produced mixed results, thus revealing inconsistent findings (Melo et al., 2019).

Therefore, a clear understanding of the features of the women who decide to pursue fertility preservation is missing, particularly focusing on patients' decision rather than the actual feasibility of treatment (Melo et al., 2019). In particular, the choice of undergoing fertility preservation can be analyzed within the framework of the adaptation process to disease. In fact, this option can subtend a better adjustment to cancer, in so far as it implies a projection toward the future and a concern about one's own quality of life. Stanton et al. (2007) identified the safeguard of life goals and the perception of personal growth as crucial indicators of adjustment to chronic conditions. In particular, the ability to manage such a complex situation may be influenced by personality traits, including Self-Directedness, Reward Dependence and Harm Avoidance (Bonacchi et al., 2012; Honorato et al., 2017).

In addition, defense mechanisms might play a role with respect to the adaptation to physical illness (Di Mattei et al., 2015). As cancer generates strong emotions, the mobilization of defenses is one of the main tools that is available to the patient to contain unpleasant feelings and to accept the current situation, excluding intolerable and painful experiences from awareness. The use of a wide range of flexible defenses contributes to protect the patient from fear and discomfort caused by the medical diagnosis, even increasing the chances of survival over time (Beresford et al., 2006). Moreover, defense style has been found to influence quality of life in oncological patients (Paika et al., 2010; Hyphantis et al., 2011, 2013).

In spite of the role played by personality features and defensive functioning in the adjustment to a disease, no studies have taken into account these characteristics in women who undergo fertility preservation techniques following cancer diagnosis. Thus, this study aimed to better understand the personality profile and defense style of female patients referred to an Oncofertility Unit after cancer diagnosis and the subsequent proposal of gonadotoxic treatment. In particular, we assessed temperament and character according to Cloninger's biosocial theory of personality (Cloninger, 1999). In line with previous studies (Bonacchi et al., 2012; Honorato et al., 2017), we expected to find high levels of Self-Directedness (i.e., responsibility, hope, self-acceptance, self-actualization, and resourcefulness) and Reward Dependence (i.e., sensitivity, dedication, sociability, and ability to express affection and communicate), and low levels of Harm Avoidance (i.e., the ability to relax, courage, calm, optimism, even in situations that usually worry other people) (Cloninger, 1999). We hypothesized that these features could facilitate the planning of fertility preservation, despite the significant challenges associated with cancer. As mood and anxiety can interfere the assessment of temperament and character, particularly Harm Avoidance levels (Sato et al., 2001; Jiang et al., 2003), we controlled for these variables, assessing symptoms associated with depression and state and trait anxiety. In addition, we assessed defense mechanisms; in light of the studies showing that a mature defense style promotes a better adjustment to disease (Di Giuseppe et al., 2018), we expected to find a greater use of mature mechanisms in our sample of patients (i.e., defenses that attenuate distressing reality, without distorting it – Prunas et al., 2014).

MATERIALS AND METHODS

Participants

Female cancer patients referred to the Oncofertility Unit of the San Raffaele Hospital in Milan after the proposal of gonadotoxic treatment between January 2014 and May 2016 were recruited to participate in the study. The Oncofertility Unit of the San Raffaele Hospital is an Italian reference center for fertility preservation in oncology; therefore, patients are referred here both within the hospital and from other hospitals in Italy. For this reason, they are usually already motivated to undergo fertility preservation. Additional eligibility criteria were the following: being at least 18 years old; speaking and understanding Italian; agreeing to voluntarily participate in the study through written informed consent. Patients were informed about the objectives of the study by a psychologist during the counseling session prior to the medical appointment, where a gynecologic oncologist and a reproductive gynecologist evaluated the patient in order to decide whether or not to refer her to pursue fertility preservation options (i.e., oocyte cryopreservation, ovarian tissue cryopreservation). Participants were asked to return questionnaires before the end of the fertility preservation process, which usually lasts 2 weeks.

Of the sixty-seven patients referred to the Oncofertility Unit, 15 women refused to participate or returned uncomplete

questionnaires, giving a response rate of 77.61%. The final sample consisted of 52 patients.

The study was carried out following the guidelines of the Hospital Ethics Committee, which approved the protocol N. 149/INT/2019, in accordance with the Declaration of Helsinki.

Measures

Patients were asked to complete a battery of self-administered tests which included:

(1) A self-report questionnaire purposely created for collecting socio-demographic (age, marital status, parity, educational level, occupation) and clinical (diagnosis, type of treatment–i.e., surgery-, previous miscarriages) characteristics.

(2) The Temperament and Character Inventory-Revised (TCI-R) (Cloninger, 1999) is based on Cloninger's model of personality, which identifies four dimensions of temperament (Novelty Seeking: NS; Harm Avoidance: HA; Reward Dependence: RD; and Persistence: PS) and three dimensions of character (Self-Directedness: SD; Cooperativeness: CO; and Self-Transcendence: ST). High scores of HA denote the tendency of the person to behavioral avoidance in the face of potentially dangerous stimuli and to show negative effects; NS refers to exploratory behaviors and activation in response to novel stimuli; RD refers to social and affective abilities; P characterizes industrious, hard-working and stable individuals; SD expresses the competence of the individual toward autonomy, reliability and maturity; C relates to social skills, such as support, collaboration, partnership; ST denotes the aptitude toward mysticism, religion and idealism. It is composed of 240 items on a five-point Likert scale (1 = *definitely false* to 5 = *definitely true*). The Italian version of the questionnaire (Fossati et al., 2007), which was used in this study, demonstrated an adequate internal consistency, with Cronbach's alpha values ranging from 0.79 to 0.91 for the main TCI-R dimensions. Test–retest reliability range from 0.76 to 0.88 (Martinotti et al., 2008). Normal scores for the Italian population were converted to *T* scores and grouped into five categories: significantly low (<30); low (30–39); medium (40–60); high (61–70); significantly high (>70). For each dimension, the corresponding cut-offs of the raw scores were also reported by Martinotti et al. (2008).

(3) The Response Evaluation Measure-71 (REM-71) (Steiner et al., 2001) assesses defense mechanisms in adults and adolescents. It is composed of 71 items, with each item scored on a nine-point Likert scale (from *strongly disagree* to *strongly agree*). Factorial analysis allowed for the identification of two factors based on the level of maturity of these defense mechanisms. Factor 1 (F1) expresses the global score regarding the immature defense mechanisms that can distort reality, contributing to less adaptive functioning. This factor is divided into 14 defenses: acting out, splitting, displacement, fantasy, omnipotence, dissociation, projection, repression, undoing, withdrawal, somatization, passive aggression, conversion, sublimation. Factor 2 (F2) represents the global score of mature defense mechanisms, which mitigate unwelcome reality and allow a more adaptive functioning. It consists of seven defenses: altruism, idealization, denial, intellectualization, humor, reaction formation, suppression. The questionnaire has adequate construct validity and internal consistency for all defense mechanisms, whereby all Cronbach's alpha values are over 0.4 (except passive aggression: $\alpha = 0.36$). The overall Cronbach's alpha values for the two factors are 0.84 for F1 and 0.69 for F2 (Steiner et al., 2001). Test–retest reliability ranged from 0.93 for F1 to 0.95 for F2 (Prunas et al., 2019). The Italian version of the questionnaire was used in this study (Prunas et al., 2009). This version has an internal consistency of 0.88 and 0.73 for F1 and F2, respectively (Prunas et al., 2009). Prunas et al. (2014) identified a score of 4.40 as the clinical cut-off only for F1.

(4) The Beck Depression Inventory (BDI-II) (Beck et al., 1996) contains 21 items designed to measure cognitive, affective, and somatic symptoms associated with depression. The BDI-II was designed to correspond closely with Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision (DSM-IV-TR) diagnostic criteria for major depressive disorder. There are four possible choices for each question with answers receiving either 0, 1, 2, or 3 points. Higher scores are indicative of higher self-reported depressive symptomatology. The test–retest reliability is reported to be ≥0.90 (Beck et al., 1996). The BDI-II showed Cronbach's α of 0.93 for non-clinical samples and test–retest reliability of 0.93 at 1 week (Arbisi and Farmer, 2001). Different severity levels have been defined on an empirical basis (Dozois et al., 1998): minimum depression (scores of 0 to 13); mild depression (scores of 14 to 19); moderate depression (scores of 20 to 28); severe depression (scores of 29 to 63). The Italian version of the questionnaire was used in this study (Ghisi et al., 2006). The Italian version of the questionnaire (Ghisi et al., 2006), which was used in this study, demonstrated a good internal consistency, with Cronbach's alpha coefficient of 0.80 (Ghisi et al., 2006).

(5) The State-Trait Anxiety Inventory-Y Form (STAI-Y) (Spielberger et al., 1983) measures severity of anxiety symptoms and differentiate acute (state) from chronic (trait) anxiety. The STAI-Y is composed of 40 questions that are answered using a 4-point Likert-type scale. Scores are grouped into three categories (Elliott, 1993): low anxiety (scores of 20 to 39), medium anxiety (scores of 40 to 59), and high anxiety (scores of 60 to 80). The STAI-State test–retest reliability has been reported as 0.40 and the Trait test–retest reliability has been reported as 0.86 (Rule and Traver, 1983). The Cronbach's α ranged from 0.83 to 0.92 for State scores and 0.86 to 0.92 for Trait scores (Dreger and Katkin, 1985). The Italian version of the questionnaire was used in this study (Pedrabissi and Santinello, 1989). For the Italian version, the internal consistency coefficients for the state anxiety scale range from 0.91 to 0.95 (depending on the sample) and for the trait anxiety scale they range from 0.85 to 0.90 (Pedrabissi and Santinello, 1989).

In order to allow for comparisons with the categories identified in the literature, we grouped subscales scores into three categories: low, medium, and high level. For TCI-R scores, low values correspond to low and significantly low values defined on the raw scores in Martinotti et al. (2008), while high values correspond to high and significantly high values (Martinotti et al., 2008). For the BDI-II, medium values correspond to mild and moderate values defined in Dozois et al. (1998). For REM-71 F1, no medium range is defined in Prunas et al. (2014), therefore we only classified scores into low and high level according to the clinical cut-off. The scores of the STAI-Y are already grouped into low, medium and high anxiety.

Statistical Analysis

Continuous variables have been reported as mean, standard deviation and quartiles, while categorical variables have been described in terms of frequency distribution.

Cronbach's α was computed to assess the internal consistency of each psychometric scale. The values of the psychometric scales were compared with normative data published on the Italian population, by means of the non-parametric Wilcoxon's test. Comparisons of the distribution of the psychometric scales between two groups were performed with Mann-Whitney's test. In both types of analyses, *p*-values were adjusted with Bonferroni's correction to account for multiple testing.

P-values less than 0.05 were considered significant. All statistical analyses were carried out with the Statistical Package for Social Science version 21.0 (SPSS Inc., Chicago, IL, United States) and R 3.5.0[1].

RESULTS

Detailed descriptive statistics are reported in **Table 1**. The analyzed sample is composed of 52 women (mean age 30.29 ± 5.58 years, range 19–39 years), suffering from various oncological malignancies (i.e., 40.38% have hematological cancer, 32.69% have breast cancer, 13.46% have sarcoma, and the remaining 13.47% have other tumors). More than half of the sample (61.54%) had previously undergone surgery. Most of them are in a relationship (76.92%) and do not have children (86.54%). Levels of education include middle school diploma (5.77%), high school diploma (50%), Bachelor's/Master's degree (42.31%), Postgraduate degree (1.92%). Most patients work (82.7%).

The Cronbach's α coefficient showed good reliability for all psychometric scales (**Table 2**). As shown in **Table 2**, means, standard deviations and quartiles were calculated for each of the TCI-R dimensions, for the two factors of the REM-71, for the BDI-II total score, and for the State and Trait anxiety total scores. These values were compared with reference data of the Italian population. Wilcoxon test indicated significantly lower scores for the TCI-R dimension of Harm Avoidance (median = 87.50, reference mean value = 96.40, *adj. p* = 0.029) and the STAI-Trait total score (median = 37.00, reference mean value = 42.06, *adj. p* < 0.001). Significantly higher levels were reported for the REM-71 mature defense mechanisms (median = 5.86, reference mean value = 5.22, *adj. p* < 0.001). Wilcoxon test also indicated higher scores for the TCI-R dimension of Persistence (median = 123.00, reference mean value = 116.30, *p* = 0.005) and Self-Directedness (median = 146.00, reference mean value = 139.10, *p* = 0.005). However, the corresponding *p*-values adjusted with Bonferroni's correction resulted to be slightly higher than the defined significance level (*adj. p* = 0.055, *adj. p* = 0.059, respectively for Persistence and Self-Directedness).

Mann–Whitney's test was used to compare the distribution of the psychometric scales between the two groups defined by age, according to literature indicating 35 years as the cut-off for advanced reproductive age (e.g., Klein and Sauer, 2001; Cobo et al., 2018). Only Factor 1 of the REM-71 was significantly different between the two groups, suggesting that younger women use immature defense mechanisms to a greater extent

TABLE 1 | Descriptive statistics of the socio-demographic and clinical characteristics of the sample (*n* = 52).

	Variable	Mean (SD)	Median [IQR]
	Age, years	**30.29 (5.58)**	**31.00 [26.35–34.75]**
Variable		**Frequency**	**Relative Frequency (%)**
Marital status	Single	12	23.08%
	In a relationship	27	51.92%
	Married	13	25.00%
Presence of children	Yes	7	13.46%
	No	45	86.54%
Educational level	Middle school	3	5.77%
	High school	26	50.00%
	Bachelor's/Master's degree	22	42.31%
	Postgraduate degree	1	1.92%
Occupation	Employee	28	53.85%
	Freelance	15	28.85%
	Housewife	1	1.92%
	Student	8	15.38%
Diagnosis	Hematological cancer	21	40.38%
	Breast cancer	17	32.69%
	Sarcoma	7	13.46%
	Brain cancer	3	5.77%
	Gynecological cancer	2	3.85%
	Melanoma	1	1.92%
	Head and Neck cancer	1	1.92%
Previous surgery	Yes	32	61.54%
	No	20	38.46%
Previous miscarriages	Yes	4 (all voluntary)	7.69%
	No	48	92.31%

[1]http://www.R-project.org/

TABLE 2 | Descriptive statistics of the questionnaires and comparison with normative data.

Variable	Cronbach's α	Mean (SD)	Median [IQR]	Reference mean value	*p*-value	Adj. *p*-value
NS TOT	0.7888	102.85 (12.64)	101.00 [95.00–111.50]	98.50	0.041	0.489
HA TOT	0.8982	88.46 (17.37)	87.50 [76.00–101.25]	96.40	0.002	**0.029**
RD TOT	0.7700	104.85 (10.56)	103.00 [97.00–112.00]	101.40	0.043	0.512
PS TOT	0.9143	123.00 (16.41)	123.00 [111.75–134.50]	116.30	0.005	0.055
SD TOT	0.8721	145.44 (15.82)	146.00 [138.00–158.25]	139.10	0.005	0.059
CO TOT	0.8231	136.48 (12.05)	135.50 [129.25–146.75]	134.90	0.384	1.000
ST TOT	0.8637	67.23 (14.94)	66.50 [55.00–78.75]	69.90	0.289	1.000
REM-71 F1	0.8876	3.76 (0.93)	3.64 [3.23–4.21]	3.66	0.788	1.000
REM-71 F2	0.7445	5.82 (0.84)	5.86 [5.43–6.46]	5.22	<0.001	**<0.001**
BDI-II	0.8297	9.06 (6.07)	8.50 [5.00–12.00]	7.79	0.151	1.000
STAI-State	0.9405	45.02 (11.30)	42.50 [37.00–54.00]	39.62	0.008	0.093
STAI-Trait	0.8406	36.31 (6.71)	37.00 [31.25–39.00]	42.06	<0.001	**<0.001**

NS, Novelty Seeking; HA, Harm Avoidance; RD, Reward Dependence; PS, Persistence; SD, Self-Directedness; CO, Cooperativeness; ST, Self-Transcendence; REM-71, Response Evaluation Measure; F1, Factor 1; F2, Factor 2; BDI-II, Beck Depression Inventory-II; STAI, State-Trait Anxiety Inventory. The bold values indicate significant differences after Bonferroni's correction.

TABLE 3 | Classification of the scores according to the cut-offs identified in the literature.

Variable	Low scores	Medium scores	High scores
NS TOT	2 (3.8%)	43 (82.7%)	7 (13.5%)
HA TOT	12 (23.1%)	34 (65.4%)	6 (11.5%)
RD TOT	1 (2.0%)	45 (86.5%)	6 (11.5%)
PS TOT	2 (3.8%)	37 (71.2%)	13 (25.0%)
SD TOT	2 (3.8%)	41 (78.9%)	9 (17.3%)
CO TOT	2 (3.8%)	46 (88.5%)	4 (7.7%)
ST TOT	8 (15.4%)	34 (65.4%)	10 (19.2%)
REM-71 F1[†]	43 (82.7%)	–	9 (17.3%)
BDI-II	45 (86.5%)	7 (13.5%)	–
STAI-State	18 (34.6%)	27 (51.9%)	7 (13.5%)
STAI-Trait	40 (76.9%)	12 (23.1%)	–

[†]A clinical cut-off for the REM-71 was available only for F1 (see Prunas et al., 2014). NS, Novelty Seeking; HA, Harm Avoidance; RD, Reward Dependence; PS, Persistence; SD, Self-Directedness; CO, Cooperativeness; ST, Self-Transcendence; REM-71, Response Evaluation Measure; F1, Factor 1; BDI-II, Beck Depression Inventory-II; STAI, State-Trait Anxiety Inventory.

(median [IQR] in age ≤35 years = 3.82 [3.41–4.30] vs. 3.18 [2.38–3.54] in age >35 years, $p = 0.003$, *adj.* $p = 0.036$).

Finally, the scores reported by the patients in these scales have been classified in low, medium and high according to cut-offs reported in the validation studies (see **Table 3**). Most patients report low scores on the REM-71 Factor 1 (82.7%), BDI-II total score (86.5%), and STAI-Trait scale (76.9%). Predominantly medium scores have been obtained on the Novelty Seeking total score (82.7%), Harm Avoidance total score (65.4%), Reward Dependence total score (86.5%), Persistence total score (71.2%), Self-Directedness total score (78.9%), Cooperativeness total score (88.5%), Self-Transcendence total score (65.4%), and STAI-State scale (51.9%).

DISCUSSION

As far as we know, no studies have investigated personality characteristics and defensive style of women who are motivated to undergo fertility preservation following cancer diagnosis. The purpose of this study was therefore to analyze the personality profile of female patients referred to the Oncofertility Unit after cancer diagnosis and prior to gonadotoxic treatment.

As hypothesized, our findings suggest that patients who are willing to undergo fertility preservation display characteristics that may favor psychological adjustment to cancer.

Concerning personality features, the lower scores of Harm Avoidance obtained by our sample of patients compared to normative data (Martinotti et al., 2008) may favor a better adjustment to the disease, promoted by optimism, courage and energy in facing new challenges. Moreover, our findings show that our patients tend to display higher levels of Persistence and Self-Directedness. Although these results need to be confirmed in a bigger sample, these scores may imply the tendency to maintain a behavior in spite of intermittent reinforcement, being perseverant in front of frustration and fatigue (Persistence); and personal integrity and efficacy, responsibility, goals for the future, constructiveness and hope (Self-Directedness). This is important in light of the results of other studies showing that low levels of Harm Avoidance (Bonacchi et al., 2012) and high levels of Self-Directedness (Bonacchi et al., 2012; Honorato et al., 2017) are significantly associated with a better quality of life in cancer patients. This may be associated with a greater ability to adjust to the disease. Contrarily to our expectations, our patients did not significantly differ from normative data (Martinotti et al., 2008) in their levels of Reward Dependence, as most of them exhibited medium scores in this subscale.

Moreover, the present findings show that our participants tend to use mature defense mechanisms to a greater extent than the general population (Prunas et al., 2009). In front of a stressful and destabilizing condition such as cancer diagnosis, patients who are willing to undergo fertility preservation may mobilize skills that allow to contain the negative effects of such experience and to manage it in the most functional way, at least in the initial stage of their treatment. Other research has shown that primitive defense mechanisms, such as repression, displacement, projection and regression, predict worse psychological adjustment in oncological patients, in terms of greater distress 1 year after diagnosis (Hyphantis et al., 2011) and long-term vulnerability to the

development of anxiety (Månsson et al., 1998). Emotional suppression, considered as an immature defense mechanism, has been found to predict chemotherapy symptomatic side effects and unpleasant mood states in samples of breast cancer patients (Iwamitsu et al., 2005; Schlatter and Cameron, 2010). Accordingly, a review focusing on oncological patients points out that mature defenses are associated with higher physical and emotional functioning, whereas mental inhibition defenses, in particular repression, foster psychosomatic symptoms, passive decisional preferences and worse physical and emotional health (Di Giuseppe et al., 2018).

Finally, none of our patients displayed severe symptoms of depression or elevated levels of trait anxiety. Notably, a meta-analyisis showed that among oncological patients pooled prevalence of depression and anxiety disorders is, respectively, 16.5 and 9.8% (Mitchell et al., 2011). In addition, lifetime prevalence of depression and anxiety disorders is also higher in Italian community samples, corresponding, respectively, to 10.1 and 11.1% (De Girolamo et al., 2006). Indeed, the decision to compare this sample of patients with normative data derived from the general population, rather than referring to other oncological patients, is attributable to the fact that these patients are mainly in the initial stage of their treatment and cancer has still not imposed many limitations to their daily life (which instead may contribute to a higher prevalence of depression and anxiety observed during treatments). These findings concerning psychopathological symptoms further support the high functioning profile of our patients. However, a few patients (13.5% of the sample) exhibited high scores of state anxiety, probably as an acute reaction to a threatening event.

Cancer exposes young women to a life crisis in two respects: the diagnosis itself and the threat of impaired fertility due to treatment (Tschudin and Bitzer, 2009). In fact, fertility concerns may disrupt future family planning potential, leading to psychological distress (Crawshaw, 2013). However, patients often feel uncomfortable expressing their fertility concerns as they are confronted with an uncertain future (Hershberger et al., 2013a). Moreover, cancer diagnosis requires choosing among intensive treatment options, leaving patients frequently submerged by the complex medical information they have to process in a very short time (Hershberger et al., 2013b). In addition, in order to prevent delays in the beginning of therapy, fertility preservation is proposed to patients shortly after they have received the diagnosis of cancer. Comprehensibly, these women can be emotionally overwhelmed, thus the ability to make long-term plans should not be taken for granted. Scheduling future childbearing may subtend the faculty to prefigure survival and picture oneself as a parent, which can be promoted by adaptive personality traits. Moreover, awareness about the uncertainty of the future may also be considered as an effective competence for future mothers, since they may face more realistically such a big project in their life and in their family life.

Some limitations of the present research must be acknowledged. First, a larger, more representative sample would increase the generalizability of the results. However, not all oncological patients of childbearing age can undergo fertility preservation due to several factors, including limited time available to make decisions about their reproductive health before the start of antineoplastic treatments, and lack of referral from their oncologists. Second, the cross-sectional design of the study did not allow testing the stability of the results nor the determination of the causal relations among variables. Nevertheless, longitudinal data about TCI-R (Martinotti et al., 2008) and REM-71 (Prunas et al., 2019) support a good stability of the scores over time. Third, the lack of a control group prevents drawing conclusions concerning the features of patients who refuse to inquire about fertility preservation. Despite the comparison with normative data clearly shows the adaptive profiles of our sample, we are not able to completely rule out that these features characterize young women facing cancer diagnosis. However, previous works show significant variation in psychological reaction and adjustment to chronic illnesses (Stanton et al., 2007) and, in particular, to cancer (Infurna et al., 2013).

In spite of these limitations, our study is relevant for several reasons. First, participants were recruited face-to-face in a clinical setting, allowing us to sample all the patients that showed up to the Oncofertility Unit. Second, we assessed patients' will to undergo specific preservation techniques without focusing on the outcomes of the procedure itself, which, in some cases, do not correspond to their decision (Melo et al., 2019). In addition, most previous studies used retrospective designs, whereas we recruited patients before the fertility preservation.

Clinical Implications and Conclusion

The current study is the first to investigate the personality profile of oncological patients who are willing to undergo fertility preservation. Our findings suggest that these women display functional personality traits and defense style, in association with low levels of depression and trait anxiety. These features may enable a proactive attitude to cancer and the ability to make long-term plans.

However, it is possible that oncologisists refer to Oncofertility Units only those patients who do not seem too emotionally overwhelmed and thus appear able to bear what fertility preservation procedures entail. An empirical understanding of these features could allow identifying women who may be more at risk of facing higher difficulties in the process of adjustment to their disease. This could help clinicians in choosing to dedicate more time to certain patients to explain the advantages of fertility preservation, fostering targeted interventions.

DATA AVAILABILITY STATEMENT

The datasets presented in this article are not readily available because participants did not provide written informed consent for it. Requests concerning the datasets should be directed to g.perego23@campus.unimib.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by San Raffaele Hospital Ethics Committee (protocol N. 149/INT/2019). The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

VEDM, LC, GP, PT, and GM contributed to conception and design of the study. PT and PMVR organized the database and wrote sections of the manuscript. PMVR performed the statistical analysis. GP wrote the first draft of the manuscript. VEDM, GM, VS, AB, and MC commented on previous versions of the manuscript. All authors contributed to manuscript revision, read, and approved the submitted version.

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Re-examining the Role of Coping Strategies in the Associations Between Infertility-Related Stress Dimensions and State-Anxiety: Implications for Clinical Interventions With Infertile Couples

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Research has shown a direct relationship between infertility-related stress and anxiety in infertile patients. The present study goes into this relationship in depth, testing the moderating role of coping strategies (Seeking Social Support, Avoidant, Positive Attitude, Problem-Solving, Turning to Religion) in the associations between specific infertility-related stress dimensions (Social Concern, Need for Parenthood, Rejection of Childfree Lifestyle, Couple's Relationship Concern) and State-Anxiety among male and female partners of infertile couples. Gender differences were also explored. Both members of 254 infertile couples completed a questionnaire consisting of Socio-demographics, Fertility Problem Inventory–Short Form (FPI-SF), Coping Orientation to Problem Experienced–New Italian Version (COPE-NIV), and State-Trait Anxiety Inventory-Y (STAI-Y). The results revealed that Social Concern and Couple's Relationship Concern, in both partners, and Need for Parenthood, in female partners, had positive correlations with State-Anxiety. Seeking Social Support and Avoidant coping were related to increasing levels of State-Anxiety in both partners, whereas Positive Attitude coping strategies were related to lower levels of State-Anxiety in female partners. Problem-Solving and Avoidant coping played moderating roles between specific infertility-related stress dimensions and State-Anxiety in unexpected directions. Problem-Solving exacerbated the negative effects of Social Concern, whereas Avoidant coping buffered the negative effects of several infertility-related stress dimensions in both partners. Interventions to improve stress management and psychological health in infertile couples should consider that the adequacy of coping strategies is inherently situation specific. It therefore follows that patient-centered clinical interventions should consider the potential inadequacy of promoting Problem-Solving strategies, and that even Avoidance can be an efficient strategy for dealing with specific infertility-related stress dimensions.

Keywords: coping strategies, gender, infertility-related stress, moderating role, state-anxiety

INTRODUCTION

Infertility condition was recognized among the greater stressors that may occur in life (Maroufizadeh et al., 2019). It, indeed, may expose infertile individuals and couples to an unexpected life crisis, characterized by loss of self-esteem, perception of disruption in the developmental trajectory of adulthood, inability to plan future, changes in identity and worldviews, and in personal, dyadic, and social relationships (Wischmann and Kentenich, 2017; Rooney and Domar, 2018; Shreffler et al., 2020; Sormunen et al., 2020).

In line with this, a large body of research demonstrated that high levels of stress and anxiety symptoms are frequently occurring psychological disorders among infertile patients (Mori et al., 1997; Chen et al., 2004; Verhaak et al., 2005; Dancet et al., 2010; Turner et al., 2013; De Berardis et al., 2014; Pawar et al., 2019; Kiani et al., 2020; Yazdi et al., 2020). Although anxiety is a normal adaptive response of individuals in stressful situations (Semple and Smyth, 2019), research performed in international context underlined that the prevalence of anxiety in members of infertile couples is significantly higher than in fertile controls and in the general population (Anderson et al., 2003; Matthiesen et al., 2011; Fallahzadeh et al., 2019; Kiani et al., 2020). Therefore, because both the prevalence and incidence of stress and anxiety symptoms stemming from infertility condition are worthy of note, research efforts were made to develop studies targeting a greater understanding of infertility-related stress process.

In this direction, in the last decades, two main traditions of research were developed. In particular, one branch of research explored the impact of Assisted Reproductive Technology (ART) treatments on quality of life and psychological health reported by infertile couples with the aim of improving service delivery and supporting infertile couples in dealing with medical treatments (Verhaak et al., 2005; Boivin et al., 2012; Gameiro et al., 2015; Agostini et al., 2017). Indeed, beyond the significant physical burden, ART treatment-related experiences may elicit adverse emotional outcomes linked to the uncertainty of the pregnancy achievement as well as feeling of hopelessness after treatment failures (Verhaak et al., 2005). Moreover, several studies also highlighted that intense and protracted experiences of stress and psychological disease may also have a significant impact on ART treatment success, including follow-ups (Smeenk et al., 2001; Gürhan et al., 2009; Turner et al., 2013; Vellani et al., 2013; Purewal et al., 2018), potentially resulting in a vicious circle.

The other branch of research recognized infertility experience in itself as a potential hindrance to psychological health of infertile patients at individual and couple levels (Newton et al., 1999). From this perspective, indeed, given the distinct feature of infertility experience, research has identified specific infertility-related stress dimensions characterizing infertility condition, namely, perceived social concerns (i.e., feelings of isolation; perceived alienation; discomfort and stress in spending time with family and/or peers; sensitivity to comments and reminders of infertility), concerns related to need for parenthood (i.e., parenthood as essential step to achieve own identity, and as fundamental life goal), concerns related to rejection of a future without a child (i.e., negative view of a childfree lifestyle; satisfaction and/or happiness as dependent on achieving parenthood), and, finally, concerns about the impact of infertility on the couple relationship (i.e., difficulty in talking about infertility with the partner; reduced intimacy and sexual enjoyment; diminished self-esteem) (Newton et al., 1999; Zurlo et al., 2017). These specific infertility-related stress dimensions were widely demonstrated to be significant predictors of infertile patients' psychological disease (Lakatos et al., 2017; Pozza et al., 2019). This fostered the development of further research aiming at identifying protective factors potentially reducing perceived stress and psychological disease among infertile couples (Donkor and Sandall, 2007; Sreshthaputra et al., 2008).

In this research direction, following the transactional approach underpinning stress-coping models on adjustment to chronic stressors (Lazarus and Folkman, 1984), research explored the effects of the interplay between individual characteristics (e.g., personality characteristics and coping strategies) and situational characteristics (e.g., infertility-related stress dimensions and parameters) in influencing infertility-related stress process and psychological health conditions in infertile patients (Van den Broeck et al., 2010; Zurlo et al., 2018, 2020).

In particular, because understanding the role of coping strategies is considered pivotal in explaining individual differences in emotional response to infertility-related stress dimensions as well as to develop preventive tailored interventions (Verhaak et al., 2007), a large body of research investigated their role in influencing infertile patients' perceived stress and psychological well-being; however, this produced contrasting and mixed evidence.

Specifically, several studies supported the protective role of positive attitude/reinterpretation (Berghuis and Stanton, 2002; Benyamini et al., 2008; Gourounti et al., 2012), seeking social support (Schmidt et al., 2005; Rashidi et al., 2011; Faramarzi et al., 2013), and problem-solving coping strategies (Berghuis and Stanton, 2002; Gourounti et al., 2012; Faramarzi et al., 2013), as well as the detrimental effect of escape/avoidance coping (Schmidt et al., 2005; Peterson et al., 2006; Lykeridou et al., 2011; Gourounti et al., 2012; Faramarzi et al., 2013).

Notwithstanding, a growing branch of research underlined the view that avoidant strategies are not limited to denial and disengagement, since including strategies such as positive distraction (Kleiber et al., 2002; Waugh et al., 2020). It was, therefore, emphasized that the recourse to positive distraction (e.g., thinking about and/or engage in other activities) may disclose the possibility to distance oneself from goals being threatened by the stressor, so inducing positive emotions. In line with this, a recent study revealed that active-distractive coping was significantly associated with lower levels of psychological disease in infertile women (Khalid and Dawood, 2020).

In the same direction, some studies also found no evidence supporting neither the expected negative role of avoidant coping nor the protective role of problem-focused strategies among infertile patients (Verhaak et al., 2005), highlighting that planning and seeking social support coping strategies could even be associated with infertile patients' impaired psychological well-being (Benyamini et al., 2008).

Finally, mixed evidence also emerged concerning the adoption by infertile patients of coping strategies centered on religious and spiritual beliefs, which revealed both negative (Berghuis and Stanton, 2002; Oti-Boadi and Asante, 2017) and protective effects (Benyamini et al., 2008; Latifnejad Roudsari et al., 2014; Casu et al., 2018).

Notwithstanding the mixed and contrastive literature, the detrimental impact of infertility-related stress dimensions on anxiety and the meaningful direct contribution of coping strategies in influencing infertility-related stress process are well demonstrated. However, further research is needed to clarify the possible interplay and complex pathways of associations between infertility-related stress dimensions, coping strategies, and perceived levels of psychological disease in terms of anxious symptoms.

In addition, although research increasingly emphasizes that infertility condition may have a significant impact on both partners of infertile couples, some gender differences were also reported (e.g., Berghuis and Stanton, 2002; Ying et al., 2015; Molgora et al., 2019). However, whether the majority of studies underlined that women perceive higher levels of infertility-related stress (Cserepes et al., 2013; Luk and Loke, 2015) and anxiety (El Kissi et al., 2013; Ying et al., 2015; Schaller et al., 2016), mixed evidence on gender differences in coping strategies were found. Indeed, on the one side, some studies highlighted that infertile women were more likely to recur to seeking social support and escape/avoidance when compared with men, whereas men used greater amounts of self-controlling (Mohammadi et al., 2018) and planful problem-solving (Peterson et al., 2006), while, on the one other side, a review conducted by Jordan and Revenson (1999) highlighted that women display higher adoption not only of seeking social support and escape/avoidance but also of plan-oriented problem-solving and positive reappraisal.

Consequently, considering all the research reported previously, there is increasing interest to achieve a greater understanding of infertility-related stress and coping processes, also taking into account potential gender differences.

Therefore, the present study aims to focus on the associations of infertility-related stress dimensions (Social Concern, Need for Parenthood, Rejection of Childfree Lifestyle, Couple's Relationship Concern) with State-Anxiety reported by male and female partners of infertile couples, exploring gender differences and evaluating the potential specific moderating role of adopted Coping strategies (Seeking Social Support, Avoidant, Positive Attitude, Problem Solving, Turning to Religion). Indeed, because of the necessity to actively counteract and prevent the detrimental effects of protracted high levels of stress and anxiety among infertile patients, this approach would allow gaining further evidence-based information to develop tailored patient-centered counseling interventions (Lorah and Wong, 2018; Liw and Han, 2020).

In line with the aim of the present study, the research hypotheses are as follows:

H1. Women perceive higher levels of infertility-related stress and state-anxiety than men. No hypotheses were made about gender differences in coping strategies due to the mixed evidence reported in the literature.

H2. Infertility-related stress dimensions are significantly and positively related to state-anxiety in male and female partners of infertile couples.

H3. Coping strategies are significantly related to state-anxiety in male and female partners of infertile couples. No prediction was made about the direction of the relationships due to the mixed evidence reported in the literature.

H4. Coping strategies moderate the relationships between infertility-related stress dimensions and state-anxiety in male and female partners of infertile couples.

MATERIALS AND METHODS

Participants and Sampling

This cross-sectional multi-center study was conducted between September 2017 and September 2019 in 10 Italian centers of assisted reproduction of Brescia, Naples, and Udine. Participants were 254 couples (254 male, 254 female) undergoing ART treatments. Chairpersons were contacted to consent the authorization for administering a questionnaire in their centers and, after obtaining their adhesion to the project, infertile couples were directly asked to participate in the study before their medical appointment. All infertile patients were fully informed about the purpose of the current study. They were assured about the confidentiality of the data, and they were informed that the data would be used only for the aim of the research and refusal to participate would not influence their current and future treatments in any way. The current study is part of a larger project on factors influencing psychological well-being of infertile couples, and therefore, the study dataset partially overlaps with those used in a previous study (Zurlo et al., 2020). The project was approved by the Ethical Committee of Psychological Research of the University of Naples Federico II (IRB:34/2019). Research was performed in accordance with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Every precaution was taken to protect the privacy of participants and the confidentiality of their personal information, and the questionnaires were completed anonymously. Informed consent was obtained from each patient before participating in the study. In total, 350 couples were asked to individually complete a questionnaire lasting 20–25 min (one session) in a quiet room setting in the medical center, and one of the authors was present to answer any queries raised by participants. If one or both members of infertile couples refused to complete the questionnaire they were not included in the final dataset. Overall, 254 couples (254 male, 254 female) completed the questionnaire (response rate: 72.57%). All the couples included were diagnosed with primary infertility.

Measures

Background Information

The questionnaire included a section dealing with background information, containing questions on socio-demographic

characteristics, i.e., Gender, Age (in years), Educational Level (Upper Secondary School/College), and Employment status (Unemployed/Employed), and on infertility-related parameters, i.e., Duration of infertility (in years), Type of Diagnosis (Female Factor, Male Factor, Combined Factor, and Unexplained Factor), and presence of Previous Treatments (No/Yes).

Infertility-Related Stress Dimensions

Infertility-related stress dimensions were measured by using the Fertility Problem Inventory–Short Form (FPI-SF; Italian version: Zurlo et al., 2017), which consists of 27 items on a six-point Likert scale ranging from one (Strongly disagree) to six (Strongly agree) divided into four subscales: Social Concern (10 items; Cronbach's $\alpha = 0.88$); Need for Parenthood (six items; Cronbach's $\alpha = 0.88$); Couple's Relationship Concern (five items; Cronbach's $\alpha = 0.70$); Rejection of Childfree Lifestyle (six items; Cronbach's $\alpha = 0.77$).

Coping Strategies

Coping strategies were measured by using the Coping Orientation to Problem Experienced–New Italian Version (COPE-NIV; Carver et al., 1989; Italian version: Sica et al., 2008), which consists of 60 items on a five-point Likert scale ranging from one (I usually don't do this at all) to four (I usually do this a lot) divided into five subscales: Seeking Social Support (12 items; Cronbach's $\alpha = 0.88$); Avoidant (16 items; Cronbach's $\alpha = 0.70$); Positive Attitude (12 items; Cronbach's $\alpha = 0.76$); Problem Solving (12 items; Cronbach's $\alpha = 0.83$); Turning to Religion (8 items; Cronbach's $\alpha = 0.85$).

State-Anxiety

Anxiety symptoms were measured by using the State scale from the State-Trait Anxiety Inventory (STAI-Y; Spielberger, 1972; Italian version: Pedrabissi and Santinello, 1989), which consists of 20 items on a four-point Likert scale ranging from one (Not at all) to four (Very much). Total score ranges from 20 to 80 (Cronbach's $\alpha = 0.91$). State-Anxiety scores were also converted into percentages and, according to the Italian validation study (Pedrabissi and Santinello, 1989), a score of 50.93 for female partners and 45.70 for male partners were considered to be the cut-off point to define the clinical cases.

Data Analysis

The SPSS statistical program (version 21) was used to perform descriptive analyses and correlation analysis. First, descriptive statistics were conducted according to gender. Therefore, to address hypothesis 1 on gender differences in study variables (H1), *t*-tests were carried out to compare mean scores of infertility-related stress dimensions, coping strategies, and State-Anxiety according to gender. Second, Pearson's correlations between the study variables were undertaken for the two genders to test, respectively, the hypothesized correlations between infertility-related stress dimensions and State-Anxiety (H2), and between coping strategies and State-Anxiety (H3). Finally, the Structural Equation Modeling (SEM) unconstrained approach put forward by Marsh et al. (2004) was carried out using AMOS (version 26) to test the hypothesized moderating role of coping strategies on the relationships between infertility-related stress dimensions and State-Anxiety in male and female partners of infertile couples, separately (H4).

RESULTS

Characteristics of Participants

Individual characteristics and infertility-related parameters of study participants are illustrated in **Table 1**.

The means and SDs of study variables for the two genders are summarized in **Table 2**. With respect to gender differences (H1), and, in particular, considering perceived levels of infertility-related stress dimensions, data revealed that women reported significantly higher levels of Social Concern ($t = 1.98$; $p = 0.049$), Need for Parenthood ($t = 2.83$, $p = 0.005$), and Couple's Relationship Concern ($t = 3.53$, $p < 0.001$). There was no significant gender difference in perceived levels of Rejection of Childfree Lifestyle ($t = 0.71$, $p = 0.476$). With respect to coping strategies, women and men showed a similar recourse to strategies centered on Avoidance ($t = 0.49$, $p = 0.622$), Positive Attitude ($t = 0.44$, $p = 0.660$), Problem Solving ($t = -0.50$, $p = 0.614$), and Turning to Religion ($t = 1.50$, $p = 0.133$), whereas women reported greater recourse to Seeking Social Support coping ($t = 3.85$, $p < 0.001$).

Considering psychological health conditions, women reported significantly higher levels of State-Anxiety ($t = 2.64$, $p = 0.008$). Moreover, according to the clinical cut-off scores for State-Anxiety (i.e., scores $\geq$ 50.93 for women and $\geq$ 45.70 for

TABLE 1 | Characteristics of study participants (*N* = 254 couples).

Variable	Female	Male	Couple
Socio-demographic characteristics			
Age [M ± SD (range)]	33.71 ± 3.66 (22–42)	35.60 ± 3.79 (24–48)	
Educational level [*N* (%)]			
Upper secondary school	51 (20.1%)	42 (16.5%)	
College	203 (79.9%)	212 (83.5%)	
Employment status [*N* (%)]			
Unemployed	63 (24.8%)	17 (6.7%)	
Employed	191 (75.2%)	237 (93.3%)	
Infertility-related parameters			
Duration of infertility [M ± SD (range)]			3.27 ± 2.64 (1–19)
Type of diagnosis [*N* (%)]			
Male factor			73 (28.7%)
Female factor			81 (31.9%)
Combined factor			61 (24.0%)
Unexplained			39 (15.4%)
Previous treatments [*N* (%)]			
No			107 (42.1%)
Yes			147 (57.9%)

TABLE 2 | Means, SDs, and correlations between study variables for male and female partners of infertile couples.

	1	2	3	4	5	6	7	8	9	10	Mean	SD
1 Social Concern	1	0.09	0.13*	0.43**	−0.11	0.22**	−0.43**	−0.16**	−0.06	0.52**	26.26	12.08
2 Need for Parenthood	0.24**	1	0.29**	0.24**	−0.01	−0.21**	0.06	0.15*	0.29**	0.06	25.82	6.32
3 Rejection of Childfree Lifestyle	0.14*	0.31**	1	0.03	−0.03	−0.19**	−0.08	0.03	0.33**	−0.11	26.63	6.39
4 Couple's Relationship Concern	0.44**	0.32**	0.03	1	0.20**	0.32**	−0.04	0.04	0.07	0.43**	11.40	4.54
5 Seeking Social Support	−0.02	0.01	−0.14*	0.19**	1	0.50**	0.60**	0.32**	0.16*	0.27**	24.27	7.10
6 Avoidant	0.11	−0.20**	−0.17**	0.18**	0.36**	1	0.25**	0.16**	0.00	0.57**	25.12	7.71
7 Positive Attitude	−0.54**	−0.11	−0.13*	−0.10	0.44**	0.28**	1	0.46**	0.17**	−0.08	27.59	6.72
8 Problem Solving	−0.10	0.11	−0.03	0.07	0.36**	0.24**	0.35**	1	0.01	0.07	28.82	6.78
9 Turning to Religion	0.05	0.31**	0.16*	0.20**	0.25**	0.02	0.17**	0.21**	1	−0.01	23.35	4.34
10 State-Anxiety	0.41**	0.16**	−0.06	0.32**	0.20**	0.39**	−0.17**	0.08	0.11	1	41.81	10.36
Mean	28.35	27.37	27.03	12.93	26.72	25.45	27.85	28.53	23.93	44.24		
SD	11.82	5.98	6.53	5.17	7.20	7.58	6.58	6.23	4.45	10.35		

*Male partners' results are reported above the diagonal. Female partners' results are reported below. *$p < 0.05$. **$p < 0.01$.*

men; STAI-Y; Pedrabissi and Santinello, 1989) it emerged that, respectively, 26.8% ($n = 68$) of female and 34.6% ($n = 88$) of male partners scored at clinical threshold for State-Anxiety. Overall, findings confirmed H1.

The Correlation Analysis

Table 2 also displayed the intercorrelations of study variables for the two genders.

Concerning the correlations between Infertility-related stress dimensions and State-Anxiety (H2), Social Concern (men $r = 0.52$, $p < 0.01$; women $r = 0.41$, $p < 0.01$) and Couple's Relationship Concern (men $r = 0.43$, $p < 0.01$; women $r = 0.32$, $p < 0.01$) were significantly and positively correlated with State-Anxiety in both partners, whereas Need for Parenthood was positively correlated with State-Anxiety in female partners only ($r = 0.16$, $p < 0.01$). No evidence supported significant correlations of Rejection of Childfree Lifestyle with State-Anxiety in both partners. Overall, findings partially confirmed H2.

Concerning the correlations between Coping strategies and State-Anxiety (H3), Seeking Social Support (men $r = 0.27$, $p < 0.01$; women $r = 0.20$, $p < 0.01$) and Avoidant coping strategies (men $r = 0.57$, $p < 0.01$; women $r = 0.39$, $p < 0.01$) were significantly and positively correlated to State-Anxiety in both partners, while Positive Attitude negatively correlated to State-Anxiety in female partners only ($r = -0.17$, $p < 0.01$). No evidence supported significant correlations of Problem Solving and Turning to Religion. Overall, findings partially confirmed H3.

Moderating Effects

Infertility-related stress dimensions and coping strategies were entered into moderating models by using SEM. Data highlighted the significant moderating role of Problem Solving and Avoidant coping strategies, partially supporting H4.

In particular, the interaction effect of Problem Solving coping and Social Concern was significant in both male and female partners (path analyses are shown in **Figure 1**). The main effect estimates for Problem Solving coping were, respectively, 0.20, $p < 0.01$ for male and 0.29, $p < 0.001$ for female partners, and the interaction effects were 0.56, $p < 0.001$ for male and 0.54, $p < 0.01$ for female. This suggests that Problem Solving coping significantly increased the negative effects of Social Concern on State-Anxiety in both partners.

Moreover, the interaction effect of Avoidant coping and Social Concern was significant in male partners (path analysis is shown in **Figure 2**). The main effect estimates for Avoidant coping were 0.40, $p < 0.001$ and the interaction effect was -0.75, $p < 0.001$. This suggests that Avoidant coping significantly buffered the negative effects of Social Concern on State-Anxiety in male partners.

Likewise, the interaction effect of Avoidant coping and Need for Parenthood was significant in female partners (path analysis is shown in **Figure 3**). The main effect estimates for Avoidant coping were 0.37, $p < 0.001$ and the interaction effect was -0.58, $p < 0.001$. This suggests that Avoidant coping significantly

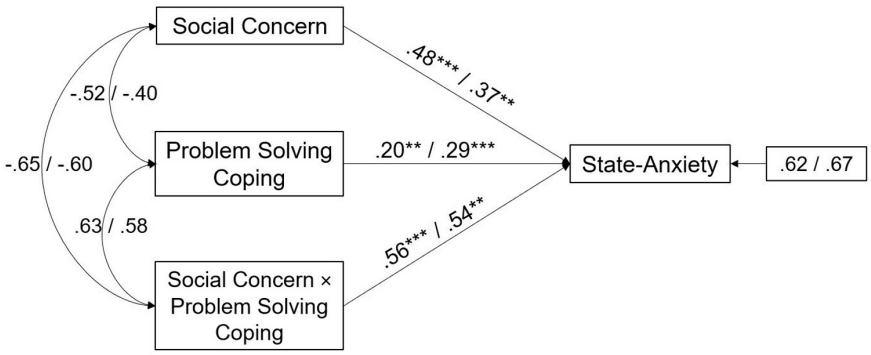

FIGURE 1 | A moderate model of Social Concern and State-Anxiety through Problem Solving coping in male and female partners of infertile couples. Standardized regression coefficients are provided along the paths. The first coefficient in each path refers to men, whereas the second refers to women. $^{**}p < 0.01$, $^{***}p < 0.001$.

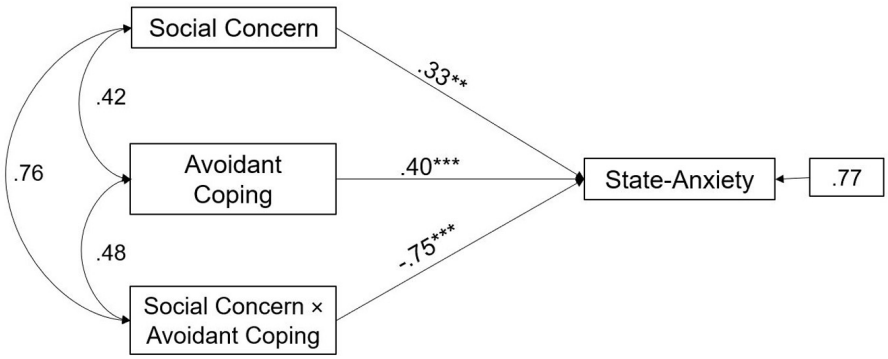

FIGURE 2 | A moderate model of Social Concern and State-Anxiety through Avoidant coping in male partners of infertile couples. Standardized regression coefficients are provided along the paths. $^{**}p < 0.01$, $^{***}p < 0.001$.

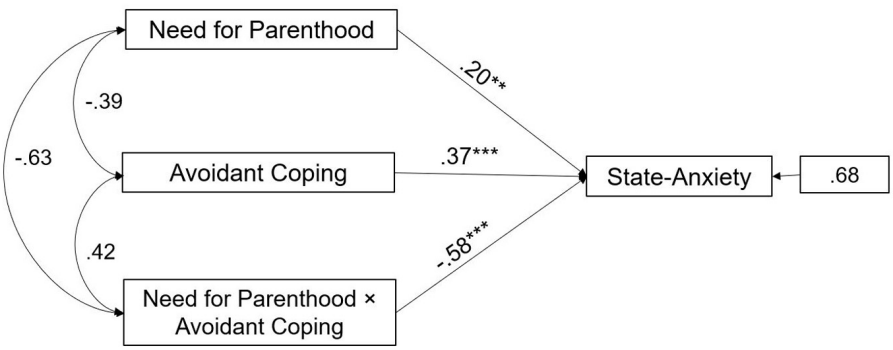

FIGURE 3 | A moderate model of Need for Parenthood and State-Anxiety through Avoidant coping in female partners of infertile couples. Standardized regression coefficients are provided along the paths. $^{**}p < 0.01$, $^{***}p < 0.001$.

buffered the negative effects of Need for Parenthood on State-Anxiety in female partners.

Finally, the interaction effect of Avoidant coping and Couple's Relationship Concern was significant in both male and female partners (path analyses are shown in **Figure 4**). The main effect estimates for Avoidant coping were, respectively, 0.29, $p < 0.001$ for male and 0.36, $p < 0.001$ for female partners and the interaction effects were -0.57, $p < 0.001$ for male and -0.93, $p < 0.05$ for female. This suggests that Avoidant coping significantly buffered the negative effects of Couple's Relationship Concern on State-Anxiety in both partners.

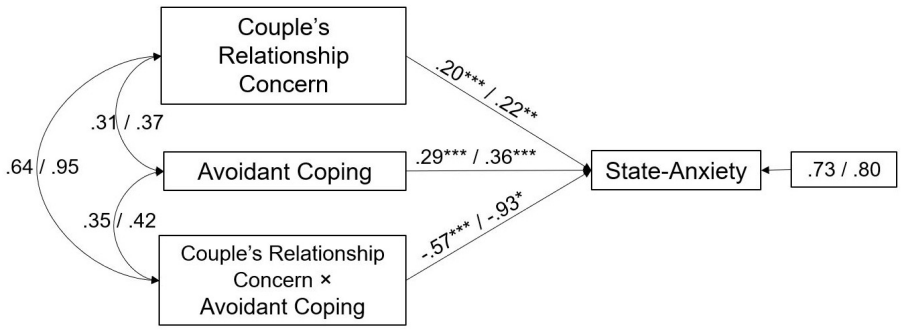

FIGURE 4 | A moderate model of Couples' Relationship Concern and State-Anxiety through Avoidant coping in male and female partners of infertile couples. Standardized regression coefficients are provided along the paths. The first coefficient in each path refers to men, whereas the second refers to women. $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.

DISCUSSION

The study aimed to investigate the associations between infertility-related stress dimensions and State-Anxiety in male and female partners of infertile couples, testing the moderating role of coping strategies. Findings provided original knowledge in the field of infertility-related stress process research, offering practical implications to foster efficacy in counseling interventions.

First, considering gender differences (H1), in line with previous research (Cserepes et al., 2013; Luk and Loke, 2015; Ying et al., 2015), data revealed that women reported significantly higher perceived levels of stress. In particular, women reported significantly higher levels of stress related to Social Concern, Need for Parenthood, and Couple's Relationship Concern. However, no significant gender differences in perceived levels of Rejection of Childfree Lifestyle were found.

With respect to coping strategies, in line with previous studies (Jordan and Revenson, 1999; Peterson et al., 2006; Mohammadi et al., 2018), women reported significantly greater recourse to Seeking Social Support. Nonetheless, no other statistically significant gender differences were supported, and our findings suggested that women and men showed a similar adoption of coping strategies centered on Avoidance, Positive Attitude, Problem Solving, and Turning to Religion.

Considering psychological health conditions, although our findings supported the majority of studies indicating higher perceived levels of anxiety in women in comparison with men (e.g., El Kissi et al., 2013; Schaller et al., 2016), it emerged that 34.6% of men and 26.8% of women met the cut-off for clinical levels of State-Anxiety. Therefore, although it is clear that infertile women could be at higher risk than their partners—because they are proven to be involved to a greater extent both at physical and emotional levels—these remarkable findings highlighted the compelling need to target both male and female partners of infertile couples for the development of timely supportive counseling interventions.

From this perspective, overall, data from the present study confirmed the international research (Anderson et al., 2003; Matthiesen et al., 2011; Kiani et al., 2020) that underlined significantly higher levels of clinical anxiety in infertile patients than the general population (i.e., 5.1% of the Italian general population suffering from clinical Anxiety; de Girolamo et al., 2006). These findings supported the interest to explore, within the present study, the dynamic relationship between perceived infertility-related stress dimensions, adopted coping strategies, and levels of anxiety in male and female partners of infertile couples.

In this direction, in line with previous research (Lakatos et al., 2017; Pozza et al., 2019), the correlation analysis revealed that both social concerns (i.e., perceived discomfort in spending time with family/friends; sensitivity to comments and reminders of infertility; feelings of isolation) and couple's relationship concerns (i.e., difficulty in talking about infertility with the partner; reduced intimacy/enjoyment/self-esteem) were significantly associated to increased levels of anxious symptoms in both male and female partners. Furthermore, perceived need for parenthood (i.e., considering parenthood as a fundamental life goal) was significantly associated to increased levels of anxiety in infertile women. Conversely, our data failed to support significant correlations between the rejection of childfree lifestyle (i.e., negative view of a childfree lifestyle; satisfaction and/or happiness as dependent on achieving parenthood) and anxiety both in female and in male infertile partners. We can hypothesize that this latter result could be connected to the possible effects of changes in Western countries' beliefs concerning the role of parenthood in the definition of individuals' identity, lifestyle, and life satisfaction. Such significant changes could be, therefore, considered as a further potential resource to be accounted for counseling interventions fostering individual and couple adjustment to infertility experience.

Overall, these findings highlighted those specific infertility-related stress dimensions significantly associated with anxiety symptoms in infertile patients, partially confirming H2. In addition, some gender specificities were also suggested.

With respect to the correlations between Coping strategies and State-Anxiety (H3), findings highlighted significant associations of Seeking Social Support, Avoidant, and Positive Attitude coping strategies, partially confirming H3.

In particular, in line with Benyamini et al. (2008), but in contrast with the majority of previous research (Schmidt et al., 2005; Rashidi et al., 2011; Gourounti et al., 2012; Faramarzi et al., 2013), our data revealed that Seeking Social Support was positively related to State-Anxiety in both partners. From this perspective, we could wonder whether these findings could unveil a potential side effect of adopting strategies centered on reliance on others, which could result in a vicious circle exacerbating feeling of apprehension, frustration, nervousness, and anxiety. Moreover, also considering our findings on the higher recourse by women to Seeking Social Support coping strategy, we can affirm that the recourse to this strategy deserves a careful exploration within interventions with infertile women.

Furthermore, in line with research underlining the detrimental effect of escape/avoidance coping on infertile patients' psychological health conditions (Peterson et al., 2006; Lykeridou et al., 2011; Gourounti et al., 2012; Faramarzi et al., 2013), we found that Avoidant coping was positively related to State-Anxiety in both partners.

Conversely, Positive Attitude coping emerged to be negatively related to State-Anxiety in female partners, and, therefore, our findings fully supported those studies underlining the protective role of coping strategies centered on positive reinterpretation (Benyamini et al., 2008; Gourounti et al., 2012). Indeed, it is remarkable that Positive Attitude emerged—despite among women only—as the sole coping strategy directly associated with lower levels of anxiety symptoms. This suggested that a better adjustment to infertility experience could be promoted, within interventions with infertile women, by fostering individual processes of positive re-appraisal and reinterpretation of own condition.

No evidence was found supporting neither positive (Berghuis and Stanton, 2002; Oti-Boadi and Asante, 2017) nor negative (Latifnejad Roudsari et al., 2014; Casu et al., 2018) associations between Turning to Religion and perceived levels of State-Anxiety. Similarly, in accordance with Verhaak et al. (2005), we did not find significant correlations between Problem Solving and perceived levels of State-Anxiety, neither in female nor in male infertile patients.

However, original and unexpected evidence for significant moderating effects of Problem Solving and Avoidant coping strategies were also found (H4).

In particular, moderation analyses showed that Problem Solving not only emerged as linked to increased levels of State-Anxiety (H3) but also played a negative moderating role, exacerbating in both partners the effects of Social Concern. This result supported the idea that the adoption of problem-management strategies could be inefficient and even counter-productive among infertile patients (Benyamini et al., 2008). We hypothesize this result could be interpreted by considering both the actual and perceived absence of control characterizing infertility condition, which may make ineffective all the efforts to re-establish it by actively rationalizing and making plans to handle frustration and reduce infertility-related social concerns.

Contrariwise, though the results from H3 indicate a significant association of Avoidant coping with increased levels of State-Anxiety, the recourse to these strategies revealed a significant moderating role in mitigating the negative effects of specific infertility-related stress dimensions, i.e., social concerns in male partners, need for parenthood in female partners, and couple's relationship concerns in both members of infertile couples.

Therefore, these findings induced to hypothesize that also the recourse, to some extent, to avoidant strategies may potentially reduce perceived levels of anxiety. This by helping infertile couples to decrease the risk that infertility-related social concerns and couple's relationship concerns become the center and need for parenthood becomes the main goal in their lives.

These findings give a further contribution to reinforcing the more recent branch of research, which sought to re-examine the role of avoidant strategies. It was, indeed, considered that one of its specific declinations, i.e., positive distraction, may not only foster a better adjustment but even promote well-being (Kleiber et al., 2002; Waugh et al., 2020). In this direction, the present study adds new acquisitions in the field of infertility research, suggesting that the adoption of avoidant and active-distractive strategies may effectively support both members of infertile couples in handling specific infertility-related stress dimensions.

Overall, findings endorsed the adoption of the transactional perspective to achieve a greater understanding of the role of coping strategies within the infertility-related stress process. Indeed, the study enlightened a specific and complex dynamic between individual characteristics and situational characteristics to be used for the assessment of both partners of infertile couples (Van den Broeck et al., 2010; Zurlo et al., 2020). It therefore follows several implications for clinical practice.

Implications for Clinical Practice

Findings from the present study provided specific information on the pathways of associations between infertility-related stress dimensions, coping strategies, and anxiety in male and female partners of infertile couples, helping to develop patient-centered evidence-based counseling interventions.

First, considering that the relevant clinical levels of anxiety emerged in international research and were confirmed in the present study, our data suggested that structured programs should be developed to assure careful assessment, support, and monitoring of infertile patients' perceived stress and psychological health.

In this direction, findings from the present study provided original evidence endorsing the adoption of a transactional perspective to achieve a greater understanding of the complex dynamics featuring infertility-related stress process and to develop tailored psychological interventions.

From this perspective, practitioners should carefully take into account the possibility that fostering coping strategies such as Seeking Social Support and Problem Solving, traditionally identified as adaptive and efficient to handle chronic stress, could be, instead, counter-productive to deal with infertility experience.

In the same direction, the findings from this study indicated that counseling interventions with infertile couples should consider the possibility to also promote the recourse, to some extent, to Avoidant coping strategies, in terms of positive distraction and seeking out individual and couple activities that may increase positive emotions in everyday life. This, indeed, can

help infertile couples to protect themselves by distancing from infertility experience, which may, in some cases, entirely absorb their life. The recourse to avoidance can be helpful in patient-centered interventions with both partners of infertile couples perceiving intense couples' relationship concerns. Moreover, its recourse can be helpful with male infertile patients suffering from social concerns, as well as with female infertile patients suffering from need for parenthood.

Nonetheless, data also fully supported the necessity to promote, within counseling interventions, the adoption of specific active coping strategies, such as Positive Attitude, considering also the necessity for practitioners to provide a meaningful space in which infertile patients could face, elaborate, signify, and re-elaborate their own experience.

Limitations and Future Research

Despite these findings, some limitations of the study need to be addressed. First, one limitation is the cross-sectional design, and, therefore, no inferences about the temporal associations between predictors and outcomes can be suggested and no cause–effect relationships can be proposed. Despite this design having been considered useful to preliminarily test our hypotheses (Spector, 2019), future research could be developed with a longitudinal design. Second, self-report measures were used in the present study; hence, common method variance could not be ruled. Therefore, although common method variance does not necessarily influence the validity of findings (Fuller et al., 2016), future research could be developed including multi-source data. Third, in line with our objective, this research study re-examined the role of coping strategies in the associations between infertility-related stress dimensions and State-Anxiety on a general sample of male and female partners of infertile couples. Nevertheless, in future studies, it would be advisable to also explore further variables that could play a role in infertility-related stress process, such as socio-demographics (e.g., Age, Educational Level, Employment Status) and infertility-related parameters (Duration of Infertility, Type of Diagnosis, Previous Treatment). In addition, because of the inherently dyadic nature of infertility experience, future research could investigate infertility-related stress process by using a dyadic approach (e.g., by adopting the Actor–Partner Interdependence Model), also including measurement tools specifically designed to explore dyadic dimensions, such as the dyadic coping strategies (e.g., the Dyadic Coping Questionnaire; Bodenmann, 2000; Donato et al., 2009). Finally, although these findings could be of international interest, the study was carried out with a sample of Italian infertile couples. Therefore, future research could be developed with a cross-cultural design to test the generalizability of these results.

Despite the limitations reported previously, the study provided original and gender-specific evidence on the role of coping as moderators in the associations between infertility-related stress dimensions and psychological health. Findings can foster the development of more tailored evidence-based counseling interventions with infertile couples.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Ethical Committee of Psychological Research of the University of Naples Federico II (IRB:34/2019). The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

MCZ contributed to study conception and design, interpretation of data, drafting of article, and critical revision. MFCDV contributed to acquisition of data, analysis and interpretation of data, and drafting of article. FV contributed to analysis and interpretation of data and drafting of article. All authors read and approved the final article.

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Saying "I Don't Know": A Video-Based Study on Physicians' Claims of No-Knowledge in Assisted Reproductive Technology Consultations

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Introduction: The assisted reproductive technology (ART) field deals with consistent and predictable gaps in knowledge. Expressing lack of knowledge with a sentence like "I don't know" can be challenging for doctors. This study examined physicians' negative epistemic disclaimer "non lo so" in Italian ART doctor-couple interactions. In particular, it aimed to reveal specific features of "non lo so": function, topic, temporality, responsibility, and interactional aspects.

Methods: This was a video-based observational study. We used microanalysis of face-to-face dialogue to analyze 20 purposively selected triadic consultations from a corpus of 85. This inductive analysis focused on the function, the content (topic and temporality) and some selected interactional aspects of the "non lo so", quantifying and capturing the interaction between these qualitative features.

Results: We found 82 doctors' "non lo so" in the corpus (mean = 4.4; range = 0–15). We discovered three main functions of this expression: propositional (n = 73/82), relational (n = 6/82), discursive (n = 3/82). The most frequent topics raising doctors' "non lo so" were costs (n = 11/82), treatment-related aspects (n = 10/82), and timing issues (n = 9/82). In more than half of the cases (n = 44/82), present issues emerged. The majority (n = 70/82) of "non lo so" was framed using the "I," with doctors' taking personal responsibility. Patients played a role in these expressions from doctors: Patients initiated more than one third of them, and in one fourth of the cases, patients followed up immediately.

Conclusion: Our findings may be related to characteristics of the specific field of ART. Doctors in this setting must frequently express a direct lack of knowledge to their patients, and when they do, they mean it literally. Patients contribute to such disclosures, and their responses suggest that they find them acceptable, showing that they may expect limitations in their potential to conceive.

Keywords: ART consultation, infertility care, lack of knowledge, uncertainty, video-based study

INTRODUCTION

In recent decades, medicine has been invited to embrace a complex view of reality and to deal more effectively with uncertainties and limited knowledge (Simpkin and Schwartzstein, 2016). Particularly, doctors and patients expect to discuss treatment options and multiple possibilities: increasingly, there is not just one clear treatment road, rather multiple ones among which to choose (Tinetti et al., 2019). Words like *option*, *risk*, or *decision* now constitute core aspects of clinical practice, all conveying intrinsic uncertainty and a lack of a single, clear, unique direction. Uncertainty in the medical consultation goes along with expanded medical and technological possibilities (Henry, 2006). Via the internet, all kinds and qualities of information become available, rendering the opinion of one professional only a single voice in a sea of voices. On one hand, medicine is forced to move from linearity to complexity, from one medical indication to multiple options; on the other hand, individuals have expanded limitations and possibilities, more information, more influence, fewer boundaries, fewer limitations. Embracing complexity and uncertainty requires a huge shift in mentality, both for doctors and for patients (Henry, 2006; Sturmberg, 2019). In contemporary medicine, doctors must embrace uncertainty and knowledge limitations, rather than preserving the traditional norm of these as negative concepts. New models of practice, such as shared decision-making and a patient-centered consultation approach, encourage doctors to make this shift (Charles et al., 1997).

The challenge of embracing knowledge gaps in the clinical consultation is particularly evident in the field of assisted reproduction technology (ART). In medicine, the ART field is unique: As a medical field born in the 1980's, it can be considered relatively young. The timing of its emergence means it is more attuned to the complexity of contemporary reality, a characteristic fitting with the deep knowledge gaps practitioners and patients face. Moreover, the consumerism culture seems to find its best medical expression in this field: individuals purchase an expensive medical service (the possibility of procreation), and clinics compete to supply these medical goods (Takhar and Houston, 2019). Doctor-shopping behaviors are frequent (Klitzman, 2017), as is outsourcing and reproductive tourism (Deech, 2003), due to country-specific regulations regarding permitted treatments. ART is a medical possibility that is rarely fully covered by national health insurance schemes, thus patients often pay considerable amounts of money (Kerr, 2013). In addition, the patient is often a couple, two distinct persons with different histories and desires. Patients want and expect more, have higher socio-economic status, higher levels of health literacy, and a larger ability to obtain information (Goisis et al., 2020). Compared to other populations of patients, those seeking ART have more power and less of a disposition to accept failure, uncertainty, and risk. Such patients may not respond favorably to doctors who express a lack of knowledge; as motivated consumers who want clearer answers, patients can go to another doctor. Doctors lose a client, but patients enter a psychologically exhausting doctor-shopping cycle, searching for the doctor who can provide hope (Klitzman, 2017).

In general, the medical field lacks research on what happens in the consultation room, when doctors actually share and manage knowledge gaps and uncertainty while talking to patients (Politi et al., 2007; Han et al., 2019). Indeed, to the best of our knowledge, there are no findings on the topic in the field of ART.

When the Expert Does Not Know

When doctors say, "I don't know," they express recognition of limited scientific, professional, existential, personal, or practical knowledge. If uncertainty is "the subjective consciousness of ignorance" (Han, 2013), saying "I don't know" represents its most direct and clear communication. In the literature, scholars have studied "I don't know" expressions primarily from a linguistic standpoint, using ordinary conversations. Linguists have moved beyond this specific expression's literal signification (not knowing something), disentangling that function from others, such as indexing disagreement, reluctance to cooperate, or desire to close sequences of talk (Tsui, 1991; Beach and Metzger, 1997; Keevallik, 2006, 2011; Weatherall, 2011; Helmer et al., 2016; Lindström et al., 2016). Indeed, speakers can use "I don't know" even when they actually know, deploying the expression to indicate an epistemic rupture or tension; that is, speakers can use it to hint that they lack certainty about what they have said. This expression has thus been generally conceived as a "negative epistemic disclaimer," akin to "I don't remember" or "I don't understand" (Lindström et al., 2016).

Medical interactions can be conceived as meetings between different epistemologies (i.e., lay and expert knowledge), with asymmetries in knowledge defining power roles in the interaction (Lindström and Karlsson, 2016; Haw et al., 2018). The only study exploring this expression in medical interactions from Sweden, focused on "jag vet inte" expressed by patients, concluding that patients used this expression to claim their epistemic rights and address epistemic tensions and asymmetries in the interaction with their doctors (Lindström and Karlsson, 2016). Thus saying "I don't know" not only expresses a relationship with knowledge (as lacking or as uncertain) but also shifts or breaks the right to that knowledge, redefining access to power (Lindström and Karlsson, 2016).

Such findings suggest that the expression "I don't know" may play an important role in the medical encounter, communicating uncertainty and lack of knowledge and organizing epistemic rights and power. By implication, claims of not knowing and uncertainty could reduce or enhance patients' involvement in the medical encounter and care process. Communicating knowledge gaps and limits can be challenging and against expectations, though more and more necessary as outlined above. It is thus astonishing to observe the lack of studies focusing on doctors' direct claims of no-knowledge. Empirical studies on doctors' expressions of uncertainty have instead included a wide selection of uncertainty expressions (Gordon et al., 2000; Medendorp et al., 2018, 2020). While this strategy gives a broader picture of uncertainty, it makes it difficult to disentangle the functions and effects of the most direct expressions in the clinical interaction. As outlined above, saying "I don't know" does not necessarily mean the speaker lacks knowledge. There is little empirically available evidence regarding how often doctors say "I don't know" to

their patients and what these disclaimers refer to. It is also unclear whether doctors express these disclaimers spontaneously, what role patients play eliciting them, and the immediate effects in the interaction. The peculiarities of the ART field make such expressions particularly salient. Especially in this setting, knowledge gaps may not be the direct responsibility of the doctor but rather a matter of what medical knowledge is available in general or in a given clinic. Thus, there may different degrees of expressed responsibility for the lack of knowledge.

With this study, we examined the physicians' negative epistemic disclaimer "non lo so" ("I don't know" in Italian) in ART doctor-couple interactions. We aimed to reveal specific features of "non lo so" (function, topic, temporality, responsibility, interactional aspects) and to answer the following research questions:

i What is the immediate communicative function of the "non lo so"?
ii To what does the "non lo so" refer (in terms of topic and temporality)?
iii What is the interactional surrounding of the different types of "non lo so" and how much does the doctor take responsibility for it, from a literal linguistic perspective?

MATERIALS AND METHODS

Dataset and Sample

The data consist of a subsample of 20 medical interactions with a total length of 15 h from a corpus of 85 collected in eight private and public ART clinics in Italy between 2013 and 2015 (see Leone et al., 2018 for further information regarding the larger research project). The corpus was video recorded and collected with the informed consent of all participants, who gave their consent to use their video for other communication studies. The research project was approved by the Ethical Review Board of the University of Milan and by the Ethical Review Boards of the eight participating ART clinics. Briefly, we selected the subsample analyzed here purposively: First, assuming that the number of people involved can change the doctor's disposition to express no-knowledge, we aimed to maintain the relational context constant, selecting only triadic visits. Second, we did not know the effect familiarity with the patients would have on whether doctors would express lack of knowledge; thus, we selected an initial and a follow up from the same doctors (although not necessarily the same patients). Applying these criteria to the 25 physicians (females n = 15, 64%; mean years of experience = 17.8), ten (females n = 7, 70%; mean years of experience = 16.6) were found to have both a first and a follow-up triadic visit. The subsample of data was verbatim transcribed from videos, using selected Jefferson notations (i.e., pauses, overlaps, cut-offs, continued turn, prolonged vowel/consonant, unclear word, notes and descriptions) (Jefferson, 2004). The extracts reported have a literal word-by-word English translation, an idiomatic translation is supplied in case the word-by-word translation obscures the meaning of the Italian.

Method of Analysis

We used microanalysis of face-to-face dialogue (Bavelas et al., 2016) to analyze the video recordings. While this methodological approach emerged from experimental social psychology (Bavelas et al., 1986), it has theoretical roots in social constructionism (Berger and Luckmann, 1966), symbolic interactionism (Blumer, 1969; Caglar and Fuson, 2015), and pragmatics, in the sense that it is concerned with how interlocutors' make meaning from each other during ordinary language use (Levinson, 1983). Most broadly, the analysts' interpretation of behaviors in interaction is guided by both the collaborative model of communication (Clark, 1996) and the integrated message model (Bavelas and Chovil, 2000).

Microanalysis of face-to-face dialogue is suited to investigating the processes and content of communication. The goal of a comprehensive, inductive microanalysis is to find all manifestations of the phenomenon of interest and to characterize them along relevant dimensions. The microanalytic lens focuses analysts on what they can observe directly from the video (i.e., interlocutors' words, how they say them, and what they do with their body at the same time). In this way, analysts concern themselves with the observable *what, when,* and *how* of the behaviors of interest rather than the underlying *why's*. Thus, for this study, the focus was stringently on when and how physician's uttered "non lo so", rather than on their actual state of knowledge, much less their motivations or intentions. The microanalytic lens further assumes that behaviors are polysemous, with meanings that can only be gleaned from context. In this case, even though the form of "non lo so" was more or less fixed (see details below), inferring what physicians conveyed when uttering those words depended on attending to their immediate interactive context, including the topic under discussion and what happened immediately previously and after.

The process of microanalysis begins by using the phenomenon of interest as a concrete *entry point* into the videotaped interaction (i.e., doctor utterances of "non lo so"). Through a process of collecting and constructing a definition of the salient features of that phenomenon, analysts eventually collect all instances. Then, through careful comparison of the instances and their immediate sequential context, the analyst can decide how best to characterize them, highlighting differences that could be most relevant for the overall purpose of analysis (in this case, to inform clinical practice). While an *a priori* categorization can be set (e.g., the topic to which the "non lo so" refers, which was informed by the taxonomy of Han et al., 2011, see details below), some emerge as important only during the analytical process. For example, here the *function* became relevant when the main analyst realized that not all "non lo so"s seemed to function to convey a lack of epistemic knowledge. Nevertheless, in the description of analysis and results, we do not distinguish between features and categories that were planned and those that emerged during analysis.

Data Analysis

Transcripts of videos along with videos were scrutinized by one researcher (JM) for extracts where the doctor expressed a "non

lo so"/"non lo sappiamo"/"non si sa" ("I don't know", "we don't know," "it is not known"). Inclusion of slightly different versions of the formulations or of doubtful cases was discussed with a small group of five researchers with experience in video-analysis of medical consultations. In general, expressions changing the meaning of the claim were excluded (e.g., "we cannot know," "how can I know?," "it is impossible to know this in advance"), while expressions with words in a different order or reduced variants were included (e.g., "non so," meaning the first person "I do not know" without the object it/"lo" which is usually needed in Italian). Such variants were so close to the original formulations that their inclusion was straightforward, considering that in Italian, the subject of a sentence is expressed both in the subject pronoun and/or, most often, in the verb conjugation. When the final set of extracts was defined, the same researcher analyzed the linguistic features and contents of the included expressions. Another researcher (LB) analyzed a random sample of 20% of the included "non lo so" independently, and disagreements were solved by discussing them and were used to refine the analysis.

To contextualize the features of "non lo so," we present an example of a doctor who is expressing his lack of further treatment options to a couple while they report a possibility of treatment in another clinic.

106	Doctor (D)	[ma con il collega che cosa] ha consigliato di [stimolazione] *But the colleague what did he suggest as stimulation*
107	Female patient (FP)	[aveva proposto] un altro protocollo *He suggested another protocol*
108	D	eh (.) ok *eh ok*
109	FP	eh [noi ve lo facciamo vedere se possiamo perché tanto noi] *eh we can show it to you if we can because in any case we*
110	Male patient (MP)	[(no ce l'ho io, no ce l'ho io)] *no I have it, no I have it*
111	D	oh a me è tutto arricchimento eh. **Io non so, non so** più [che fare] (ride) *oh for me it is all enriching eh.* ***I don't know, I don't know*** *what to do anymore (laughs)*
112	MP	[ce l'ho io] *I have it*
113	FP	grazie (sorridendo) [consolante] *thank you (smiling) [comforting]*
114	D	[nel senso] cioè quello che noi si pensava che potessero essere le cose che funzionavano di più le abbiamo provate quindi- *I mean we tried what we thought it would have worked most so*

The extract foreshadows and illustrates four key features of "non lo so" analyzed in this study: it touches on aspects of *content* (what is not known), *temporality* (whether the "I don't know refers to the past, present, or future), *responsibility,* and *function* (what it is doing in the interaction at that moment). The patients play a role, sometimes initiating and always responding; analysis took into account these *interactional* features as well.

The *topical content* of each instance of "non lo so" were analyzed by combining a deductive and an inductive approach. Contents related to the "non lo so" were extracted inductively (from the object complement, if present, or from the related question or close topic) and organized in bottom-up categories, which were at the end grouped in macro-categories based on a taxonomy of substantive issues of medical uncertainty (Han et al., 2011). According to this taxonomy, three substantive categories feature medical uncertainty: (i) scientific, (ii) practical, (iii) personal (Han et al., 2011). While some relational contents of the "non lo so" also emerged from the data (e.g., a doctor responding "non lo so" to a patient question about why she refer to the female patient with the informal pronoun "you" and to the male patient with the formal third person), these were ultimately collapsed into the personal category. In line 111 of the example above, the doctor expresses lack of knowledge about *scientific/medical content*, specifically available treatment options.

The *temporality* (past, present, future) of the "non lo so" was extracted based on the grammatical indicators used in the sentence (e.g., verb, temporal adverbs). In the example, the doctor referred to present matters (e.g., options, treatments, possibilities), saying he does not know what to do anymore.

The *function* of the "non lo so" was positioned at an illocutionary level and anchored on selected linguistic descriptors of the "non lo so": (1) with vs. without object complement; (2) the sequential position, (3) in responsive vs. first position turns. The linguistic descriptors were complemented by the analyst's understanding of the interaction dynamics as preceding and following turns were considered. While initially the categories of functions drew from previous studies of this expression in other fields (Tsui, 1991; Beach and Metzger, 1997; Keevallik, 2006, 2011; Weatherall, 2011; Helmer et al., 2016; Lindström et al., 2016), in keeping with the inductive nature of the analysis, new categories emerged from the data. The doctor in the above example uses the expression literally, at the propositional level to claim a lack of knowledge. Patients may reveal access to more knowledge than doctors have, as they often are in contact with multiple ART clinics.

In this setting, knowledge gaps may easily not be the direct *responsibility* of the doctor but rather a matter of what medical knowledge is available in general or in a given clinic. Here, the doctor uses the "I" construction, expressing his own responsibility for the lack of knowledge.

Finally, key linguistic and *interactional* aspects were also selected to describe the interactional surrounding of the "non lo so." Analysis focused on the pragmatic nature of the turn, identifying whether the doctor's expression was in response to a query or statement from the patient and which participant raised the topic. Capturing the sequential context required including more than the immediate utterances before and after the "non lo so," as sometimes doctors' multiple turns when responding to a patient's question combined with patients' encouragement to continue constituted responsive turns. Another interactional aspect was the degree of responsibility the doctor claimed, when expressing lack of knowledge to the patient. Here, analysis focused on the pronoun the doctor used, which was either I (an explicit, personal disclaim) or we/impersonal pronoun (a less explicit, more impersonal disclaim). Finally, if and how the patient followed up after the

doctor said "non lo so" provided an indication of acceptability (e.g., the patient might follow the immediate topic of the "non lo so"). By examining these interactional surroundings, analysis can reveal the immediate result when doctors reveal epistemic holes directly. In this excerpt, the male patient responds (in line 112) without surprise and with a smile, repeating "I have it", referring to the suggested protocol. The patients here do not comment specifically on the doctor's lack of knowledge.

Table 1 summarizes the dimensions of "non lo so", along with a brief definition and an extract.

These aspects were analyzed in Excel and reported by using descriptive statistics (frequency; average; percentage). We selected one extract from one consultation, that we reported in detail, to highlight key aspects emerged from the descriptive analysis.

RESULTS

Overall, 82 doctors' "non lo so" were found in the 20 analyzed consultations. There was a median of 2.5 no-knowledge claims per visit (range = 0–15). The majority of the no-knowledge claims was in the first visits (n = 50; 61%, with a median of 3, range 2–15), while follow up consultations contained 32 "non lo so" (32%; median = 2, range 0–12). Regarding physicians' characteristics, the seven female physicians expressed a median of 4 "non lo so" per visit (range 2–15), while the three male physicians expressed

TABLE 1 | Key features of "non lo so" considered in the analysis, with definition and decontextualized examples.

Key feature	Brief definition	Example
Topic	***The topic about which the doctor is stating a lack of knowledge***	
Scientific/Medical	causal explanations, treatment recommendations, prognosis, examinations, and other health issues	(1) This is a procedure that we usually follow when the sperm liquid is not good, so **we don't know** why an embryo did not develop from the 10 oocytes that were fecundated (. . .)
Practical	expected quality of care, the structures of care, and the procedures required to access care	(2) But we don't work in that way, I mean, we treat all the patients in the same way, **I also didn't know** you were covered by the national health insurance system (. . .)
Personal/relational	From patients' point of view: the effects of illness or treatment on their personal experiences and goals in life From doctor's point of view: personal disclosures of limited possibilities of knowledge and action From doctor's and patients' point of view: disclosures of limited knowledge about aspects concerning their actual relationship	(3) if to wait or to decide to go abroad: **I do not know** what to suggest to you, surely if you have in mind to go abroad because it's quicker. . .
Temporality	***The time to which the doctor is referring***	
Past	Something that preceded the consultation	See (2) above
Present	Something that is occurring during the consultation (e.g., . . .)	See (1)(3)
Future	Something that can happen in the future	(4) **I don't know** who will meet you the next time (. . .)
Function	***What the "non lo so" is doing in the interaction at that moment***	
Propositional	Conveying negative epistemic stance (lack of knowledge, aleatory uncertainty, obtaining information from the patient)	See (1)(2)(4)
Discursive	Managing the conversation (marking turn or topic exchange, maintaining the turn, hesitation)	(5) D I give you back the papers, because you understand coming here for a stimulation is one thing FP mh D coming for doing everything MP (unint) FP (unint) D **I don't know** (.) I will get the information, think about this FP (unint) MP yes (.) (unint)
Relational	Managing preferences about roles and positions in the relationship (including the preference of not having a position regarding a certain instance)	See (3)
Responsibility	***How the "non lo so" statement places responsibility for the lack of knowledge***	
Personal	The doctor uses "I"	See (2)(3)(5)
Generic	The doctor uses "we" or the impersonal pronoun	See (1)(6)
Interactional aspects	***What precedes and follows the "non lo so"***	
Who raises topic	Patient initiates the topic (i.e., the "non lo so" is in the responsive turn) vs. the doctor raises	(6) FP I produce 4 oocytes D but **we don't know** how many do you produce when you are under stimulation (. . .)
Patient follow up	Patient continues/expands/follows up the topic of the "non lo so" in the next turn vs. not	Next turn of (3) FP I don't know what to do either, I have a refusal inside me

a median of 1.5 "non lo so" per visit (range 0–3). When dividing for their years of professional experience, the five physicians with less than 15 years of experience expressed the same median of 2.5 "non lo so" per visit (range 1–15) as those with more than 15 years of experience (range 0–12).

The Doctors' "Non lo so" Functions: Propositional, Discursive, Relational

The 82 doctors' claims of no-knowledge covered three main mutually exclusive functions: propositional, discursive, relational. As will be shown in the following, not all claims had a prototypical function of truly conveying negative epistemic stances like lack of knowledge ("propositional"), but some served discursive functions, managing turns ("discursive"), while others served a relational function, managing roles and positions in the interaction rather than expressing epistemic stances.

The majority of the "non lo so" expressions (n = 73/82) had a true propositional function. These were distributed in the following ways. First, doctors primarily used propositional "non lo so"s to convey an outright lack of knowledge (n = 49/73), for example, when they were unable to answer patients' requests for information (either directly or in anticipation of informational needs) or when they communicated areas of ignorance to justify past, present or future actions. Second, doctors used them to express uncertainty about information-containing utterances, terminology, or on-going behaviors (n = 17/73). Finally, doctors used them to obtain information from patients (n = 7; 10%), expressing a lack of knowledge about something the patient might know and be able to contribute to the discussion.

A few "non lo so" expressions (n = 6/82) had a relational function, meaning that they were used by doctors to manage preferences about roles or positions in the interaction, including the preference of not having a position (directly asked or expected to be asked).

A minority of the "non lo so" (n = 3/82) functioned as discursive markers. In one case, the doctor used the expression to close the patient's turn, and twice, a doctor used it to hesitate, allowing the doctor to time to reflect and plan.

The Doctors' "Non lo so" Contents: Scientific/Medical, Practical, Personal-Relational Topics and Temporality

Doctors primarily referred to practical topics when saying, "non lo so" (n = 40/82), followed by scientific/medical (n = 29/82), and personal-relational topics (n = 13/82). In particular, the specific categories of topics most frequently raising the "non lo so" were costs (n = 11/82), treatment-related aspects (n = 10/82), and timing issues (n = 9/82). **Table 2** provides a description of the type and frequency of doctors' "non lo so" topics and specific categories.

Regarding the temporality of the doctors' "non lo so," most referred to present issues (n = 44/82), followed by past (25/82) and future (13/82). Combining these frequencies with those from the topic analysis revealed that the majority of the "non lo so" about scientific/medical topics referred to past issues (n = 14/29), while for the other two topics the temporal reference was mostly to the present (n = 23/40 for the practical and n = 10/13 for the personal-relational topics). **Table 3** presents the frequencies of the "non lo so" temporality by the three topics.

TABLE 2 | Type and frequency of doctors' "non lo so" (n = 82).

Main topics and categories	n
Practical topics	***40***
costs	11
timing	9
coordination	8
bureaucracy	7
computer	3
location	1
patient attrition/flow	1
Scientific/Medical topics	***29***
treatment	10
causes	7
examinations	5
prognosis	5
other health issues	2
Personal-relational topics	***13***
patient choice	4
relational aspects	3
living place	2
self-disclosure	2
patient experience	1
doctor choice	1

Functions of the "Non lo so" for the Different Topics

When connecting the main functions with the topics of the "non lo so," we observed that doctors used all scientific/medical and most of the practical (n = 36/40) topic-related "non lo so" to literally convey a negative epistemic disclaimer, while personal-relational topics had a greater variation in how doctors used them. **Table 4** shows the frequency of uses by the different topics.

The Interactional Surrounding of the Different "Non lo so" Types

Finally, we explored the interactional surrounding of "non lo so"; in particular, whether the doctors were responding to patients when they said it, how the patients followed up, and how much responsibility the doctor took for the lack of knowledge from a linguistic standpoint (as indicated by pronoun use). **Table 5** presents the frequencies for these interactional features.

Overall, the "non lo so" were usually raised by doctors (n = 50/82) rather than being responsive to something initiated by patients (n = 32/82). Almost all of the 32 "non lo so" initiated by the patients had a propositional function (n = 30/32). Patients were more likely to open scientific/medical topics raising doctors' "non lo so" expressions (n = 14/29) than practical topics (n = 15/40) and personal-relational (n = 3/13). This distribution of frequencies was more or less the same when focusing specifically on propositional "non lo so."

TABLE 3 | Frequency of "non lo so" temporality by topics.

	Temporality		
	Past	**Present**	**Future**
Scientific/Medical topics	14	11	4
Practical topics	9	23	8
Personal-relational topics	2	10	1
	25	44	13

TABLE 4 | Frequency of functions by the different "non lo so" topics.

Function	**Topic**			**Total**
	Scientific/Medical (n = 29)	**Practical (n = 40)**	**Personal-relational (n = 13)**	
Propositional	29	36	8	73
Discursive	0	2	1	3
Relational	0	2	4	6

TABLE 5 | Frequency of interactional aspects of the "non lo so" (n = 82).

Interactional aspects		
"Non lo so" raised by the patient (responsive turn) vs. the doctor (first turn)	"I" vs. "we/impersonal" pronoun (personal vs. deferred responsibility)	"Non lo so" followed up by the patient vs. not
32 vs. 50	70 vs. 12	21 vs. 61

In general, patients did not follow up the "non lo so" in the next turn (n = 61/82), and especially not when the "non lo so" was about personal-relational issues (n = 11/13). Patients were slightly more likely to follow up the "non lo so" and explore it in the next turn when the topic of the "non lo so" was about scientific/medical issues (n = 8/29). Overall, "non lo so" expressions explored by the patients in the next turn had in most of the cases (n = 18/21) a propositional function.

Finally, the majority (n = 70/82) of the "non lo so" were framed using the "I" pronoun, thus indicating doctors taking a personal responsibility for the lack of knowledge from a literal linguistic perspective. This was the case of all the "non lo so" about personal-relational topics and of most (n = 36/40) of the practical ones. In some (n = 8/29) of the "non lo so" about scientific/medical topics, the doctor framed the expression deferring responsibility to others using the "we" or impersonal pronoun. All the "non lo so" framed using the "we" or an impersonal pronoun had a propositional function, while all non-propositional functions were framed using the first person pronoun.

Zooming Into One Consultation

In this section, we report in detail an excerpt from one consultation. In it, the doctor expressed "non lo so" several times, and the excerpt focuses on one that illustrates the dialogic context surrounding this particular "non lo so", which has a propositional function.

In this consultation, a couple with a diagnosis of infertility asked the gynecologist's opinion about the possibility of performing a second heterologous fertilization in Italy. While it was the first time that this doctor and these patients met, the couple was not new to the ART field. They previously attempted to conceive with a heterologous fertilization with ovum donation. This attempt was through a different clinic, and the treatment failed. During the consultation with this gynecologist, the couple complained about the lack of information about the treatment failure from the other clinic, and they asked for explanations. Despite not knowing the details of what actually happened at the former clinic, the doctor explained why- in her view- the treatment failed. Extended talk about the medical and practical knowledge limitations about ART unfolded, both about the failed treatment and about the decision to take regarding if, when, and where to undergo a second heterologous fertilization. This extract of a "non lo so" from the end of the visit, seeing the doctor coming back to the desk after having printed some papers, exemplifies how the patients direct the conversation toward making the uncertainty and lack of knowledge more explicit:

Extract 1 (First visit, female doctor, second level treatment; 0:57:36)

518	D	(enters in the camera and sits at the desk) quindi fondamentalmente io vi metto in questa nostra lista (.) così però non (Word) avremo informazioni speriamo a settembre o fine luglio (.) pero quali informazioni purtro:ppo = *so basically I put you in our waiting list (.) so but not (Word) we will have the information hopefully in September or end of July (.) but which information unfo:rtunately =*
519	MP	= non lo sapete *=you don't know*
520	D	**non lo sappiamo** (.) non-possiamo dire con certezza che nel giro di 3 mesi siamo in grado di fare (.) quindi sulla base di questo valutate ***we don't know*** *(.) we cannot say for sure that in three months we are able to do (.) so evaluate based on this*
521	MP	quindi aspettiamo settembre cosa fa cosa = *so we wait September what does what =*
522	FP	= noi ci mettiamo in questa lista d'atte:sa (Word) [se decidiamo] *=we enlist in this wa:iting list (Word) [if we decide]*

In this case, the "non lo so" expresses a real (propositional) lack of knowledge about a practical topic: bureaucracy, and it is related to a future issue as revealed by the time references in lines 518 and 520. It is one of the few practical "non lo so" framed using the "we" (mirroring the patient's formulation with the second-person plural pronoun "you" in line 519), which is elicited (line 519) and also followed up by both patients, who rephrase and ask the doctor to specify the implications of the "we don't know" (line 521 and 522).

Therefore, this extract highlights some of the key points from the previous sections: (1) Patients can be open to explicit expressions of lack of knowledge (in this case, by anticipating them and even completing the doctor's sentence), (2) Doctors can express varying degrees of uncertainty with "non lo so", and patients can guide doctors in specifying the degrees of acceptable uncertainty (see 521–522 and the clarification in 520 following the "we don't know"), (3) In the ART setting, both doctors and patients influence doctors' expressions of not knowing something, doctors can do so spontaneously or responsively,

elicited by patients, and (4) The decision-making process can lean on significant epistemic holes (see 520–522) and does not necessarily depend on notions of certainty expressed during the interaction.

DISCUSSION

This is the first study analyzing doctors' negative epistemic disclaimer "I don't know" in medical consultations. We described distinctive features that accompany the "I don't know" in the ART setting: content (topic, temporality), function, interactional surrounding.

The first finding of this study is that ART doctors frequently say "I don't know" to their patients. We detected 82 doctors' "I don't know" in 20 consultations, that is, a median of approximately three per visit, with one doctor expressing 15 such expressions in the same consultation. This finding was unexpected, given the literature on the issue. Opinion papers on uncertainty in the medical consultation argue that doctors do not disclose lack of knowledge or uncertainty (Henry, 2006; Lian and Robson, 2019). Indeed, the doctors' role is to diagnose, evaluate, or treat a patient's condition; patients typically go to the doctor precisely to seek an expert view on how to get well. As Pilnick and Dingwall (2011: 1374) have argued, "asymmetry lies at the heart of the medical enterprise: it is, in short, founded in what doctors are there for". As mentioned in the introduction, Lindström and Karlsson (2016) conducted the only empirical study specifically focused on this expression in medical consultations during which patients were seeking relief from rheumatism and fibromyalgia. These authors focused on patients' "I don't know", identifying 29 such utterances in 35 consultations. Empirical studies on doctors' expressions of uncertainty (not limited to "I don't know") in the medical consultation report rates slightly lower than our findings. Gordon et al. (2000) found that doctors made 475 direct verbal expressions of uncertainty in 154 primary care visits, with a mean of 2 per visit. A recent study (Medendorp et al., 2020) on 29 simulated genetic counseling consultations focused on expressions of uncertainty, and these authors found 1207 such utterances in counselors, with 77% of them framed directly (including some "I don't know" expressions). The pure, formal expression "I don't know" could be seen as the tip of the iceberg of expressing uncertainty, suggesting that ART consultations may be a particularly rich source for studying such expressions. As the same Gordon et al. (2000) revealed, physicians express more uncertainty to patients with more education, greater desire for information, and more questions, precisely the characteristics of patients seeking ART. Our findings suggest specific training needs for ART doctors, namely how to disclose lack of knowledge and uncertainty. Our findings also demonstrate the potential of the field of ART to reveal current practices of disclosing uncertainty to patients that can be used as natural strategies in other fields. It also provides empirical ground for showing that doctors seem prone to embrace and communicate their lack of knowledge and uncertainty directly.

We found that almost all the ART doctors' expressions of "I don't know" conveyed uncertainty or lack of knowledge (i.e., with a prototypical or propositional function). This finding is not consistent with the linguistic literature on the use of "I don't know" in ordinary (non-clinical) conversations. Indeed, the function of truly displaying lack of knowledge was found to occur in only 7.6% of the 210 instances when speakers expressed "I don't know" in daily interactions (Helmer et al., 2016). Linguists have concluded that this expression functions much like a discourse marker, serving as an interaction-organizing resource rather than conveying literal meaning (Lindström and Karlsson, 2016). Our contrasting findings highlight how the specific circumstances of the medical interaction influence such expressions, with the particularities of ART consultations providing potentially fertile ground and rationale for this expression. In particular, medical and practical topics, specifically treatments, timing, and costs provided concrete reasons driving the need to communicate lack of knowledge. Our findings around these topics provide concrete indications for ART doctors, pointing to which areas of their work may require the need to express uncertainty to patients, thus helping ART doctors to be prepared to such disclosures.

The findings of this study also highlighted the relational aspects (both in the function and topic) in direct expressions of lack of knowledge. The relational dimension has rarely been mentioned, neither in the literature on medical uncertainty more broadly (Han et al., 2011; Medendorp et al., 2018, 2020) nor in the linguistic literature focused on medical interactions (Lindström and Karlsson, 2016). In Han's taxonomy of medical uncertainty, the relational dimension notably missing (Han et al., 2011), perhaps due to the way the taxonomy was developed: it was based on existing literature and not on empirical studies observing real medical interactions. Medendorp et al. (2018) used the same taxonomy as the basis for analyzing clinical consultations, without opening the analysis to include novel, emergent phenomena. Lindström and Karlsson (2016) was an inductive analysis of medical interactions, but they used specific lenses (knowledge asymmetries) in the analysis of patients' use of "I don't know." While our findings do not provide indications about the exact and in-depth reasons why doctors express a relational-type of lack of knowledge, we speculate that the reasons may be multiple, ranging from reducing the relational distance from patients to shying away from a difficult conversation. In general, we suggest including relational aspects in studies from linguistics and medicine that focus on expressions of lack of knowledge and uncertainty. Further studies should include non-verbal communication and/or explore doctors' views on the use of relational types of "I don't know" to disentangle the reasons behind their use.

Even with a direct, clear, explicit expression such as "I don't know", different degrees of uncertainty can be expressed. This was particularly evident by our analysis of the function and topic of the "non lo so"s in our material. Indeed, we found propositional functions ranging from communicating areas of ignorance and epistemic holes to expressing doubt or giving epistemic legitimacy to the patient, using the "I don't know" to obtain information that was lacking up to that point. The topic indirectly revealed different possible degrees of uncertainty

too, ranging from intrinsic and hard-to-reduce knowledge topics (like the scientific/medical ones) to more easy-to-reduce knowledge topics like the practical ones (e.g., the case of costs). Further studies might explore the role of topics and functions in revealing degrees of uncertainty that could be expressed by a same utterance. Interestingly, "I don't know" about potentially hard-to-reduce topics like the medical ones were quite frequently framed using the first-person pronoun, thus indicating doctors taking a personal responsibility for it. This may support the first finding here discussed: ART doctors seem to be open to face, communicate, and take responsibility for a lack of knowledge, even in cases where the responsibility relies on other people, institutions, or forces.

Finally, our findings revealed some interactional features of the "I don't know." More than one third of the "I don't know" was expressed after a patient request or elicitation, especially when the expression referred to medical topics (close to 50%). In the linguistic literature, the occurrence of this expression has been related to responses to questions, which is considered to be the most frequent sequential environment of an "I don't know" occurrence (Tsui, 1991; Beach and Metzger, 1997; Lindström et al., 2016). This may indicate that both patients and doctors are willing to discuss knowledge holes, thus revealing the ART consultation as a person-centered place, where both parties have the possibility of sharing and co-constructing care. Such finding exemplifies "patient-centered" aspects of the ART consultation that have not been grasped in previous studies, where the ART consultation was rated as very much "disease-centered" if looking at the topics discussed (Leone et al., 2018).

Finally, we found that patients followed up on only one fourth of the "I don't know" expressions. This finding could indicate that the patient "accepts" the "I don't know", which may ultimately serve to close the topic and open the door to moving on to other relevant issues. This finding could be related to the very specific field of ART: patients are aware there is uncertainty in the treatment they are undergoing and in the prognosis, and they seem to search for limitations in the natural, human possibilities to conceive, rather than exhausting cycles of hope.

LIMITATIONS

This study has some limitations. First, the analysis was focused on verbal communication, and while we considered non-verbal aspects in our interpretation of the speech, we did not include non-verbal aspects specifically in the analysis. This may have limited findings, as non-verbal aspects (e.g., gaze direction, facial displays) can be particularly relevant in explaining and characterizing uncertainty and lack of knowledge expressions. Further studies should include and focus on non-verbal aspects more directly. Second, we included any type of "I don't know", without, for example, considering in advance linguistic differences between not knowing whether (believed/uncertain) and not knowing at all (unknown) (Zuczkowski et al., 2017). Third, we analyzed a "fixed" expression, without including other expressions that may have conveyed the same meaning. While this decision may have obstructed any investigation of the different ways physicians express lack of knowledge, it afforded the opportunity for us to reveal the various functional and interactional nuances of a same expression with increased certainty regarding interpretation. Fourth, we extracted the interactional function, but we did not have data about the views of doctors on the reasons why they said "I don't know" and their intrinsic motivations and intentions in saying it.

CONCLUSION

Findings of this study reveal that doctors' "I don't know" expressions are frequent; they are mostly used with a propositional function, about present issues and about treatment, costs, and timing; they are framed with doctors' taking a personal responsibility, they are opened both by patients and doctors, and they are immediately followed up by patients in one quarter of the cases. While not common, relational aspects emerged as relevant topics and functions characterizing the "I don't know". Findings provide indications to (ART) doctors about the need to disclose lack of knowledge to patients, about what, and about the openness of the patients and positive patients' reactions to it.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Ethical Review Board of the University of Milan. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

JM, EV, JG, and PG conceived and designed the study. EV collected and provided the data. JM and LB analyzed the data. JG supervised the data analysis process. JM and JG wrote the manuscript with the input from all authors.

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An Epistemological Perspective of Integrated Multidisciplinary Treatment When Dealing With Infertile Women With a Parenthood Goal: The Importance of Matterpsychic Perspective

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This article proposes a multidisciplinary work perspective on couples who undergo assisted reproductive technology (ART) treatments, with particular attention paid to the treatment of women. The epistemological references underlying a vision of infertility and sterility that respect the psyche–soma unity of the person are illustrated: the biopsychosocial model and the psychoneuroimmunology and psychosomatic contemporary models of health and illness. Based on clinical experience in a private and institutional setting, different steps in the course of treatment are described with the related areas of psychological work: from the search for pregnancy to the choice of adhering to an ART treatment, to conception, up to delivery and beyond. The implications of the work are targeted at a better qualification of psychological interventions in this specific multidisciplinary area.

Keywords: female infertility-sterility, socio-anthropological level, condition of matterpsychic, assisted reproductive technology treatments, integrated multidisciplinary treatment

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"The old healer of the soul said:

It's not your back that hurts, but the burden.
It's not your eyes that hurt, but injustice.
It's not your head that hurts, it's your thoughts.
Not the throat, but what you don't express or say with anger.
Not the stomach hurts, but what the soul does not digest.

It's not the liver that hurt, but the anger.
It's not your heart that hurts, but love.
And it is love itself,
that contains the most powerful medicine."
The Old Healer to the Soul by Ada Luz Marquez

"Feelings are not an independent production of the brain, but the result of a cooperative alliance between the body and the brain [. . .] We must point out that a collaboration between nervous systems and bodies was necessary to generate human minds, and that minds have manifested in organisms not already isolated, but which were part of a social context" (Damasio, 2018, p. 22, 88).

INTRODUCTION

Our epistemological position contains and develops the principles of the biopsychosocial model, of the psychoneuroimmunological model, and of contemporary psychosomatics regarding the interpretation of female infertility–sterility, underlining that the emotional, social, and medical–biological aspects of the person cannot be separated (subsequently defined as a whole "matterpsychic").

In particular, following this perspective, the interventions for the woman (and the couple) who undergoes assisted reproductive technology (ART) treatments need to be organized through an integrated multidisciplinary work. This is revealed more clearly considering that the presence of infertility manifests at a specific time in the cycle of life, not through pathological symptoms but with the failure to achieve a desire for the individual and the couple (Greil et al., 2011).

According to the biopsychosocial model developed by Engel (1977) on the basis of the multidimensional concept of health described in 1947 by the World Health Organization (WHO), the afflicted individual was placed at the center of a system influenced by various factors. To comprehend and treat, the doctor not only has to look at the problems of functions and organs but must also pay attention to the psychological, social, and familial aspects of the individual, which interact with each other and are able to influence the evolution of the disease. The medical aspects relating to infertility were the first to receive a wide attention (da Motta and Serafini, 2002; Lindsay and Vitrikas, 2015; Cunningham, 2017); the psychological ones were later considered in various terms, among which the effects of the diagnosis of infertility and the application of specific infertility counseling (Boivin et al., 2001; Boivin and Gameiro, 2015). We have recently begun to study and deepen social aspects such as the advanced age of women at the moment of conception, lifestyle habits such as smoking and obesity, the fact of being single or part of a homosexual couple, and the donation of gametes and management of the unveiling to their family network and subsequently to the children born from this process (Dhillon et al., 2000; Cousineau and Domar, 2007; Mohiyiddeen and Cerra, 2017; Walentynowicz-Moryl, 2020).

Psychoneuroimmunology informs us of the mutual interaction between behavior, mental activity, the nervous system, the endocrine system, and the immune response of human beings (Procaccini et al., 2014; Bottaccioli and Bottaccioli, 2017). Here, we want to recall some of the discoveries that have contributed to the foundation of this discipline such as Candace Pert's studies on emotions (1997), in which she describes how neurotransmitters, called peptides, carry emotional messages. These messages change the chemistry of the cells in our body. Neuropeptides and their receptors are the biological substrate of emotions and are in constant communication with the immune system, the system, as it is commonly known, through which health and disease are created.

For this reason, we can state that contemporary psychosomatics has overcome the classical conception according to which something that happens in the mind can reflect on the body, which thus supported a clear distinction between psychosomatic illnesses and those of organic origin. This distinction excluded most of the somatic pathology from psychological intervention, and it proposed the possibility of obtaining therapeutic results in some diseases just through psychological intervention, with disappointing results. Such perspective also referred to an isolated individual and paid no attention to the relational context, while in contemporary research, this dimension for the health and illness of the person is central (Solano, 2016, 2018).

We suggest using a multidisciplinary approach and treatment, which not only aims at obtaining pregnancy but also guarantees the development of a disciplined clinical practice that includes a comparison and a systematic dialogue in correspondence of all the steps of the treatment between the various professional figures involved (gynecologist/andrologist; biologist; geneticist/genetic counselor; psychologist/psychotherapist; obstetrician; nurse; cultural mediator; neonatologist pediatrician; pediatric nurse).

We also specify that we always address our psychological treatment to the couple.[1] In this work, we have decided to deal specifically with the condition of infertile women (Namdar et al., 2017; Li et al., 2019), on which we are currently focusing our studies (Vasta and Girelli, 2019; Vasta, 2020a).

Table 1 presents both the challenges and tasks that the woman/couple have to face at each stage and the competences and duties of the carers as a working multidisciplinary team.

A clinical case is illustrated (see section "Discussion") in order to show our therapeutic intervention and perspective and to offer useful evidence for further implications.

FEMALE INFERTILITY AND STERILITY[2]: A CONDITION OF MATTERPSYCHIC

In an effort to support this unity also on an epistemological level, we use in our work the term matterpsychic of philosophical origin (Pauli, 1952; Sparzani and Panepucci, 2016). We therefore assume a conception where body and mind do not exist in a specific and distinct form in relation to the whole organism, rather they are two categories that have to do with the vertex from which the observer sets himself. This conception has ancient roots, as the philosopher Michel Foucault (1963) claims when retracing the history of medicine. It was already present in the

[1] Psychological work with couples undergoing ART treatments must take into account the partners' ability to cope together with stress. Dyadic coping is a multidimensional construct, defined as the process through which partners deal with stressful situations, not as individuals, but as a couple, by leveraging on the relationship (Donato, 2014). To learn more about dyadic coping and the models that have described various aspects of it, see the review of the empirical literature and the conceptual integration published by Falconier and Rebekka (2019).

[2] The World Health Organization (World Health Organization [WHO], 2020) defines sterility as the situation of a couple in which one or both members are suffering from a permanent physical condition that does not make conception possible. Infertility, on the other hand, is "a disease of the male or female reproductive system defined by the failure to achieve a pregnancy after 12 months or more of regular unprotected sexual intercourse." The two terms, therefore, although sometimes used in common language as synonyms, refer to conditions with very different characteristics also in prognostic terms.

TABLE 1 | The stages of woman/couple's journey in ART treatments.

Stages of the journey	Challenges and goals for women	Tasks of the woman/couple (to be pursued with the support of a multidisciplinary team)	Health professionals involved (the caregiver of the multidisciplinary working team)	Required skills of caregivers (in addition to general technical-professional ones)
Infertility/sterility diagnosis	Addressing the identity crisis following the diagnosis (see par. 5.1).	• Acceptance and elaboration of the diagnosis. • Gather clear information on possible treatments. • Get rid of any prejudices about the treatment that has to be undertaken or however avoid them if they dominate the decision-making field. • Make decisions on whether or not to start the path with awareness and sense of responsibility shared with the caregivers.	• Gynecologist/Andrologist • Psychologist/Psychotherapist • Possible cultural mediator • Other doctor of reference of the patient for any previous pathology.	• Ability to communicate with colleagues of different professions and to work as a multidisciplinary team. • Specific training on this clinical area. • Assume and maintain a global vision of the patient as a mind-body unit inserted in his socio-anthropological context (see par. 2 e 4). • Empathic communication with the patient (in the various steps from the diagnosis onwards). • Take responsibility for accompanying the patient as a working multidisciplinary team throughout the treatment (until after childbirth).
ART treatment start-up	• Relying on the multidisciplinary team. • Taking care of yourself globally, as a mind-body unit (a condition of matterpsychic: see par. 2). • Keep the focus on the present moment, without going too far in the future or the past.	• Sign up to various medical appointments. • Establish a permanent psychological support for the couple with the psychologist/psychotherapist of the multidisciplinary team. • Attend your own socio-emotional network (avoid isolating along the way). • Use the psychological support space to process any early failures that occurred during treatment and comprehend if and when to interrupt the treatments.	• Biologist • Gynecologist/Andrologist • Geneticist/Genetic Counselor • Psychologist/Psychotherapist	• Maintain all the above. • Schedule periodic meetings as a multidisciplinary team for the entire duration of the treatment in which discuss and make shared decisions.
Pregnancy	• Accept that the journey in ART treatment is not over yet, even if conceiving has finally taken place. • Continue to take care of yourself in a global way, with additional self-protective measures. • Manage the fears and anxieties related to the new psychophysical condition.	• Continue the psychological work to address the fears associated with the various stages of pregnancy, childbirth and following the birth.		

(Continued)

TABLE 1 | Continued

Stages of the journey	Challenges and goals for women	Tasks of the woman/couple (to be pursued with the support of a multidisciplinary team)	Health professionals involved (the caregiver of the multidisciplinary working team)	Required skills of caregivers (in addition to general technical-professional ones)
Delivery and birth	• Consciously choose the modality of giving birth (natural childbirth or caesarean section: see par. "Achievement of pregnancy and child birth: psychophysical transformations") • After birth, establish a relationship with the real child (who is not the one imagined). • Maintain confidence in your parenting skills in the first months of life, especially in front of the first evolutionary challenges (breastfeeding, sleep-wake rhythms, prime first baby food, etc.).		• In addition to the aforementioned careers: • Obstetrician • Nurse • Pediatric Nurse • Neonatologist pediatrician.	• It is useful for the psychologist/psychotherapist to organize a pre-delivery meeting with the obstetrician and the nurse to describe the psychological condition of the woman and the couple, informing these professionals on the importance of empathic communication. • The same can be done immediately after the birth with the neonatologist pediatrician and the pediatric nurse.

thought of the philosopher Baruch Spinoza.[3] We must therefore not build from scratch but recover a concept of disease and cure.

In this perspective, certain steps of clinical relevance are explored: the diagnosis of infertility/sterility, the failure of ART treatments, pregnancy achievement, gestation, and childbirth. In this way, we underline that the discovery of infertility–sterility does not represent a single event; rather, it is configured as the beginning of a series of evolutionary challenges which involve the individual and the couple in their body/mind uniqueness.

MEDICALIZATION OF STERILITY: THE DIS-INTEGRATION OF MATTERPSYCHIC

Medicalizing means considering the patient's body as an object of care, simplifying the complex nature of the sick person and creating emotional distance between the caregiver and the person being treated (Colucci, 2006; Vernero, 2017). The patient's needs are reduced to malfunctions of the organism (Ongaro Basaglia, 2012), and medicine in this perspective is seen as a science endowed with technological and pharmacological power rather than *therapeutic* power in the etymological sense of the term. The word therapist comes from the Greek θεραπεύω (*Terapeuo*) and means "I am at the service of." This position of medicalizing the illness is opposite to the one that, already in the last century, the psychoanalyst Balint (1957) supported when speaking of the doctor as the (principal) drug for the patient.

We must therefore ask ourselves whether it is possible to treat the problem of infertility/sterility and the related course of treatment only from a medical point of view, emphasizing the medicalization[4] of infertility/sterility or providing psychological treatment only as a path on a parallel track that proceeds on its own. As anticipated, this article aims to offer a contribution to the formulation of an articulated answer to the question. With this objective, we intend to draw the attention to the socio-anthropological aspects of the problem (Khetarpal and Singh, 2012; Hocaoglu, 2018; Vasta, 2020a).

SOCIO-ANTHROPOLOGICAL LEVEL: OPACITY VS. PERMEABILITY OF CARE CONTEXTS

Each person is immersed in his own historical–anthropological and social contexts of reference. This context in our perspective does not represent a single frame in the life of the person but

[3]"[...] the Mind and the Body are one and the same thing which is conceived now under the attribute of Thought and now under the attribute of Extension [...] the order of the actions and passions of our body is simultaneous by nature with the order of the actions and passions of the mind" (Spinoza, 1677).

[4]Conrad and Schneider (1980) have used the term "medicalization" to denote the process by which certain behaviors come to be understood as questions of health and illness and therefore subject to the authority of medical institutions. Medicalization has progressed much further in highly industrialized nations than it has in less industrialized societies (Conrad, 2005, 2007). Within highly industrialized nations, the medicalization of women's lives has proceeded at a faster pace than the medicalization of men's lives (Inhorn, 2008).

shapes an identity component and influences his choices (Pacilli, 2019; Vasta, 2020b).

Without no claim to be exhaustive, we report some aspects of this context that have appeared relevant to us while following couples who receive ART treatments.

For our argument, it is useful to remember that in Italy the law prevented gamete donation until 2015. The prohibition has contributed to the consolidation of social prejudices towards this choice. Since 2017, medically assisted procreation has been included in the essential levels of assistance (LEA).[5]

Another component of the Italian socio-cultural context may also make complex both the choice of relying on medically assisted fertilization, in particular gamete donation, and the management of the subsequent steps. Italy has a culture, in the broad sense of the term, which is influenced by the Catholic matrix, also for historical reasons. In our clinical experience, both in the institutional area and in private practice, this element has been required to be taken into consideration as much as other aspects of more obvious attention (from the doctor, for example, the age of the couple, rather than familiarity with certain organic pathologies), in line with the indications of the ESHRE guidelines for routine psychosocial care in infertility and medically assisted reproduction (Gameiro et al., 2015).

In the end, the COVID-19 pandemic has brought with it a whole series of constraints in the protocols, for example, the start-up times of a new ART treatment attempt forcedly anticipated by the fear of a closure of the health center for a possible second *lockdown* and the impossibility of having close relatives during pregnancy or the child's father in the delivery room. All this has generated negative feelings, particularly with regard to the closure of the centers during the *lockdown*; the literature reports feelings of fear, uncertainty, frustration, and anger and a sense of injustice suffered (Boivin et al., 2020).

Therefore, even considering the social level of the problem, an indispensable factor emerges for the effectiveness of the entire treatment process: the different professionals thinking together about the times and methods of the steps to be taken (Di Trani, 2018).

THE FEMALE'S JOURNEY IN ART TREATMENTS: SUSPENDED IDENTITIES

We have to consider the different evolutionary challenges faced by the couple during treatment, paying attention to the position of the woman, in line with the purpose of the article.

First of all, we recall that the aforementioned ESHRE guidelines (Guidelines for Counseling in Infertility, 2001) involve different types of "patient-centered care" psychosocial intervention for ART treatments: informative counseling on the implications of treatment; psychological support counseling for specific critical steps—for example, waiting for the results of the implant or for the preliminary examination ones (Boivin and Lancastle, 2010; Cipolletta and Faccio, 2013; Ockhuijsen et al., 2013), a phase of intense care, the failure of a cycle of treatment, and the choice of whether or not to continue along the medical course—which aims to mobilize the couple's resources and define strategies to cope with stress; and psychotherapeutic intervention, in the presence of diagnosed disorders of the individual or couple.

Diagnosis vs. Acceptance/Elaboration/Decision

First of all, we underline that motherhood represents a complex human condition, not attributable only to the physical, psychic, and cultural components (Schirone, 2013). Stern (1995) and Stern et al. (1998) has highlighted the relationship between the identity shift and becoming a mother. Subsequent research has deepened the qualitative characteristics of identity changes of women in the process of becoming mothers (Laney et al., 2014, 2015); the role of cultural factors in facilitating or not the passage of identity (Märtsin, 2018; Gardner et al., 2020); and how the possibility of reorganizing the attachment during the transition to motherhood by mothers with unresolved traumatic past experiences is a key factor for the quality of care provided to the child and also for the type of attachment that he will develop (Iyengar et al., 2019).

The search for a pregnancy that results in the diagnosis of infertility and even more so of sterility can cause a crisis of such magnitude that it can be defined as an "identity" crisis (Thorn, 2009). It is the body image that has been damaged, with repercussions exactly on the level of identity and gender identity (Salerno and Piccolo, 2006; Rosner, 2012; Patel et al., 2018). The experience of identity loss takes place on several levels: in genetic continuity; in the image of oneself as a fertile person; and regarding the possibility of pregnancy and childbirth. The effects on each individual are of course different. However, literature has highlighted how the diagnosis is accompanied by emotional experiences such as shock, rejection, frustration, and feelings of inadequacy.

It is not only the woman, but also the couple, that goes through a suffering triggered by the failure of carrying out a project related to motherhood/fatherhood, which involves psychological well-being, marital relationship, sexual relationship, and quality of life. A review of 20 articles in English (2000–2014) by Luk and Loke (2015) and subsequent studies (Luk and Loke, 2019) highlight that infertility has a negative effect on the psychological well-being and sexual relationships of couples. A recent study on Chinese couples with infertility in Hong Kong has demonstrated the negative association between quality of life of infertile couples and infertility-related stress and the role of family sense of coherence in promoting infertile couples' well-being (Ngai and Loke, 2021).

Furthermore, it has been proved that the way a partner reacts to infertility can have a great influence on the other partner (Berghuis and Stanton, 2002; Chaves et al., 2019; Ha and Ban, 2020); also, a positive correlation was found between the anxious and/or avoidant attachment styles of the

[5]The LEA are the performances and services that the National Health Service must guarantee to all citizens, free of charge or upon payment of a participation fee (the "ticket").

two partners and the perceived level of distressing infertility on the other (Van den Broeck et al., 2010; Donarelli et al., 2012, 2016). Even when studies do not allow us to find a causal relationship, they still underline the importance of considering attachment patterns and related abilities of emotion regulation in psychological counseling for promoting couples' health (Moura-Ramos et al., 2017).

The psychological and psychosocial interventions, based on the multidisciplinary dialogue with the doctor who performed the diagnosis, in this phase are aimed at preventing the development of psychological distress (Van den Broeck et al., 2010; Frederiksen et al., 2015; Molgora et al., 2020) and analyzing with the couple the scenario in which the choice to arrive at a center for ART treatments occurs. Inside (or outside) the couple, by whom is the decision made? How long after the diagnosis? Was the couple alone at this juncture, or were they able to deal with family and/or friends? Clinical experience confirms that depending on the answer to these questions, the subsequent challenges in the course of treatment within the center will be experienced by the couple as more or less difficult. We would like to emphasize that the diagnosis of infertility has an impact on the dyad, on the couple, regardless of whomever of the two partners received it. In any case, the positive influence of partner and family support is underlined in literature (Martins et al., 2014a,b), as well as the marital stability for lower stress levels of the couple both initial and subsequent (Martins et al., 2014a,b). Through research on psychological counseling for infertility, it has been demonstrated that the couple responds to treatment as a whole; in fact, the effects of psychological work result as a change in the couple's relational dynamics, not just as a change in the individual partner (Donarelli et al., 2019). As a confirmation of this, other studies have shown that the capacity of the partners to face this experience is the result of both individual and relational coping strategies (Zurlo et al., 2018, 2019, 2020; Molgora et al., 2019).

Furthermore, the health protocols of ART treatments include the precise scanning of execution times and techniques. Considering only the physical level, through the development of biotechnology, fertilization can be perceived as a definitive solution to suffering, and the fertility center or clinic where they arrive can be invested with miraculous expectations. If it is the woman who is identified as the one who cannot achieve conception, the initiation of the protocol in order to have a biological child becomes the main objective. We immediately start to face statistics about the chances of success related to age, calendars and drug administration, endometrial preparation cycles for implantation, self-monitoring of the body experience to detect signs of pregnancy, expectations, analysis, and results.

In this way, the protocols force one to concentrate on the soma (excluding the level of matterpsychic), running the risk of leaving the thought in the background. It is precisely that dangerous mechanism that we have defined "dis-integration of psychic matter": the biological aspects are isolated from the affective and body aspects. Instead, we know from the studies carried out that the treatment cycles are characterized by hope, expectation, and stress, followed by disillusionment, sadness, and other negative emotions (Mohiyiddeen and Cerra, 2017).

Once again, we reaffirm that it can be the multidisciplinary team, cohesive and with a good internal dialogue, that makes sure that the mind–body splitting mechanism does not take over.

Achievement of Pregnancy and Child Birth: Psychophysical Transformations

We now refer to the clinical experience with couples who, following the diagnosis of sterility, achieved a pregnancy after two or more cycles of gamete donation in ART treatment (in some cases after the failure with the homologue, which has represented a further critical step).

Achieving pregnancy involves different emotions: joy, surprise, hope, and fear (Boz et al., 2018).

The woman's body becomes the container of the child's body, and the pregnancy proceeds through the establishment of a psychobiological relationship.

From the beginning of conception, the woman undergoes medical procedures and the intake of medications to protect the pregnancy.

Even in this passage, if the problem dealt with by the couple up to now is seen only from the somatic point of view (medicalization of sterility), one might think that the couple has reached the resolution of the problem. Instead, we propose to consider conception and pregnancy from the perspective of the totality of the matterpsychic woman. This implies that the team has to undertake the preparation of appropriate settings to elaborate and support the changes and challenges taking place. If it is true that an important goal has been achieved, it is equally true (it is real) that complications can occur. When pregnancy presents complications (high blood pressure, shortening of the uterus neck, placental abruption, etc.), the woman can experience a strong sense of danger, sometimes guilt. In some cases, absolute rest may be prescribed. The constant worry regarding the evolution of pregnancy causes great stress, one can experience the feeling that the body betrays again, and we confront ourselves with new limits and attend the birth as a moment of relief and joy. Furthermore, even if the complication does not occur, we cannot think that all the past emotional history preceding conception can magically disappear with the arrival of pregnancy. Instead, we believe that it is a protective factor of pregnancy and of the subsequent development of the bond with your child to work on the awareness of the present moment and the path undertaken. Among the possible complications, an early (abrupt) interruption of pregnancy and premature birth can occur. We have described (Vasta et al., 2013; Vasta and Girelli, 2016) the psychological conditions of parents who suffer this potentially traumatic event, illustrating how the psychosocial intervention addressed to them, with the involvement of the healthcare staff of the neonatal intensive care unit (NICU) in which premature babies are hospitalized, can be a useful prevention and treatment tool for the new family unit. Here, we just remember that in literature, it has emerged that the risk of preterm birth in singleton pregnancies resulting from ART treatments is significantly greater than that in spontaneously conceived singletons (Cavoretto et al., 2018). However, also

drawing on our 10-year clinical experience in the NICU, we believe that premature birth should be taken into consideration as a possible reality scenario after a course of ART treatment, especially if gamete donation was performed (Vasta and Girelli, 2017). Beyond the specific situation of prematurity, childbirth can represent a new trial that has to be dealt with. Through our clinical experience, we would want to bring attention to the wish of many women to give birth naturally, and not through a cesarean section. Natural childbirth is thus perceived as a proactive stance to facilitate their child's entry into the world and seems to have the specific function of letting women regain the feeling of having a body tuned to their desires. However, this intention may not coincide with the most protective choice for the success of childbirth. For example, a rise in blood pressure may occur during pregnancy, and a cesarean section may be more suitable. If the woman/couple did not have the opportunity to consider these aspects with the psychologist during pregnancy, even if they were presented to her as statistically possible events by the doctor, she could experience the birth with a double trauma: that of the unexpected event (the increase in pressure) and that of the renunciation of natural childbirth.

Breastfeeding: Acceptance and Relationship

Breastfeeding may also be specifically connoted as a challenge, as a space for the woman to recover the safety of her maternal function. Breastfeeding can, like natural childbirth, be loaded with expectations and functions. It is important to work on these aspects on a psychological level and to help the mother and the couple to focus on which elements the attachment relationship with the child is really based on. For example, it could happen that the mother cannot breastfeed regardless of her will and develops again a sense of guilt and inadequacy or that she adopts methods and times of breastfeeding that do not respond to an adequate tuning of the real needs of the child but rather to her own self-healing needs that we have already talked about. A recent study (Barrera et al., 2019) has emphasized how these mothers who conceive using ART treatments may breastfeed for shorter periods than mothers who conceive spontaneously, partially mediated by a likelihood of giving birth preterm or multiple birth. More research is needed to clarify these associations and to understand the intentions and barriers to breastfeeding among women who achieved pregnancies through ART treatments.

CLINICAL CASE[6]

Pia and Giorgio contacted me after getting my contact details from their gynecologist, Dr. R.

Dr. R. and I are part of an association of professionals (psychologists, psychotherapists, gynecologists, biologists, lawyers, social psychologists, and geneticists) who deal with ART treatments in Italy.

[6]The psychotherapist is Dr. Vasta. The first names Pia and Giorgio are fictional.

I inform the couple that my working method involves a constant dialogue and discussion with the gynecologist and therefore I ask to be able to contact Dr. R. before our meeting to have medical information on their situation. After receiving consent, I call her and I am told that the partners have undergone several cycles of homologous fertilization.

Moreover, Pia has just received the diagnosis of premature ovarian failure; the gynecologist thus proposed the possibility of pregnancy through egg donation and at the same time pointed out the usefulness of dealing with this step also on a psychological level. The couple seems surprised by the doctor's proposal regarding psychological counseling.

Before starting the treatment with Dr. R., the couple had visited other two counseling centers, meeting doctors who had addressed the specific problem by showing general success/failure statistics and superficially informing them of the presence of a psychologist in the center.

Therefore, I meet with the couple, and we set up a five-session counseling meeting to analyze their questions.

The couple, 38 years old (Pia) and 39 years old (Giorgio), had tried for at least 2 years to have children naturally; she turned to ART treatments about 3 years ago. They are a solid couple who love each other a lot, and both have satisfying jobs and a good social network. They wish to have a child but are also aware and accept that this option may not occur.

In the course of counseling meetings, we explore together all the issues which surround gamete donation: the difficulty in accepting the diagnosis; the loss of security with respect to the parenting project; the discussion with the couple on how this decision can influence the bond between the partners; the (religious) prejudices of a part of her family of origin; thoughts about the future; and the possible sensations during pregnancy and after birth in the relationship with the child.

At the end of the counseling process, the couple chooses to follow the fertility treatment with egg donation. Pia and Giorgio appear united in facing the next challenges. The good basic bond between the partners has facilitated the couple's psychological work aimed to take a common decision.

We part, I confirm my availability for the future, aware that the ART treatment path could also subsequently require the need for a listening space.

After a few months, in fact, I receive a call from Pia who tells me she is close to the transfer, and we decide to arrange some meetings. I contact the gynecologist for a discussion regarding the situation again. The gynecologist tells me that at this stage, she has received many phone calls from Pia. The woman has asked to speak to the biologist, calling him daily to find out how the embryo was developing. In agreement with Dr. R., I also contact the biologist for an exchange of views, and we decide that on the day of the transfer, we will be present together with the gynecologist to greet the couple.

After the transfer, Pia and Giorgio did not come to the scheduled meeting: Pia wants to rest until the day of the beta HCG levels. I suggested Pia contact me in order to handle the need of sharing her fear of the possible failure of the engraftment of the embryo. She resurfaces the memory of previous failed

attempts. Pia is convinced that by staying at home, she can protect this engraftment.

After the analysis and the news of the pregnancy, we agree with the couple for a fortnightly meeting with the aim of continuing to support the couple in facing the subsequent steps and related anxieties.

For example, Pia is worried because now Dr. R. won't follow the pregnancy but Dr. Z. of the University Hospital where Pia will give birth. We plan a periodic comparison between me and the gynecologist who follows the pregnancy.

Around the 8th week of pregnancy, Pia manifests a strong hyperemesis gravidarum. She is very depressed, and she is afraid to miscarry.

We resume meeting again at the 18th week, considering that Pia is feeling better. Unfortunately, around the seventh month, she experienced a threat of abortion and is hospitalized. I plan a couple of visits to Pia at the hospital. We only have two short sessions, but Pia on that occasion proves to be very grateful for seeing me there. She feels guilty for what is happening, and she fears that she has "crossed the line," by not receiving the support of her family of origin which has never been fully convinced of her choices. Giorgio reminds her that they did it together, that he is present. Pia talks on the phone with her gynecologist, but now the doctors in the obstetric pathology department are taking care of her, not her gynecologist. She feels scared, in the hands of unknown doctors, she is very down in the dumps, and she is afraid of losing her pregnancy.

An emergency cesarean section is needed: the child, Pietro, will remain in sub-intensive care unit in the hospital for 4 weeks.

At that juncture, I introduced myself to the hospital staff, and I tried to present the history of Pia and Giorgio. This abrupt termination of pregnancy, premature birth, and the delicacy of the baby's condition rendered the weeks of hospitalization particularly difficult. We have continued our meetings after discharge, facing the challenges as they arose: Pia's mood swings, Giorgio's tiredness (who in the moments that immediately followed the birth kept in touch with the doctors, encouraged Pia, but he himself felt very afraid for her and for the baby); breastfeeding; the reorganization of daily life; and Pietro's first medical check-ups after his discharge. At this stage, I got in touch with the pediatric neonatologist to work together on supporting Pia's parental function, severely tested by the precipitous events of the last part of her pregnancy and her son's hospitalization. Today, Pietro is 2 years old, and he is a beautiful child; he has been walking since he was 18 months old, and at 20 months, he said his first word: mom.

Discussion

We, as mental health professional specialists in this field, are aware that all new parents face challenges during the transition to parenthood (Doss and Rhoades, 2017). The case presented shows our attempt to work in an integrated manner in the private setting through the full involvement of the various professional figures responsible for the physical and mental care of women who intend to follow an ART treatment path.

In the light of this experience, at least two further aspects worth noting emerge, in addition to what has already been written in this work.

1. It is important that the psychologist adopt a flexible setting that always allows his presence next to the couple in critical moments. For example, when Pia does not want to leave home to go to the psychologist's office, the therapist understands that there is no real need for Pia to stay at home in terms of physical health but rather that it is very important through that stage to satisfy Pia's emotional need to protect the pregnancy in the only way that the woman has available (staying at home). In this sense, a flexible setting through the use of the telephone allows us not to give up the session and at the same time to satisfy this emotional need of the woman.
2. Equally important is the activation of a multidisciplinary care network in each phase of ART treatments. In fact, in the case presented, a forecast of any contact with a network of hospital doctors before the end of the pregnancy was lacking. After the experience of Pia and Giorgio, it is our practice in this type of pregnancies to get in touch in time with the hospital caregivers, in order to be able to communicate effectively with the healthcare workers who will follow the couples until delivery and beyond. We wanted to propose a case with a certain complexity—and not cases that foresee the working model presented here from the beginning—to highlight how important it is in this context to build an articulated project of multidisciplinary work from the beginning of taking over the couple.

CONCLUSION: BUSINESS PROPOSAL AND ETHICAL IMPLICATIONS

We have tried to illustrate how the couple, in particular focusing on the woman, who receives a diagnosis of infertility/sterility and relies on an ART treatment, needs a form of multidisciplinary and integrated support and care by a team, that is, not by a single healthcare professional (the doctor) and/or another (the psychologist), but by a *group of healthcare professionals*. We retraced the various steps and related challenges that the couple faces before, during, and after the treatments, highlighting the risks of an approach that tends to separate the aspects of the body from the emotional, affective, cultural, and anthropological–social aspects of the person.

Our position has epistemological assumptions in philosophy, which today are also confirmed in the neurological sciences. In this regard, we have already mentioned the work of Pert (1997) who identified the existence of a communication network, the psychosomatic mind/body network, which runs through the body and brain. It is a non-hierarchical network that accesses all the systems of the body, which testifies to how our functioning is best expressed by an integrated mind–body entity (Brunnhuber and Michalsen, 2012), rather than by two different levels, one of which can "jump" in the other (classical psychosomatic view).

Emotions pass through the body, and therefore, it becomes crucial to take them into account. On the level of ethical implications, we wish to underline that this knowledge should represent a shared heritage of all the healthcare professionals, not just a part of them, and be reflected in a clinical practice that we have tried to outline. In this perspective, it is not enough, if not harmful, to allow a desire to be realized without taking care of the results that that desire will produce. We can therefore think of the network of caregivers of ART treatments, of the multidisciplinary team, as of the system of care, external to the person, which promotes and supports for the woman and the couple that same functioning of integration (and not of division) mind–body, which Pert (1997) has identified within *organisms such as human beings*.

We have suggested this approach by generalizing a path for the couples foreseeing certain stages with the related experiences and care interventions. However, we know that each couple, precisely because they are human beings, with all the inherent vulnerabilities, lives the experience of infertility/sterility in their own and unique way. As caregivers, we need to be aware of this.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author/s.

AUTHOR CONTRIBUTIONS

Both authors have contributed substantially to this opinion article and have approved the final version of the manuscript.

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Maternal and Paternal Representations in Assisted Reproductive Technology and Spontaneous Conceiving Parents: A Longitudinal Study

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Aim of this study was to investigate whether parental mental representations during pregnancy and after delivery differed between parents who conceived after Assisted Reproductive Treatments (ART) and spontaneous conceiving (SC) parents. Effects of specific ART variables (previous ART attempts, treatment type and cause of infertility) were also taken into account. Seventeen ART couples and 25 SC couples were recruited at Santa Maria Nuova Hospital (Reggio Emilia, Italy). At both 32 weeks of gestation (T1) and 3 months postpartum (T2) participants completed the Semantic Differential of the IRMAG, a self-report tool which measures specific domains of mental representations pertaining either individual (Child, Self-as-woman/man, and Partner) or parental (Self-as-parent, Own parent) characteristics. Results showed that ART parents had significantly more positive representations of the child compared to SC parents, while the scores at Partner dimension improved from T1 to T2 for SC parents only. With regards to ART history, scores at the Self-as-woman/man dimension were significantly less positive for ICSI than IVF parents and improved substantially from T1 to T2 only in case of mothers with previous ART attempts and of fathers at the first ART cycle. The representation of own parents increased from T1 to T2 in case of infertility diagnosis due to male factors, while a decrease emerged when infertility was due to female factors. Findings suggest the need to investigate parental mental representations after ART, in order to improve the understanding on the transition to parenthood of infertile couples and to target more specific intervention for parenting support.

Keywords: assisted reproductive technology (ART), mothers, fathers, parental mental representations, infertility, ICSI (intracytoplasmic sperm injection), IVF (*in vitro* fertilization), longitudinal study

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INTRODUCTION

Infertility represents a relevant health issue in many countries across the world, so much so that it currently affects about one in eight couples of reproductive age (McLachlan and O'Bryan, 2010). In order to make parenting possible, an increasing number of infertile couples undergoes Assisted Reproductive Treatments (ART), such as *in vitro* fertilization (IVF) or intracytoplasmic sperm injection (ICSI; Mascarenhas et al., 2012; Ferraretti et al., 2017).

Nevertheless, the recourse to ART leads to potential psychological consequences particularly for women, who may feel a sense of loss, anxiety, depression, and frustration throughout different treatment phases (Fassino et al., 2002; Hammarberg et al., 2008; Monti et al., 2009, 2015; Vitale et al., 2017; Agostini et al., 2018; Allan et al., 2019). Negative consequences could also occur with regards to men's psychological well-being, with an increased risk of emotional problems such as elevated levels of anxiety and indirect aggression (Hjelmstedt and Collins, 2008; Pinto et al., 2017). Despite the psychological impact seems to be greater for women, as they show higher levels of anxious and depressive symptoms than men (El Kissi et al., 2013; Monti et al., 2015), the investigation of both maternal and paternal psychological state should always be included in the assessment of couples undergoing ART.

The psychological impact of ART may be particularly intense when the treatment fails and new cycles are needed. Specifically, recent literature shows that repeated ART attempts are associated with recurring frustrated expectations, loss of hope, lower quality of life and an increased risk of depression and/or anxiety (Monti et al., 2015; Moura-Ramos et al., 2016; Agostini et al., 2017, 2018; Molgora et al., 2020). Moreover, previous failed ART cycles may negatively influence the quality of parent-infant interactions (Wang et al., 2014; Allan et al., 2019) and represent an aggravating factor, associated with high infant fussiness and difficulties during free parent-infant interactions (McMahon et al., 1997; Agostini et al., 2020). Treatment type represents another influencing variable to be included in studies about ART parenting, as it associates to the severity of the infertility diagnosis. Specifically, Agostini et al. (2020) showed that infants conceived through ICSI had higher levels of both compulsivity and passivity during interactions with their parents compared to IVF infants.

All these studies well support the psychological burden of ART and suggest that parenting after ART pregnancies may be challenging and emotionally highly demanding (Hammarberg et al., 2008; Ranjbar et al., 2020). Indeed, not only the transition to parenthood regards the welcoming of a baby, but it also represents a profound psychological and emotional experience that brings future mothers and fathers to activate their caregiving system, as well as to adjust to the new parental role (Ammaniti et al., 1992, 2013; Stern, 1995; Ilicali and Fisek, 2004; Slade et al., 2009; Raphael-Leff, 2010).

However, early parenting and psychological processes involved in the transition to parenthood in the context of ART pregnancies have not been investigated enough (Hammarberg et al., 2008), therefore more research in this field is recommended.

The activation of the caregiving system and the development of a parental role require a profound reorganization of personal identity (Ammaniti et al., 1992; Stern, 1995; Slade et al., 2009; Raphael-Leff, 2010). At a deeper level of psychological processes, during the transition to parenthood mental representations of the self and of the baby are strongly activated. Mental representations can be defined as schemes of reality based upon memories, conscious and unconscious fantasies, expectations and perceptions of past experiences, which shape one's sense of self and interpersonal behavior (Main et al., 1985; Ammaniti et al., 1992; Stern, 1995; Larney et al., 1997). The construct of mental representations, therefore, well describes the women's psychological states and processes during perinatal period (Ammaniti et al., 1992, 2013; Stern, 1995; Ilicali and Fisek, 2004). Especially in the second and third trimester of pregnancy, maternal representations regarding self-as mother and the baby arise, in parallel with the growth of the fetus, the starting of fetal movements and the activation of the caregiving system (Ammaniti et al., 1992, 2013; Stern, 1995; Ilicali and Fisek, 2004; Slade et al., 2009; Raphael-Leff, 2010). At the same time, women are supposed to rework the relationship with their partner and with their own mother, in order to define their parental attitude (Ammaniti et al., 1992; Vizziello et al., 1993; Stern, 1995; Cohen and Slade, 2000; Dayton et al., 2010). The process of reorganization of parental representations continues also after childbirth when parental representations are generally enriched by the encounter with the baby's real characteristics.

Therefore, it is recognized that parental mental representations well describe the state of mind regarding parenthood; besides, they play an important role in predicting early parenting styles (Zeanah and Benoit, 1995). In fact, many studies highlight that the characteristics of prenatal maternal representations may influence the emerging interactive behavior with the infant (Fonagy et al., 1991; Ammaniti et al., 1992; Stern, 1995; Zeanah and Benoit, 1995; Flykt et al., 2012).

Based on this evidence, the assessment and investigation of mental representations during the perinatal period is recommended. Particularly, both the content of mental representations and their narrative structure should be taken into account (Cramer, 1989; Stern, 1991; Zeanah et al., 1994; Ammaniti et al., 1995). Ammaniti et al. (1995, 2013) developed the Interview of Maternal Representations During Pregnancy (IRMAG; Ammaniti et al., 1995, 2006) to assess mental representations describing three main types of representations according to how the mother copes with the experience of motherhood and with the forthcoming baby: Integrated/Balanced, Restricted/Disinvested, Not integrated/Ambivalent. The IRMAG interview also includes an adjectives list, built on the model of semantic differentials (Osgood et al., 1957) and concerning contents of mental representations (the baby, the self-as-woman, the partner, the self-as-mother, and the own-mother).

Recent studies showed that the reorganization of parental representations during pregnancy is active in men too (Vreeswijk et al., 2014, 2015), even if paternal representations have been less investigated. Nevertheless, when compared with their female partners, men would tend to show more frequently disengaged representations of their infants (Vreeswijk et al., 2014, 2015).

There is enough evidence that the nature and the quality of parental mental representations may be impaired in presence of specific risk conditions (i.e., psycho-social risk, depressed, or drug-abusing women), where high levels of not integrated maternal representations have been observed, with negative consequences on early parenting skills too (Pajulo et al., 2001; Wendland and Miljkovitch, 2003; Flykt et al., 2012; Ammaniti et al., 2013; Davis et al., 2020).

Interestingly, very little attention has been paid to the investigation of mental representations in the context of parenting following ART. To our knowledge, only the study by Agostini et al. (2009) analyzed the quality of parental mental representations comparing spontaneous conceiving (SC) mothers with ART mothers, showing that ART women had less integrated and more ambivalent representations compared to controls, both during pregnancy vs. 3 months postpartum. Furthermore, a high prevalence of disengaged representations was observed in ART fathers (Agostini et al., 2009). However, that study lacked a sample of SC fathers for more complete comparisons.

Given the emotional challenges related to the transition to parenthood after ART pregnancies, the study of parental representations is useful for the advancement of this field of research and for the improvement of clinical practice. Previous literature underlined how infertility and ART treatments may impair both women's and men's affective states, possibly mental representations too, in terms of perceiving themselves as not able to fulfill one's generative role, with low self-esteem and low self-confidence (Hammarberg et al., 2008; Ladores and Aroian, 2015; Alamin et al., 2020; Ranjbar et al., 2020).

Therefore, the aim of the present study was to investigate the quality of parental mental representations during pregnancy and after delivery in ART parents, in comparison with SC parents. Specifically, we aimed to answer to the following research questions: (1) Do mental representations in the perinatal period differ depending on both conceiving method (ART vs. SC), parental role (mother vs. father) and time of assessment (at 3rd trimester of pregnancy vs. 3 months postpartum)? (2) Are the characteristics of mental representations in ART parents influenced by variables pertaining ART treatment, such as cause of infertility, presence of previous ART attempts, and treatment type?

MATERIALS AND METHODS

Participants

Seventeen couples who conceived through ART (M_{age} = 38.6, SD = 5.7) and 25 SC couples (M_{age} = 33.5, SD = 4.7) were recruited at the Santa Maria Nuova Hospital in Reggio Emilia (Italy). A retrospective examination of the adequacy of the number of participants for repeated measure ANOVA was run through the software G*Power 3.1. Repeated measure ANOVAs with within-between interactions, two assessment points and four groups (i.e., ART vs. SC and mothers vs. fathers) were considered in order to calculate the achieved power. A total sample size of 84 participants reached a power of 0.97 which is conventionally deemed to be satisfactory (Faul et al., 2009).

Inclusion criteria for ART and SC couples were: good understanding of the Italian language, absence of any major complications during pregnancy and at childbirth (including preterm births), neonatal or maternal severe disease in the perinatal period. Specific additional inclusion criteria for the ART group were: maternal age lower than 44 years (in accordance with the Hospital guidelines for ART treatments), and having a successful IVF/ICSI cycle using fresh and ejaculated sperm.

Procedure

This study was part of a wider longitudinal study, involving both ART and SC couples from 20 gestational weeks up to 10 months postpartum. In this paper, we only present data regarding 32 weeks of pregnancy and 3 months after childbirth.

Couples were contacted by a psychologist of the Hospital in occasion of the morphological ultrasound visit, at around 20 gestational weeks. At enrollment, participants were given detailed information on the study aims and protocol, and were asked to sign an informed consent form. Participation was voluntary and anonymous. At both 32 gestational weeks (T1) and 3 months after birth (T2), all couples who agreed to participate received an envelope containing a questionnaire booklet, for the assessment of parental representations (through the Semantic Differential) and depression, anxiety, prenatal attachment, social support through other instruments; the couples also received an additional envelope for returning the material. The study was conducted according to the Helsinki Declaration, though it was not submitted to the Ethics committee of the Hospital because at the time of data collection the Italian law for non-interventional study did not require it.

Measures

Demographic and Obstetric Variables

A questionnaire was created to collect parental demographic characteristics (e.g., age, level of education, current employment) and obstetric variables (e.g., number of previous pregnancies and deliveries). Additionally, ART participants were asked to provide information about their ART history (number of previous ART attempts, treatment type, and cause of infertility).

Parental Representations

The Semantic Differential of the IRMAG (Interview of Maternal Representations During Pregnancy; Ammaniti et al., 1992, 1995, 2006) and of the IRPAG (Interview of Paternal Representations During Pregnancy; Ammaniti et al., 2006) was used to assess parental mental representations during pregnancy and after childbirth. This instrument is generally used for research goals as a self-report and independently from the interview (Pajulo et al., 2001, 2004). The semantic differentials of IRMAG have already been used in previous studies including psychosocial and depressive risk (Pajulo et al., 2001; Ammaniti et al., 2013), single mothers (Wendland and Miljkovitch, 2003), drug abusing mothers (Flykt et al., 2012), couples with prenatal diagnosis of fetal anomaly (Giuliani et al., 2014).

The Semantic Differential explores five dimensions of parenthood experiences in terms of mental representations regarding: the child, self-as-woman/man, partner (individual characteristics), self-as-mother/father and own mother/father characteristics (parental characteristics). Each dimension is measured through a list of 17 pairs of opposite adjectives (e.g., self-confident/insecure, calm/anxious, joyful/serious, permissive/authoritarian) placed at one and the other end of a horizontal line (10 cm long), so that respondents are required to

mark the point from 0 to 10 that best indicates their description. For each pair of adjectives, a score of 10 corresponds to the more positively-laden adjective. Global scores for each dimension were computed by averaging the scores obtained at the relevant adjective list, so that a higher score corresponds to a more positive representation.

Other specific scores were calculated, according to four areas based on factorial analyses as identified by Ammaniti et al. (1995). For what concerns the representations of individual characteristics (dimensions of child, self-as-woman/man and partner), four areas were calculated: Personal functioning, Interpersonal style, Emotional tendencies, Content of impulses. Regarding parental characteristics (dimensions of self-as-mother/father and own mother/father's characteristics), the following four areas were considered: Personal functioning, Maternal/paternal role, Maternal/paternal interaction and sensitivity and Emotional tendencies.

Statistical Analysis

Demographic and obstetric data were compared between ART and SC parents using Pearson's χ^2 test and Student's *t* test for independent samples for nominal and continuous variables, respectively.

To examine mean-level differences between parents who conceived through ART and parents who conceived spontaneously, a series of repeated-measures analyses of variance (ANOVAs) were conducted. Each model included two between-subject variables (conception modality: ART vs. SC; parental role: mother vs. father), and time of assessment (T1 vs. T2) as a within-subject variable. Single ANOVAs were run for every dimension of the semantic differential and the relative four representation areas pertaining either individual (Child, Self, and Partner) and parental (Self-as-mother/father, Own parent) characteristics.

The same analytic strategy was used to explore differences within the sample of ART conceiving parents. The variables parental role (mother vs. father) and time of assessment (T1 vs. T2) were taken into account together with one among the following between-subject factors: presence of previous unsuccessful ART attempts (yes vs. no), treatment type (IVF vs. ICSI), or cause of infertility (female factor vs. male factor).

All statistical analyses were performed using SPSS (version 25) for Windows (IBM, Armonk, NY, United States). In all statistical tests, a *P* value of less than 0.05 was considered significant.

RESULTS

Demographic and Obstetric Characteristics

Differences in demographic and obstetric variables between ART and SC parents are shown in **Table 1**. Overall, all parents were employed and married, and 90% of them was born in Italy. The only statistically significant demographic difference between parents was in age, as mothers and fathers who conceived through ART were older compared to their Spontaneous counterparts [$F(1,84) = 7.5$, $p < 0.001$]. Such result is in line with data coming from both the last report on fertility of the Italian National Institute for Statistics (Istituto Nazionale di Statistica [ISTAT, Italian National Institute for Statistics], 2018; Registro Nazionale sulla Procreazione Medicalmente Assistita [National Assisted Reproduction Registry of Italy], 2017). With regards to obstetric variables, ART babies had a lower weight at birth compared to SC babies ($t = 2.48$, $p < 0.05$).

With respect to ART parents, data regarding infertility history showed that the prevalent cause of infertility was due to a male factor ($n = 18$; 52.9%; e.g., varicocele), followed by a female factor ($n = 16$; 47.1%), related either to women's age ($n = 8$; 50%; e.g., low AMH values) or endometriosis ($n = 8$; 50%). The majority of our sample ($n = 22$; 64.7%) achieved pregnancy with ICSI, while the remaining couples achieved pregnancy through IVF ($n = 12$; 35.3%). Most participants were at their first ART attempt ($n = 20$; 58.8%), with number of previous ART attempts for the overall sample ranging from 0 to 4 ($M = 0.88$, SD = 1.3).

Semantic Differentials Dimensions in ART and Spontaneous Conceiving Parents

Detailed presentations of the results from repeated measures ANOVAs on semantic differentials and the four representation areas for individual and parental characteristics are shown in **Tables 2**, **3**, respectively.

Child

Results on the scores of the Child dimension for ART and Spontaneous parents at T1 and T2 showed a main effect of the variable conception modality [$F(1,80) = 6.01$; $p < 0.05$; partial $\eta^2 = 0.07$], while no parental role [$F(1,80) = 0.44$; $p = 0.51$; partial $\eta^2 = 0.01$] nor time-point effect [$F(1,80) = 0.28$; $p = 0.60$; partial $\eta^2 = 0.00$] and no interaction effects (all *p*s = n.s.) were found. ART parents had overall significantly higher (i.e., more positive representations; $M = 7.51$, SD = 0.96, and $M = 7.50$, SD = 0.97, at T1 and T2, respectively) scores than SC parents ($M = 7.12$, SD = 0.88, and $M = 7.04$, SD = 0.83, at T1 and T2, respectively) on the Child dimension irrespectively of parental role.

With respect to the four representations areas, the only significant result was obtained for Interpersonal Style where an interaction effect time of assessment conception modality [$F(1,80) = 6.65$; $p < 0.05$; partial $\eta^2 = 0.08$] was found: scores for ART parents increased from T1 to T2, while those for SC parents decreased (**Table 3**).

Self-as-Woman/Man

Results on the scores of the Self-as-woman/man dimension for ART and SC parents showed a main effect of the variable time of assessment [$F(1,80) = 4.90$; $p < 0.05$; partial $\eta^2 = 0.06$], while no conception modality [$F(1,80) = 1.06$; $p = 0.31$; partial $\eta^2 = 0.01$] nor parental role [$F(1,80) = 0.03$; $p = 0.85$; partial $\eta^2 = 0.00$], and no interaction effects were found (all *p*s = n.s.). Particularly, for each sub-group there was a significant improvement (i.e., more positive representations) of the representation of the Self from T1 to T2 ($M = 7.39$, SD = 0.96 at T1, and $M = 7.65$, SD = 1.20 at T2, for ART parents; $M = 7.24$, SD = 0.87 at T1, and $M = 7.41$, SD = 0.88 at T2, for SC parents).

TABLE 1 | Main demographic and obstetric characteristics in ART and Spontaneous conceiving (SC) parents.

	ART (*N* = 34)			SC (*N* = 50)			
	Fathers (*N* = 17)	Mothers (*N* = 17)	Total (*N* = 34)	Fathers (*N* = 25)	Mothers (*N* = 25)	Total (*N* = 50)	*p* value
Demographic characteristics							
Mean age in years (SD)	39.7 (7.2)	37.5 (3.6)	38.6 (5.7)	34.4 (4.8)	32.7 (4.6)	33.5 (4.7)	0.001
Place of birth, *n* (%)							0.461
Italy	15 (88.2)	15 (88.2)	30 (88.2)	23 (92)	23 (92)	46 (92)	
Abroad	2 (11.8)	2 (11.8)	4 (11.8)	2 (8)	2 (8)	4 (8)	
Level of education, *n* (%)							0.187
Secondary school	3 (17.7)	2 (11.7)	5 (14.7)	5 (20)	2 (8)	7 (14)	
High school	9 (52.9)	7 (41.2)	16 (47.1)	11 (44)	8 (32)	19 (38)	
University	5 (29.4)	8 (47.1)	13 (38.2)	9 (36)	15 (60)	24 (48)	
Obstetric characteristics							
Type of delivery, *n* (%)							
Natural childbirth			10 (58.8)			19 (79.2)	0.148
Caesarian section			7 (41.2)			5 (41.7)	
Mean gestational age at birth in weeks (SD)			38.7 (3.2)			39.1 (1.5)	0.065
Mean birth weight in grams (SD)			2999 (0.62)			3406 (.41)	0.018
Sex, *n* (%)							
Male			6 (35.3)			16 (64)	0.067
Female			11 (64.7)			9 (36)	

With respect to the four representations, a significant interaction assessment × conceiving method × parental role [$F(1,80) = 4.32$; $p < 0.05$; partial $\eta^2 = 0.05$] was obtained for Personal Functioning: **Table 3** shows that while for ART fathers and SC mothers scores at this dimension increased from T1 to T2, for ART mothers and SC fathers they remained almost unvaried. Additionally, a significant interaction conception modality × parental role [$F(1,80) = 4.33$; $p < 0.05$; partial $\eta^2 = 0.05$] was found for Emotional Tendencies; while in the case of ART parents, fathers had higher scores compared to mothers ad this dimension, the opposite pattern could be observed for SC couples. Regarding Interpersonal style, a main effect of parental role [$F(1,80) = 4.10$; $p < 0.05$; partial $\eta^2 = 0.05$] indicated higher scores for mothers compared to fathers, irrespectively of conception modality. No significant result for Content of Impulses was observed (all *p*s = n.s.).

Partner

Results on the scores of the Partner-dimension showed no main significant effects, neither for the variable conception modality [$F(1,80) = 2.51$; $p = 0.11$; partial $\eta^2 = 0.03$], nor for parental role [$F(1,80) = 0.30$; $p = 0.58$; partial $\eta^2 = 0.00$], nor for time of assessment [$F(1,80) = 3.67$; $p = 0.06$; partial $\eta^2 = 0.04$]. Only an interaction effect of the variable time of assessment × conception modality was found [$F(1,80) = 4.41$; $p < 0.05$; partial $\eta^2 = 0.06$]. As depicted in **Table 3**, while for ART parents the means and standard deviations at this dimension remained almost stable over time, for SC parents there was an improvement of the scores (i.e., more positive representations) from T1 to T2.

Regarding the four representations for this dimension, a main effect of assessment [$F(1,80) = 6.46$; $p < 0.08$; partial $\eta^2 = 0.05$] was obtained for Personal Functioning, with overall scores improving from T1 to T2 irrespectively of parental role and conception modality. Yet, a main effect of parental role was found for both Emotional Tendencies [$F(1,80) = 14.85$; $p < 0.001$; partial $\eta^2 = 0.16$] and Interpersonal Style [$F(1,80) = 4.10$; $p < 0.05$; partial $\eta^2 = 0.05$]: while in the first case mothers reported better representations of their partners compared to fathers, irrespectively of conception modality, the opposite pattern was observed for Interpersonal Style. No significant results were detected for Content of Impulses (all *p*s = n.s.).

Self-as-Mother/Father

Differences on the Self-as-parent dimension scores for ART and SC parents were non-significant for all the variables included in the model, namely conception modality [$F(1,80) = 1.75$; $p = 0.19$; partial $\eta^2 = 0.02$], parental role [$F(1,80) = 1.16$; $p = 0.28$; partial $\eta^2 = 0.02$], and time of assessment [$F(1,80) = 1.33$; $p = 0.25$; partial $\eta^2 = 0.02$], as well as for their interactions (all *p*s = n.s.).

With respect to the four representations areas for this dimension, a significant interaction effect assessment × parental role [$F(1,80) = 6.12$; $p < 0.05$; partial $\eta^2 = 0.07$] was obtained for Personal role, indicating an increase at the scores for this dimension from T1 to T2 for mothers only, irrespectively of conception modality. Additionally, an interaction effect conception modality × parental role [$F(1,80) = 4.79$; $p < 0.05$; partial $\eta^2 = 0.06$] was found for Emotional Tendencies, with SC fathers reporting the lowest scores compared to SC mothers and ART mothers and fathers (see **Table 3**). A main effect of assessment [$F(1,80) = 9.15$; $p < 0.01$; partial $\eta^2 = 0.11$] resulted for Parental role and showing an increase at this dimension from T1 to T2 for all parents, irrespectively of conception modality. Last, a main effect of conception modality [$F(1,80) = 4.27$; $p < 0.05$; partial $\eta^2 = 0.05$] was found for the area Parental Interaction and Sensitivity, showing significantly higher scores for ART compared to SC parents irrespectively of parental role.

TABLE 2 | Means ± Standard Deviations for each dimension of the Semantic Differentials in ART (*N* = 34) and SC (*N* = 50) parents at 32 gestational weeks and 3 months after delivery.

	ART						SC					
	Fathers		Mothers		Total		Fathers		Mothers		Total	
Dimensions	**T1**	**T2**	**T1**	**T2**	**T1**	**T2**	**T1**	**T2**	**T1**	**T2**	**T1**	**T2**
Child	7.49 ± 1.05	7.47 ± 0.98	7.54 ± 0.89	7.51 ± 0.98	7.52 ± 0.96	7.49 ± 0.97	7.09 ± 0.95	6.89 ± 0.82	7.16 ± 0.81	7.19 ± 0.81	7.12 ± 0.88	7.04 ± 0.83
Self-as-woman/man	7.53 ± 0.97	7.82 ± 0.94	7.25 ± 0.97	7.48 ± 1.43	7.39 ± 0.96	7.65 ± 1.20	7.16 ± 0.87	7.25 ± 0.75	7.31 ± 0.89	7.57 ± 0.98	7.24 ± 0.87	7.41 ± 0.88
Partner	7.75 ± 1.10	7.70 ± 1.09	7.71 ± 1.16	7.70 ± 0.86	7.73 ± 1.11	7.71 ± 0.98	7.10 ± 1.03	7.44 ± 0.98	7.32 ± 0.89	7.70 ± 1.02	7.21 ± 0.96	7.57 ± 1.00
Self-as-parent	7.33 ± 0.90	7.36 ± 0.79	7.10 ± 0.71	7.38 ± 0.65	7.21 ± 0.81	7.37 ± 0.71	6.94 ± 1.34	6.75 ± 0.82	7.11 ± 0.81	7.50 ± 0.81	7.02 ± 1.09	7.13 ± 0.89
Own parent	6.46 ± 1.42	6.61 ± 1.43	6.67 ± 1.48	6.66 ± 1.60	6.57 ± 1.43	6.64 ± 1.50	6.26 ± 1.51	6.12 ± 1.40	6.92 ± 1.41	6.93 ± 1.75	6.60 ± 1.48	6.53 ± 1.62

ART, assisted reproductive treatments; T1, 32 gestational weeks; T2, 3 months after delivery.

Own Parent (Mother/Father)

No significant differences emerged for this dimension between ART and SC parents depending on conception modality [$F(1,80) = 0.02$; $p = 0.88$; partial $\eta^2 = 0.00$], parental role [$F(1,80) = 1.78$; $p = 0.19$; partial $\eta^2 = 0.02$], time of assessment [$F(1,80) = 0.01$; $p = 0.98$; partial $\eta^2 = 0.00$], and their interactions (all *p*s = n.s.).

With respect to the four representation areas, no significant main and interaction effects were detected (all *p*s = n.s.).

Semantic Differential Dimensions Within the Sample of ART Conceiving Parents

Table 4 presents means and standard deviations for each of the ANOVA models testing the differences from 32 gestational weeks to 3 months after delivery within the sample of ART conceiving parents. Overall, all tested models did not show significant effects (all *p*s = n.s.) for the variables time of assessment (T1 vs. T2) and parental role (mother vs. father).

With regards to the variable cause of infertility (female factor vs. male factor), only a significant interaction time of assessment × cause of infertility emerged on the dimension Own Parent [$F(1,27) = 5.55$; $p < 0.05$; partial $\eta^2 = 0.17$]: scores improved from T1 to T2 for parents with an infertility diagnosis due to male factors, while the opposite pattern emerged for those parents with an infertility diagnosis due to female factors (**Table 4**). In all other dimensions no significant differences were observed (all *p*s = n.s.).

For what concerns the variable previous ART attempts (yes vs. no), a significant interaction effect parental role × time of assessment × previous ART attempt emerged on the Self-as-woman/man dimension [$F(1,27) = 4.20$; $p < 0.05$; partial $\eta^2 = 0.12$]. Specifically, an improvement from T1 to T2 was observed in fathers with no previous ART attempts, while the same pattern was observed only in mothers who already had previous ART attempts. No significant differences emerged on other dimensions (all *p*s = n.s.).

When the variable treatment type (IVF vs. ICSI) was considered, a main effect emerged on the Self-as-woman/man dimension [$F(1,28) = 6.31$; $p < 0.05$; partial $\eta^2 = 0.18$], revealing more positive representations for those parents who conceived with IVF compared to ICSI, irrespectively of parental role and time of assessment ($M = 7.12$, SD = 0.80 at T1, and $M = 7.27$, SD = 0.99 at T2, for ICSI; $M = 7.66$, SD = 1.01 at T1, and $M = 8.33$, SD = 1.40 at T2, for IVF). No significant effect on any other dimensions emerged (all *p*s = n.s.).

DISCUSSION

The main aim of the present study was to deepen the knowledge on the transition to parenthood for infertile parents who underwent ART in order to conceive, specifically investigating the characteristics of parental representations.

Despite the psychological burden of infertility and ART (Hammarberg et al., 2008), little is known about the psychological experienced by infertile couples transitioning to parenthood in terms of mental representations about themselves as parents and

TABLE 3 | Means ± Standard Deviations for the four representation areas for individual and parental characteristics in ART (*N* = 34) and SC (*N* = 50) parents at 32 gestational weeks and 3 months after delivery.

	ART						SC					
	Fathers		Mothers		Total		Fathers		Mothers		Total	
	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2
Individual characteristics												
Personal functioning												
Child	44.33 ± 7.17	43.16 ± 10.57	42.33 ± 6.50	43.73 ± 5.67	43.33 ± 6.81	43.45 ± 8.36	41.21 ± 6.34	40.42 ± 5.16	41.82 ± 5.54	40.72 ± 4.99	41.51 ± 5.90	40.57 ± 5.03
Self-as-woman/man	42.49 ± 8.85	45.32 ± 5.55	42.87 ± 8.10	42.56 ± 6.79	42.68 ± 8.36	43.94 ± 6.26	41.97 ± 8.37	41.09 ± 6.14	40.70 ± 7.27	42.00 ± 5.92	41.02 ± 7.81	41.55 ± 5.98
Partner	43.98 ± 9.60	46.91 ± 8.25	45.54 ± 7.24	45.97 ± 5.53	44.74 ± 8.44	46.46 ± 6.97	40.94 ± 6.45	42.87 ± 6.47	43.36 ± 6.62	45.09 ± 7.31	42.25 ± 6.58	43.98 ± 6.92
Interpersonal style												
Child	21.86 ± 4.99	24.12 ± 4.11	22.98 ± 4.41	22.76 ± 3.88	22.42 ± 4.67	23.44 ± 3.99	21.54 ± 3.84	20.03 ± 3.59	23.05 ± 4.57	21.14 ± 3.92	22.29 ± 4.25	20.59 ± 3.76
Self-as-woman/man	22.40 ± 4.18	23.18 ± 4.18	24.33 ± 9.54	26.68 ± 17.11	23.37 ± 7.31	24.93 ± 12.39	21.43 ± 4.39	22.72 ± 3.07	23.52 ± 3.58	24.50 ± 3.42	22.47 ± 4.10	23.61 ± 3.34
Partner	23.49 ± 4.46	24.09 ± 4.08	23.71 ± 4.73	22.79 ± 5.94	23.60 ± 4.53	23.46 ± 5.03	22.02 ± 4.17	22.47 ± 3.84	22.83 ± 4.72	23.78 ± 5.90	22.43 ± 4.43	23.13 ± 4.97
Emotional tendencies												
Child	38.33 ± 5.03	36.70 ± 4.63	38.58 ± 5.61	37.99 ± 5.77	38.45 ± 5.25	37.35 ± 5.19	36.97 ± 5.22	35.07 ± 4.97	38.10 ± 4.96	37.49 ± 5.50	37.53 ± 5.07	36.28 ± 5.33
Self-as-woman/man	39.30 ± 5.38	38.31 ± 5.67	36.03 ± 5.37	36.79 ± 5.15	37.66 ± 5.54	37.55 ± 5.39	35.46 ± 5.88	36.70 ± 5.74	37.84 ± 4.30	38.17 ± 4.61	36.65 ± 5.24	37.44 ± 5.02
Partner	37.78 ± 5.13	38.09 ± 5.25	39.93 ± 5.05	39.72 ± 5.22	38.82 ± 5.13	38.88 ± 5.22	34.17 ± 5.71	35.17 ± 4.28	39.97 ± 5.03	40.74 ± 4.74	37.07 ± 6.08	37.95 ± 5.28
Content of impulses												
Child	20.34 ± 3.81	20.77 ± 3.84	21.62 ± 3.52	20.45 ± 4.72	20.98 ± 3.67	20.61 ± 4.24	21.20 ± 4.19	20.85 ± 2.85	19.32 ± 3.07	20.31 ± 3.87	20.21 ± 3.74	20.58 ± 3.38
Self-as-woman/man	23.97 ± 3.30	23.12 ± 4.02	21.86 ± 3.43	21.85 ± 2.80	22.92 ± 3.48	22.48 ± 3.47	21.13 ± 3.30	22.13 ± 3.03	21.11 ± 3.92	22.27 ± 4.47	21.12 ± 3.58	22.20 ± 3.78
Partner	22.66 ± 3.90	21.72 ± 4.10	23.96 ± 3.44	22.78 ± 2.47	23.39 ± 3.67	22.23 ± 3.40	21.56 ± 5.30	22.30 ± 4.43	21.05 ± 4.02	21.99 ± 3.63	21.30 ± 4.66	22.14 ± 4.01
Parental characteristics												
Emotional tendencies												
Self-as-parent	23.79 ± 3.37	23.67 ± 3.26	23.22 ± 3.35	23.05 ± 4.28	23.51 ± 3.32	23.36 ± 3.75	22.13 ± 3.22	22.72 ± 2.88	23.76 ± 3.27	25.60 ± 3.33	22.96 ± 3.31	24.19 ± 3.41
Own parent	23.28 ± 4.71	22.67 ± 4.68	20.01 ± 5.34	19.76 ± 6.18	21.54 ± 5.22	21.17 ± 5.62	19.10 ± 6.49	19.87 ± 5.08	21.35 ± 5.55	21.05 ± 6.64	20.22 ± 6.08	20.46 ± 5.88
Personal functioning												
Self-as-parent	36.89 ± 5.95	36.62 ± 6.65	35.61 ± 4.15	37.69 ± 4.12	36.25 ± 5.09	37.16 ± 4.90	32.89 ± 5.89	32.45 ± 4.41	35.34 ± 6.93	38.47 ± 5.54	34.14 ± 6.49	35.53 ± 5.82
Own parent	32.49 ± 9.36	33.37 ± 11.52	34.04 ± 8.92	33.66 ± 9.90	33.29 ± 9.03	33.52 ± 10.55	29.75 ± 8.95	28.32 ± 8.39	35.91 ± 10.48	36.02 ± 9.48	32.83 ± 10.13	32.17 ± 9.67
Parental role												
Self-as-parent	14.59 ± 3.10	15.45 ± 3.24	15.22 ± 2.27	16.11 ± 2.85	14.91 ± 2.91	15.78 ± 3.03	14.16 ± 2.56	15.05 ± 2.98	14.85 ± 2.87	16.47 ± 2.15	14.52 ± 2.72	15.77 ± 2.66
Own parent	14.27 ± 3.65	14.58 ± 4.11	14.34 ± 3.95	13.76 ± 4.30	14.31 ± 3.75	14.16 ± 4.17	12.99 ± 3.75	14.31 ± 3.65	14.50 ± 3.75	14.28 ± 4.87	13.74 ± 3.79	14.29 ± 4.26
Parental interaction and sensitivity												
Self-as-parent	35.35 ± 5.38	35.94 ± 5.63	34.63 ± 3.54	35.50 ± 4.18	34.99 ± 4.50	35.72 ± 4.89	32.43 ± 5.27	31.56 ± 4.60	34.43 ± 5.88	35.49 ± 5.34	33.45 ± 5.62	33.57 ± 5.32
Own parent	31.72 ± 9.54	33.03 ± 7.65	33.71 ± 8.25	33.16 ± 8.71	32.74 ± 8.81	33.10 ± 8.09	31.19 ± 8.73	30.57 ± 7.83	35.14 ± 6.55	35.42 ± 10.70	33.17 ± 7.89	33.00 ± 9.59

ART, assisted reproductive treatments; T1 = 32 gestational weeks; T2 = 3 months after delivery.

TABLE 4 | Means ± Standard Deviations for each dimension of the Semantic Differential in ART conceiving parents at 32 gestational weeks and 3 months after delivery by infertility cause, previous ART attempts, and treatment type.

	Infertility cause				Previous ART attempts				Treatment type			
	Male factor		Female factor		Yes		No		IVF		ICSI	
Dimensions	**T1**	**T2**	**T1**	**T2**	**T1**	**T2**	**T1**	**T2**	**T1**	**T2**	**T1**	**T2**
Child												
Fathers	7.41 ± 0.91	7.59 ± 0.91	7.43 ± 1.25	7.17 ± 1.09	7.14 ± 1.05	7.07 ± 0.97	7.81 ± 1.00	7.83 ± 0.90	7.50 ± 1.08	7.79 ± 0.98	7.39 ± 1.07	7.24 ± 0.98
Mothers	7.33 ± 0.74	7.58 ± 0.95	7.58 ± 0.92	7.30 ± 1.10	7.40 ± 0.90	7.38 ± 1.16	7.67 ± 0.92	7.62 ± 0.85	7.96 ± 0.83	7.50 ± 1.19	7.20 ± 0.71	7.44 ± 0.96
Total	7.37 ± 0.81	7.58 ± 0.91	7.50 ± 1.06	7.23 ± 1.05	7.27 ± 0.95	7.22 ± 1.04	7.74 ± 0.93	7.72 ± 0.85	7.72 ± 0.94	7.64 ± 1.03	7.30 ± 0.89	7.34 ± 0.95
Self-as-woman/man												
Fathers	7.27 ± 0.85	7.72 ± 0.94	7.70 ± 1.08	7.89 ± 1.04	7.51 ± 0.84	7.56 ± 1.02	7.54 ± 1.12	8.05 ± 0.84	7.62 ± 1.11	8.21 ± 0.89	7.38 ± 0.92	7.60 ± 0.96
Mothers	6.94 ± 0.63	7.02 ± 1.03	7.35 ± 1.03	7.90 ± 1.80	7.15 ± 0.77	7.92 ± 1.63	7.34 ± 1.15	7.09 ± 1.18	7.70 ± 1.02	8.44 ± 1.89	6.86 ± 0.59	6.93 ± 0.93
Total	7.10 ± 0.75	7.37 ± 1.02	7.52 ± 1.03	7.89 ± 1.41	7.33 ± 0.81	7.74 ± 1.33	7.44 ± 1.11	7.57 ± 1.11	7.66 ± 1.01	8.33 ± 1.40	7.11 ± 0.80	7.27 ± 0.99
Partner												
Fathers	7.55 ± 0.84	7.64 ± 1.06	7.75 ± 1.29	7.55 ± 1.12	7.47 ± 0.64	7.41 ± 1.15	8.00 ± 1.38	7.96 ± 1.05	7.77 ± 1.49	7.87 ± 1.32	7.57 ± 0.82	7.47 ± 0.95
Mothers	7.26 ± 1.28	7.70 ± 1.01	7.96 ± 0.73	7.84 ± 0.80	7.70 ± 0.85	7.47 ± 0.78	7.73 ± 1.41	7.93 ± 0.92	8.51 ± 0.64	8.06 ± 0.55	7.31 ± 1.17	7.61 ± 1.01
Total	7.42 ± 1.04	7.67 ± 1.01	7.85 ± 1.01	7.69 ± 0.95	7.57 ± 0.72	7.44 ± 0.96	7.87 ± 1.36	7.95 ± 0.96	7.96 ± 1.10	7.97 ± 0.96	7.45 ± 0.98	7.54 ± 0.95
Self-as-parent												
Fathers	7.40 ± 0.78	7.49 ± 0.69	7.08 ± 1.03	7.23 ± 0.99	7.60 ± 0.96	7.42 ± 0.90	7.08 ± 0.81	7.32 ± 0.73	6.99 ± 0.99	7.42 ± 0.95	7.38 ± 0.84	7.35 ± 0.79
Mothers	6.73 ± 0.61	7.30 ± 0.72	7.43 ± 0.60	7.36 ± 0.54	7.30 ± 0.65	7.34 ± 0.75	6.92 ± 0.76	7.42 ± 0.60	7.30 ± 0.82	7.18 ± 0.52	6.92 ± 0.62	7.39 ± 0.69
Total	7.06 ± 0.76	7.39 ± 0.69	7.26 ± 0.83	7.29 ± 0.77	7.45 ± 0.81	7.38 ± 0.80	7.01 ± 0.77	7.37 ± 0.65	7.15 ± 0.87	7.30 ± 0.73	7.50 ± 0.76	7.37 ± 0.72
Own parent												
Fathers	6.67 ± 1.19	6.94 ± 1.12	6.03 ± 1.66	6.01 ± 1.61	6.93 ± 1.65	7.07 ± 1.58	6.10 ± 1.17	6.26 ± 1.27	6.42 ± 1.16	6.48 ± 1.23	6.35 ± 1.58	6.51 ± 1.55
Mothers	6.23 ± 1.59	6.86 ± 1.74	7.01 ± 1.26	6.19 ± 1.44	6.71 ± 1.67	6.17 ± 1.90	6.64 ± 1.39	7.11 ± 1.22	7.33 ± 1.16	6.38 ± 1.57	6.23 ± 1.51	6.65 ± 1.68
Total	6.44 ± 1.39	6.90 ± 1.43	6.52 ± 1.51	6.10 ± 1.48	6.82 ± 1.61	6.59 ± 1.76	6.37 ± 1.28	6.89 ± 1.28	6.87 ± 1.19	6.43 ± 1.33	6.28 ± 1.51	6.59 ± 1.58

ART, assisted reproductive treatments; T1 = 32 gestational weeks; T2 = 3 months after delivery; IVF, in vitro fertilization; ICSI, intracytoplasmic sperm injection.

their baby. Parental representations are predictive for the quality of early parenting behaviors (Zeanah and Benoit, 1995), therefore their investigation in the context of ART parenthood may have potential practical implications for the prevention and treatment of the psychological consequences of conceiving after infertility.

With regards to our first research question, present findings show that the conceiving method had a significant effect on the global representation of the child, but not on the other four dimensions of the Semantic Differential. Indeed, ART parents had more positive representations of their child compared to SC parents, irrespectively of parental role and time of assessment (before or after birth). In previous literature, Pajulo et al. (2004) found that representations of the child were more positive in the case of planned pregnancy, suggesting that these parents were somehow more prepared for the changes required by the arrival of the baby. In our case, ART conception usually occurs after several emotional challenges related to infertility and after a long period of attempts of conceiving through ART (Hammarberg et al., 2008; Flykt et al., 2011); our result may be placed along the lines of a possible and natural mechanism of idealization of parenthood and of the long-awaited child. Previous literature questioned if overly positive representations may act as positive or risk factors for parenting; they could reflect a tendency to maintain inflexible views of the child, which are difficult to change (Flykt et al., 2012), as observed in studies on high-risk samples (Mazzoni, 1992; Ammaniti et al., 1995), or a tendency to be more sensitive and attuned to the baby's needs, as shown by the good quality observed in ART mother-infant interactions (Tallandini et al., 2012). More longitudinal studies are needed to clarify this issue. The high scores at Child dimension especially emerged in Interpersonal style area, where ART parents' representations improved from pregnancy to postpartum, while those of SC parents decreased. Because this scale included item such as acceptance, sociability and independency, it could reveal how ART parents further improve their representation of the child after delivery, while SC parents would probably express more the need to adjust to the baby's arrival.

For what pertains Self-as-woman/man dimension, we found a significant improvement in the passage from pregnancy to 3 months after childbirth, irrespectively of conception modality. Overall, the birth of the baby seems to enrich the positive representation about oneself (Ammaniti et al., 1992; Ilicali and Fisek, 2004), and this evidence may be in line with a possible cultural mandate and the resulting expectation that adult women and men should become parent (Langher et al., 2019). Despite this improvement was observed in all parents, scores at Personal functioning area significantly increased from pregnancy to postpartum period only for ART fathers and SC mothers. The improvement in SC mothers during postpartum period is in line with the literature underlining how the childbirth and the presence of the baby are generally rewarding for the mothers, giving confirmation of their adequacy (Ammaniti et al., 1992; Stern, 1995). This increase did not emerge for ART mothers, because their scores were already high since pregnancy; they probably felt themselves as adequate since the conception, perceived as a success after infertility diagnosis (Hammarberg et al., 2008). For what concern fathers, some specific considerations could be given. Indeed, if we refer to the gender attitude toward parenting in SC pregnancies, men are expected more to provide physical support to the infant and to the partner, being also more oriented to the larger family context, while women are more responsible for affective and emotional caregiving (Winnicott, 1958; Russell et al., 1998). This explanation is consistent with the low scores obtained by SC fathers in Personal functioning both in pregnancy and in postpartum period. Moreover, it could also explain why SC fathers represented themselves with low scores in Emotional tendencies area.

Interestingly, ART fathers showed both an increase in Personal functioning and constant high scores at Emotional tendencies. The more active role played in trying to achieve a conception through ART and the long waiting for a child could explain the higher level of personal involvement since pregnancy (El Kissi et al., 2013; Monti et al., 2015).

Taken together, these results suggested that the representation of Self-as-woman/man could be different in ART and SC parents, especially for men.

Differences between ART and SC parents also emerged regarding the Partner dimension, where only SC parents showed a significant improvement in overall representations from 32 weeks of pregnancy to 3 months postpartum. According to the literature of couple adjustment during the transition to parenthood, results suggest that positive changes in the representations of the partner are gradually activated and achieved in postpartum period, so that the parental couple jointly adapts to the new parental role, while this transition could be affected by the complexity and emotional challenges of conception achieved through ART attempts (Darwiche et al., 2015).

According to Self-as-parent dimension, the effect of conception modality did not emerge for the overall representations, even if it did show a difference for the Parental Interaction and Sensitivity area: ART parents showed higher scores compared to SC parents, suggesting a better representation of their ability to interact with their baby. This result could be explained considering two elements. First, a tendency to idealize and invest on both the baby and the relationship with her/him, that should return to parent the efforts spent into conceiving (Hammarberg et al., 2008). Second, studies investigating the quality of early interactions between ART parent and infant, by using observative tools, have often shown not enough sensitive and adequate patterns (La Sala et al., 2004; Cairo et al., 2012; Agostini et al., 2020). Therefore, the highly positive representations would not seem supported by the effective quality of interactive patterns and would suggest some difficulties in taking care of the "real" baby (Lier et al., 1995).

Another interesting result about Self-as-parent dimension regarded the Emotional tendencies area: SC fathers got lower scores compared to all other parents (SC mothers, ART mothers, ART fathers), suggesting again in this group a tendency to be less affectively and emotionally involved than other parents, as already emerged for SC fathers in the Emotional tendencies area for the representation of Self-as-man.

Finally, when Own parent dimension was considered, no significant effects emerged. Actually, this dimension is related to a relevant psychological process of the transition to parenthood. Indeed, during pregnancy, the work through one's childhood experiences requires to women a re-elaboration of the relationship with their own mother (Vizziello et al., 1993; Cohen and Slade, 2000) and, in parallel, in men in relation to their own father: in adequate conditions, this intrapsychic work should lead to accept and recognize being similar to own parents (Cramer, 2000). Conversely, previous studies showed that specific risk conditions (i.e., depression or drug addiction) could interfere with this process, leading future parents to see themselves more negatively and less similar to their own mothers/fathers after the childbirth (Mazzoni, 1992; Ammaniti et al., 1995). In the context of ART, representations of own parental figures could be influenced, because in most cases their own parents were able to conceive naturally. Nevertheless, all these psychological processes of identification and differentiation from own parental figures occur mostly at an unconscious level, therefore it is possible that the Semantic Differential did not detect possible significant effects. Anyway, we got interesting results when we considered specific ART variables (cause of infertility, previous ART attempts, and the treatment type) and their influence on parental representations, according to our second aim of the study.

In particular, a significant effect of the cause of infertility emerged, confirming that the infertility diagnosis (i.e., the role and contribution of female or male factors on infertility) could represent a obstacle for adequate representation of own parents. Nevertheless, while the role of maternal factor on infertility increased after childbirth, the effect of male infertility could permian and intensify in postpartum period, with a worsening of the representation. It is possible that the mothers, through the achievement of a pregnancy and giving physically birth the baby, could retrieve elements of contact with their mothers, promoting an improvement of her representation. Conversely, for men the birth of baby, despite desired, could not be enough to improve their sense of inadequacy due to infertility. However, given the absence of previous literature and the small size of our sample, these considerations should be taken with caution and confirmed by future studies.

With regards to the effects of treatment type and previous ART attempts, we found that both variables were associated to a worse representation of Self-as-woman/man, in line with already existing literature attesting the detrimental effects of these variables on psychological wellbeing (Monti et al., 2015; Moura-Ramos et al., 2016; Agostini et al., 2017, 2018) and quality of parent-infant interactions (Agostini et al., 2020). Specifically, we observed more negative representations of Self-as-woman/man in parents who underwent ICSI when compared to IVF counterparts; this might be related to the fact that, in our sample, ICSI was chosen as reproductive technique in the case of a more severe infertility diagnosis, which in turn might have negatively affected parents' self-image. Furthermore, a negative effect of previous failed ART attempts emerged, thus suggesting this variable as a potential risk factor for negative psychological outcomes, such as anxiety and depressive symptomatology (Monti et al., 2015; Moura-Ramos et al., 2016; Agostini et al., 2017, 2018; Alamin et al., 2020). Yet, parental representations improved from pregnancy to three postpartum months only in case of mothers with previous ART attempts and of fathers at their first ART cycle. This result should be further explored by future studies, specifically taking into account both parents' vulnerabilities and resilience that persist ART after failures. Taken together, our results reinforce the knowledge on the role played by variables attesting the severity of infertility over psychological functioning. At the same time, they suggest the relevance of including clinical data on infertility and ART history in future studies on pregnancies after ART. For instance, it would be important to further understand how the diagnosis of infertility as well as its severity may impact individual's and couples' transition to parenthood.

Limitations of the present investigation pertain methodological issues, as only one self-report measure was included, analyses were performed over small groups by using comparisons only (ANOVA), and parental psychological wellbeing (e.g., measures of anxiety and depression) was not included. Particularly, the small sample size did not allow more in-depth analyses. For instance, we couldn't control for the effects of relevant covariates such as age, which was significantly different between ART and SC parents, and the actual number of previous unsuccessful ART attempts, as well as the specific infertility diagnosis (e.g., azoospermia, endometriosis, and premature ovarian failure), for analyses pertaining ART sample only. Given the relevance of these variables, we suggest their inclusion in future studies with larger sample size.

Despite such limitations and the need for caution in generalizing present findings, it is important to stress that the novelty of this study relies on the focus on the longitudinal assessment of parental mental representations in ART and SC parents, both fathers and mothers. Globally, present results did not show relevant differences in mental representations between ART and SC parents. On the one hand, this may suggest that for those couples who successfully conceived after ART, according to the specific clinical characteristics of the sample, the psychological process related to the transition to parenthood may be similar to that of SC parents. On the other hand, our data put a light on some specific differences which should be addressed more in depth by future studies, in order to better identify peculiarities of the process of becoming a parent in the context of ART.

Current literature shows a dearth of published studies focusing on parental mental representations, and this is one among the few recent investigations which explored this issue, especially within the context of pregnancies after ART. It is worth mentioning that the only other published study on the same topic (Agostini et al., 2009) showed some different results. This could be explained to a certain extent by methodological issues; indeed, Agostini et al. analyzed parental representations by using the semi-structured interview, with the aim of identifying the type of parental representations; however, they did not include in their investigation neither a group of SC fathers nor the effects of clinical variables pertaining ART treatment.

Given the potential psychological consequences of infertility and ART, and considering the emotional challenges related to the transition to parenthood, further studies reinforcing present findings are recommended, as the assessment of parental representations is relevant for a more complete understanding of psychological processes in both mothers and fathers and may help clinicians in tailoring more personalized support to ART couples.

DATA AVAILABILITY STATEMENT

The datasets presented in this article are not readily available because data refer to a clinical population and therefore are confidential. Requests to access the datasets should be directed to FAn, federica.andrei2@unibo.it.

ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

MP, ET, SS, MV, and LA contributed to prepare the study design, supervised data collection, and the research team. FAn performed statistical analysis, prepared the tables, and contributed to the writing of all the sections of the manuscript. EN contributed to the writing of all the sections of the manuscript. FAg prepared the study design, supervised all the phases of the research study, and contributed to the writing of all the sections of the manuscript. All authors reviewed and approved the manuscript for publication.

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SYSTEMATIC REVIEW
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Communication of Diagnosis of Infertility: A Systematic Review

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Background: When infertility is diagnosed, physicians have the difficult task to break bad news. Their communication skills play a central role in improving patients' coping abilities and adherence to infertility treatments. However, specific guidelines and training courses on this topic are still lacking. The aim of the present study is to provide some practical advice for improving breaking bad news in infertility diagnosis through a systematic literature review of qualitative and quantitative studies.

Methods: Electronic searches were performed in the MEDLINE, Embase, PsycINFO, Cumulative Index to Nursing and Allied Health Literature (CINAHL), and Psychology and Behavioral Sciences Collection databases. All articles focusing on the communication of the diagnosis of infertility were included. The main findings of each included article were then summarized.

Results: Literature search identified 11,838 references that were screened for eligibility. Full texts of 81 articles were retrieved, and their analysis led to the inclusion of 4 articles, which treated the theme of communication of infertility only partially. The main addressed aspects concerning the communication of the infertility diagnosis were the following: (i) the value that patients give to healthcare professionals' communication skills; (ii) the importance of giving clear information on diagnostic procedures and treatments in order to decrease patients' anxiety; and (iii) the importance of involving both partners.

Conclusions: This review pointed out that the communication of the infertility diagnosis is still underinvestigated. Specific guidelines are currently not available, but other protocols could be used. Taking into account the principal aspects of communication highlighted with this review, in this study, we suggested an adaptation of the original SPIKES protocol that could be used by healthcare professionals for the communication of the infertility status.

Keywords: infertility, care, communication, counseling, prenatal care, perinatal care

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INTRODUCTION

Infertility is an extensive problem worldwide. It has been estimated that in 2010, there were 48.5 million infertile couples all over the world. Around 2 out 100 women between 24 and 44 years old suffer from primary infertility, while 10 out 100 women suffer from secondary infertility (Mascarenhas et al., 2012). In Italy, the "Istituto Superiore di Sanità" estimates that around 15% of couples suffer from infertility (Istituto Superiore di Sanità). Most couples begin to fear an infertility

issue after a few months of unsuccessful attempts to conceive. The time frame between the decision to have a child and the diagnosis of infertility is very stressful: infertility is a physical condition that has a direct impact on the individual's perception of physical integrity, on the couple functioning, and on the couple's short- and long-term life projects (Ansha Patel and Sharma, 2018). For this reason, the diagnosis of infertility has a strong impact on women' and couples' well-being. In a study of Domar et al., about 500 women with several medical conditions completed the Symptom Checklist-90-Revised (SCL-90R). The results suggest that the psychological impact of stress related to reproductive problems could be comparable to those of other long-term medical conditions such as cancer, undergoing cardiac rehabilitation, and hypertension (Domar et al., 1993).

When infertility is diagnosed, physicians have the difficult task to break bad news. However, little is known about communication in this field. The diagnosis of infertility has a strong impact *per se*, and it could be defined a "symbolic loss" and is related to an "infertility grief." The "symbolic loss" related to the diagnosis of infertility is not clear and visible to others, while other life events are clear and identifiable forms of loss, such as the death of a loved one. In other conditions, the loss is publicly recognized, and the bereaved are likely to receive support throughout their mourning. They can openly discuss their feelings of loss, and the grieving process follows cultural norms that include rituals to mitigate the grieving process (McBain and Reeves, 2019). None of this happens following a diagnosis of infertility.

Moreover, infertility diagnosis is related to many other challenges for couples: they have to decide the subsequent steps, and they have to discuss the risks and limitations related to infertility treatments with healthcare professionals. This has a deep impact on their health and quality of life: according to a literature review, women who received a diagnosis of infertility had significantly lower scores on mental health, social functioning, and emotional behavior (Chachamovich et al., 2010). It should be taken into account that infertility treatments have a poor outcome for most couples. In fact, in Italy, the percentage of live births with intrauterine insemination (IUI) over the total of assisted reproductive technology (ART) cycles is 6.9%, while with FIVET or intracytoplasmatic sperm injection (ICSI) is 11.3% (Istituto Superiore di Sanità-ISS, 2017). In this sense, sometimes, the diagnosis of infertility is not the only and last piece of bad news: for instance, people who resort to ART often receive further bad news during the diagnostic workup and the infertility treatment (reiteration of bad news) (Lalos, 1999; Leone et al., 2017). It is useful to remember that bad news following the primary diagnosis of infertility is one of the reasons for patients' dropout before completing infertility treatments; moreover, poor management of psychological aspects is listed among the main causes of treatment discontinuation (Gameiro et al., 2012). Quality of communication is a key point for improving patients' coping abilities, well-being, adherence to infertility treatments, and patient–provider continuity of care. The latter is one of the main factors of patient-centered care (PCC) that could prove essential for treatment compliance (Palmer-Wackerly et al., 2019). However, while patients claim for clear information, honesty, emotional support, and respect (Ussher et al., 2018), healthcare providers should have access to adequate training programs. Some experiences demonstrated that nurses' knowledge of reproductive issues, communication skills, and practice behaviors increased significantly after structured courses (Quinn et al., 2019).

Nowadays, the impact of breaking bad news on healthcare providers and their perceptions in the relationship with the patient are still poorly characterized. The fear of inflicting pain or not to fully understand patients' discomfort, lack of time, and the complex management of patients' expectations are just some of the problems identified (Klitzman, 2018). In addition, more attention must be paid to psychological care after the diagnosis of infertility and after the subsequent bad news due to the failure of ART (e.g., a negative pregnancy test). In particular, the current literature highlights the importance of specific psychological interventions to reduce stress and to improve couples' well-being.

Although there is a proposal of guidelines on how to communicate bad news during ART (based on SPIKES protocol) (Leone et al., 2017), shared protocols and guidelines on how to communicate the diagnosis of infertility are currently not available. The fields of infertility and ART are strongly connected but show different communication issues. As mentioned above, in the context of ART, there is a reiteration of bad news connected to repeated treatment failures and the clinical ineffectiveness of medical treatments (Leone et al., 2017). Meanwhile, infertility diagnosis involves couples before the beginning of the ART path. In this case, they face bad news for the first time and have not dealt with an alternation of hope and despair. For this reason, the aim of the present systematic literature review of qualitative and quantitative studies is to explore existing research focusing on the communication of the diagnosis of infertility and to highlight existing evidence on physician–patient relationship in this field. Starting from this point, the final goal of our research was to provide some practical advice for improving breaking bad news in clinical practice.

MATERIALS AND METHODS

Search Strategy

Data for the systematic review were obtained through a search strategy based on the intersection of two main domains. The first one was related to infertility, communication, and physician–patient relationship. The second one focused on healthcare professionals vs. patients (women and couples). Electronic searches were performed in the MEDLINE, Embase, PsycINFO, Cumulative Index to Nursing and Allied Health Literature (CINAHL), and Psychology and Behavioral Sciences Collection (PBSC) databases. Complete search strategies for all databases are provided within the **Supplementary Material 1**.

Inclusion and Exclusion Criteria

We included all studies, posters, and abstracts published in English or Italian in scientific journals between January 2000 and March 5, 2020. We included all qualitative and quantitative studies, independently from their study design, containing

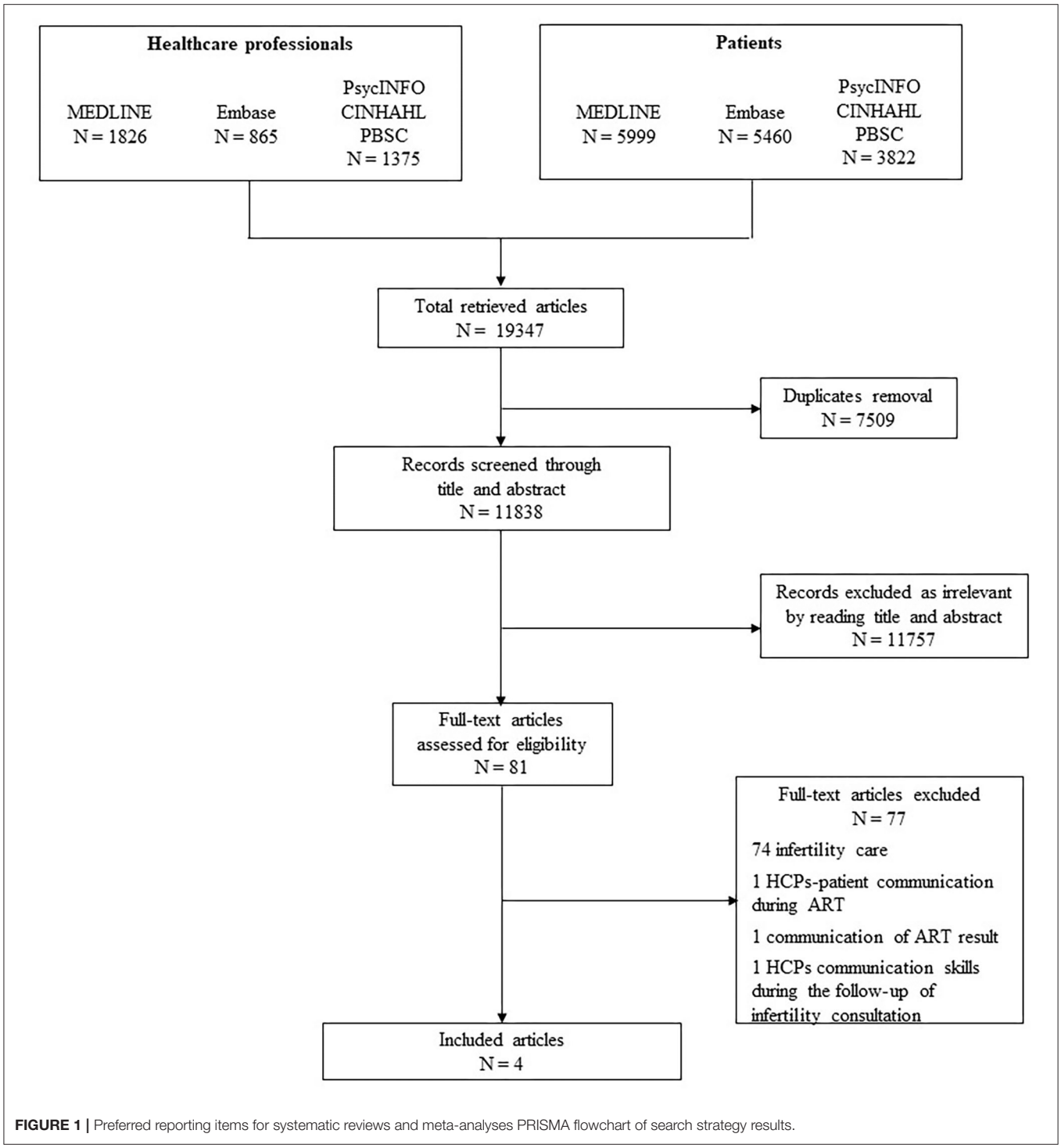

FIGURE 1 | Preferred reporting items for systematic reviews and meta-analyses PRISMA flowchart of search strategy results.

information about breaking bad news in infertility. Additional searches in the reference lists of retrieved manuscripts were also performed. We excluded all papers that deal with infertility care but did not mention how to communicate the diagnosis of infertility. We also excluded remaining articles concerning patients' coping strategies and psychological adaptation after receiving the diagnosis of infertility.

Selection Process and Data Extraction

Records were retrieved on the same day from all sources. Two investigators (CR, LM) independently selected the studies (double-blind selection). Discrepancies about inclusion/exclusion were resolved through discussion or in consultation with a third reviewer (AV, GC). CR and LM reviewed the main reports and **Supplementary Material** and

TABLE 1 | Characteristic of included studies.

References	Country	Type of study	Perspective	Patients	Main results of the study	Communication and relationship with staff	Quality of the study
Dancet et al. (2012)	UK Spain Belgium Austria	Qualitative study	Patients' perspective	48 heterosexual patients (50% women) diagnosed with infertility and/or treated with IUI or IVF/ICSI	It has identified important specific care aspects about the 10 dimensions of "patient-centered infertility care:" provision of information, attitude of and relationship with staff, competence of clinic and staff, communication, patient involvement and privacy, emotional support, coordination and integration, continuity and transition, physical comfort, and accessibility.	Patients valued the following staff attitudes: being friendly, empathic, accessible, helpful, careful, respectful, and engaged. Patients appreciated being informed spontaneously in an understandable way (language, level) and valued staff with skill in communicating bad news.	This paper checks 8 out of 10 items of the scale.
Gameiro et al. (2015)	Europe	Guideline	Patients' perspective	–	Patients' preferences about psychosocial care and psychosocial needs, which can be behavioral (lifestyle, exercise, nutrition, compliance); relational and social (relationship with the partner, family, friends, work, and larger social networks), emotional (emotional well-being), cognitive (knowledge and concerns).	Patients valued: how staff relate to them, staff showing understanding and paying attention to the emotional impact of infertility, being involved in decision-making, sensitive and trustworthy staff members, minimal waiting times, not being hurried in medical consultation, continuity of care, receiving attention to their distinct needs related to their medical history, written information on treatment, explanations about treatment results and treatment options, understandable and customized (i.e., personally relevant) treatment information, and the provision of information about psychosocial care options.	It is evaluated with an overall score of 6 on a scale from 1 to 7.
Jafarzadeh-Kenarsari et al. (2015)	Iran	Qualitative study	Patients' and HCPs' perspective	26 infertile couples (17 men and 26 women) and 7 members of medical personnel (3 gynecologists and 4 midwives)	The study highlights part of couples' challenges and concerns, and necessity for cooperative assistance and support. Moreover, four main categories of infertile couples' needs are identified: infertility and social support, infertility and financial support, infertility and spiritual support, and infertility and informational support.	Patients underlined the importance of being informed on the disease (comprehensive information during diagnosis and treatment). Main problems encountered during the communication with HCPs: inadequate knowledge on the nature of the condition, the outcomes of a diagnostic and treatment method, and ignorant behavior of HCPs to patients' questions.	This paper checks 8 out of 10 items of the scale.
Liu (2015)	China	Poster presentation	Patients' perspective	200 infertile couples	The desire to receive information was significantly greater in female partners; male partners were more satisfied with information provision than female partners, the desire to participate in decision-making was greater in male than female partners, the desire to receive information and participate in decision-making was positively related to education.	Infertile couples were highly interested in receiving information about their diagnosis and treatment options and participating in clinical decision-making.	This poster presentation checks 7 out of 10 items of the scale.

HCPs, healthcare professionals; ICSI, intracytoplasmatic sperm injection; IUI, intrauterine insemination; IVF, in vitro fertilization.

extracted all relevant information for the included studies. In case of doubt or missing information, we contacted the authors of the original paper. For each paper, the following qualitative and/or quantitative data were extracted: country, type of study (i.e., quantitative, qualitative, guidelines), perspective [i.e., patients' or healthcare practitioners' (HCPs')], main results, and parameters used by authors for their evaluation (i.e., theme for qualitative studies, scores for quantitative studies), and main results concerning communication and relationship with the staff.

Quality of Included Studies

Quality of included studies was evaluated using the Checklist for Qualitative Research by the Joanna Briggs Institute (JBI) (JBI Critical Appraisal Checklist for Qualitative Research, 2020) and with the Checklist for the Quality Assessment of Guidelines (AGREE II) (Canadian Agency for Drugs and Technologies in Health (CADTH), 2014).

This systematic review was reported in accordance with the preferred reporting items for systematic reviews and meta-analyses (PRISMA) (Moher et al., 2009).

RESULTS

A flow chart describing the results of the selection process is reported in **Figure 1**. The literature search identified 19,347 references. After removing duplicates ($n = 7{,}509$), titles and abstracts of 11,838 references were screened. Of those, 11,757 were excluded. We retrieved the full texts of the remaining 81 references and assessed them for eligibility.

Seventy-seven studies were excluded due to the absence of information about breaking bad news in infertility. These papers deal with infertility care, but there was no reference to the specific topic explored in the present review (communication of the infertility diagnosis). For instance, the paper "Impediments to communication and relationships between infertility care providers and patients" concerns communication issues between ART practitioners and patients that underwent infertility treatment (Klitzman, 2018). However, it does not take into account how to communicate the diagnosis of infertility. Another study concerns the communication of results after the first cycle of ART, but it does not focus on giving bad news specifically and does not deal with the diagnosis of infertility itself (Groh and Wagner, 2005). A paper published in 2005 (Leite et al., 2005) focused on women's satisfaction with physicians' communication skills during a follow-up infertility consultation at the initial phase of the infertility treatment. Although physicians' communication skills are mentioned in the study, there is no advice on how to communicate the diagnosis of infertility. Once again the main focus is on ART and infertility treatment in general.

Ultimately, four studies were eligible according to the inclusion criteria (Dancet et al., 2012; Gameiro et al., 2015; Jafarzadeh-Kenarsari et al., 2015; Liu, 2015). Features of the analyzed studies are reported in **Table 1**. Two of them are qualitative studies, and the others are a poster presentation and a clinical guideline for psychosocial care in infertility and the medically assisted reproduction setting. Apart from one paper that has a mixed perspective of patients and HCPs (Jafarzadeh-Kenarsari et al., 2015), the others take only the patients' perspective. The main results of each paper are highlighted, with particular attention to the aspects of communication and relationship with staff. In particular, Dancet et al. (2012) suggested that patients "valued staff with skill in communicating bad news." They reported no other advice concerning how to communicate the diagnosis of infertility. The study mainly concerns the "patient centered infertility care" model (PCIC) from the patients' perspective and does not explain its dimensions thoroughly. Authors gave just a brief description of them (Dancet et al., 2012). The European Society of Human Reproduction and Embryology (ESHRE) guidelines (Gameiro et al., 2015) pointed out that fertility staff should provide information about diagnostic procedures to decrease patients' anxiety and stress related to the process itself. Moreover, the authors recommended involving both partners during the diagnosis. These guidelines are a landmark in the infertility care field, but their primary focus is the treatment of infertility. Finally, the poster presentation by Liu (2015) suggested that Chinese patients valued receiving information about their diagnosis (Liu, 2015). Other advice concerned both the diagnosis and the treatment of infertility without a clear separation between the two steps. In particular, authors pointed out that women were more anxious to receive information than their male partners, while the latter dominated in clinical decision-making. Another paper from Iran highlights the patients' need to obtain comprehensive information about diagnosis and fertility treatment (Jafarzadeh-Kenarsari et al., 2015), and this is in line with the poster presentation by Liu (Liu, 2015). Inadequate knowledge about their condition leads to mistrust against HCPs as shown by a couple's words: "We are so unhappy because they refuse to explain what the problem is [...] we have to search the web to find some answers." [18] Finally, authors of the ESHRE guidelines made a list of general principles of psychosocial care that patients value that could be applied to the communication of bad news (**Table 2**) (Gameiro et al., 2015).

TABLE 2 | What fertility staff should be aware of about patients' needs.

Infertility patients' needs
How staff related to patients.
Staff should show understanding and pay attention to the emotional impact of infertility.
Patients need psychosocial care from sensitive and trustworthy staff members.
Patients want to receive attention to their specific needs related to their medical history.
Patients want minimal waiting time, continuity of care, and not hurried medical consultations.
Patients want personalized care and value professional competence of staff.
Patients want the opportunity to contact other patients.
Patients that express a need for emotional support value the opportunity to access specialized psychological interventions.
Positive staff characteristics (i.e., communication and respect) are associated with better patient well-being.

TABLE 3 | SPIKES protocol for infertility diagnosis.

Phases	Actions
Setting up	Try to minimize waiting time before the consultation.
	Arrange for some privacy.
	Involve both partners during the diagnosis.
	Sit down and try to not have barriers between you and patients.
	Make connection with the patients maintaining eye contact and/or touching them on the arm or holding a hand.
	Avoid interruptions and to be in a hurry during the consultation.
Perception	Try to understand what the patients know about their medical situation.
	Remember that patients value receiving attention to their specific needs related to their medical history.
Invitation	Try to understand how much information the patients want. Usually, patients with infertility appreciate knowing all information.
Knowledge	Use phrases to anticipate the bad news, for instance "I'm so sorry to tell you…" or "Unfortunately…"
	Avoid medical jargon
	Give comprehensive information.
Empathize	Try to pay attention to the emotional impact of the diagnosis.
	Remember that patients value a trustworthy and sensitive staff.
Strategy and summary	Ensure a continuity of care by planning follow-up with the same staff. Remember that patients value personalized care.
	Give the opportunity to contact other patients in a similar situation.
	Give the opportunity to access to a specialized psychological help.

According to JBI's Checklist for the evaluation of the quality of included studies and according to the Checklist for the Quality Assessment of Guidelines (AGREE II), all papers show a good quality. However, the paper by Dancet et al. (2012) and the poster presentation by Liu (2015) do not mention any cultural or theoretical statement from the researchers, and they do not address any influence of the researcher on the research or vice versa. On the other hand, in the paper by Jafarzadeh-Kenarsari et al. (2015), the cultural and theoretical statement from the researchers is unclear, and the evaluation of the influence of the researcher on the research or vice versa are not applicable because it is part of a larger study. Although the poster presentation is not a qualitative study, data reported were evaluated even though we could not assess if the conclusion drawn in the study flowed from the analysis of the data. Moreover, the ESHRE guidelines show a high score in all domains except for the applicability domain where the average score is 4 in a scale from 1 to 7. The evaluation of the domain of "Editorial Independence" is not applicable because the guidelines were funded by the ESHRE group itself. Complete quality evaluation of included studies is available in **Supplementary Material 2**.

DISCUSSION

Infertility is a very common issue around the world, and it represents a milestone in a couple's life. Coping with the infertility status can be very complicated due to the sudden interruption of the family plan and the lack of acknowledgment of the couple's grief. However, HCPs can avoid further trauma and pain using good communication. How the diagnosis is communicated could improve patients' well-being and the ability to cope with it.

In this literature review, we did not find any protocol or guideline concerning breaking bad news in infertility. Many papers concern infertility treatment care or ART, for instance, the paper of Leone et al. (2017) about a proposal of guidelines about breaking bad news in ART. However, we found some useful information that could help practitioners in their daily practice whenever they face an infertility diagnosis. About this, Dancet et al. (2012) suggested that patients value staff's skills on communicating bad news[16]. This is in agreement to the ESHRE guidelines (Gameiro et al., 2015), which points out that patients value positive staff characteristics including communication skills, which are linked to the couples' well-being. Moreover, we should consider that some patients report unprofessional communication from HCPs. In fact, they point out that they felt the practitioners' fear during the diagnosis of infertility (Dancet et al., 2011).

Giving information is linked to the staff's communication skills, and it is very important to patients according to the ESHRE guideline (Gameiro et al., 2015), Liu's (2015) and Jafarzadeh-Kenarsari et al. (2015) works. Another important issue is the need for personalized, sensitive, and continuous care from trustworthy staff members who should show an understanding of the emotional impact of infertility (Gameiro et al., 2015). Communication, information, and continuity of care are three dimensions of PCC whose application is linked to the patients' well-being (Gameiro et al., 2013). PCC is usually valued more important by patients than HCPs (Van Empel et al., 2011), and this could be an obstacle to satisfy patients' needs. Moreover, giving poor information could lead to mistrust against HCPs (Jafarzadeh-Kenarsari et al., 2015), and it might result in inadequate care. Also, in this case, there is a different evaluation about the importance of information between patients and providers. The latter ones value providing information less important than patients do (Streisfield et al., 2015). This gap should be removed to improve the quality of care and to move from physician centered care to PCC.

Concerning psychological help and support, patients expect to have the possibility to access professional psychological care, and they want the opportunity to contact other couples (Gameiro et al., 2015). Patients have various counseling needs that HCPs should take into account and that involve several areas: emotional, sexual, marital, and the family one (Jafarzadeh-Kenarsari et al., 2015). Infertility counseling organizations agree that all patients who suffer from infertility should be able to access individual or couple counseling before, during, and after infertility treatment. Infertility counseling has different goals depending on the type of counseling itself: individual, couple, or group approach. Individual counseling allows exploring in greater depth concerns related to the experience and treatment of infertility, as well as coping mechanisms and social implications. Couple counseling enables patients to understand couple dynamics and to learn how to support each other. Finally, group counseling offers couples the opportunity to share their experience with others who are living in a similar situation (Van den Broeck et al., 2010). The literature helps mental health practitioners by showing the key issues that should be considered during infertility counseling (Stammer et al., 2002; Van den Broeck et al., 2010; Peterson et al., 2012). For instance, gender differences involve a diverse coping approach to the issue (Peterson et al., 2012).

Many other psychological approaches appear to be effective to reduce couples' stress and improve well-being. For instance, acceptance and commitment therapy helps patients to reduce stress and to increase couples' intimacy (Taheri et al., 2013). A paper about mindfulness-based cognitive approach points out how this technique can help to improve women's self-acceptance and their relationship with others (Fard et al., 2018).

Implications for Clinical Practice

Although there is no specific guideline to communicate the diagnosis of infertility, other protocols currently adopted in daily medical practice could be used. SPIKES is an easy-to-follow protocol that has been used in the oncology setting for 20 years. It is divided in six steps, which help and facilitate HCPs to break bad news (Baile et al., 2000). These steps are identified as "Setting up, Perception, Invitation, Knowledge, Empathize, Strategy, and Summary." SPIKES has been applied in the area of perinatal grief (Greiner and Conklin, 2015; Mosconi et al., 2019) and ART (Leone et al., 2017) and could be used to communicate the infertility status. In **Table 3**, we suggest an adaptation of the original SPIKES protocol for the infertility field, taking into account the results of this literature review. In particular, we modified some advice included in the original version of the SPIKES protocol, and we added other recommendations; for instance, we replaced the sentence "Manage time constraints and interruptions" with "Avoid interruptions and to be in a hurry during the consultation." In fact, patients with infertility appreciate a thorough consultation without rush. These few actions could be very useful in clinical practice due to their easiness to be remembered and to be applied. Moreover, they could be integrated with the professional personal experience of HCPs.

STRENGTHS AND LIMITATIONS

This review has several points of strength. First, the literature research was performed, retrieving articles from five large databases, and the literature screening was performed double blind, ensuring a rigorous methodology. Second, the extensive analysis of articles allowed us to highlight the lack of investigations focused on this topic and, therefore, to propose a new approach for the communication of infertility diagnosis. Finally, focusing on the importance of HCPs' communication skills in this field, this review may act as a starting point for future investigations and targeted interventions for HCPs.

The main limitation of this review lies in the scarcity of information reported in each of the included studies. In this light, the adaptation of the original SPIKES protocol may not include all aspects of patients' needs other than the few ones reported within the included articles. Further research could identify other areas of interest to be analyzed and included in an updated protocol for the communication of the infertility diagnosis.

CONCLUSIONS

Most of the currently available literature is related to infertility treatment care, and its main focus was not the communication of infertility diagnosis, which represents the starting point of infertility grief for many couples. Only a few papers give some advice about breaking bad news, and there are no thorough guidelines about it. Based on the findings of this review, our adapted version of the SPIKES protocol is an easy-to-use guideline, which could be very useful for healthcare professionals and could be easily integrated in routinary clinical practices.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/**Supplementary Material**, further inquiries can be directed to the corresponding author/s.

AUTHOR CONTRIBUTIONS

AV and CR: conceptualization and validation. GC and LM: original draft, methodology, writing, and formal analysis. All authors: writing, review, and editing.

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2021.615699/full#supplementary-material

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BRIEF RESEARCH REPORT
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Laughs and Jokes in Assisted Reproductive Technologies: Quantitative and Qualitative Analysis of Video-Recorded Doctor-Couple Visits

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Purpose: To explore the characteristics of the use of laughs and jokes during doctor-couple assisted reproductive technology (ART) visits.

Methods: 75 videotaped doctor-couple ART visits were analyzed and transcribed in order to: (1) quantify laugh and jokes, describing the contribution of doctors and couples and identifying the timing of appearance; (2) explore the topic of laughs and jokes with qualitative thematic analysis.

Results: On average, each visit contained 17.1 utterances of laughs and jokes. Patients contributed for 64.7% of utterances recorded. Doctor (40.6%) and women (40%) introduced the majority of laughs and jokes. Visits with female physicians had significantly more laughs and jokes than visits with male doctors; no differences were found considering physicians' age and years of experience, cause of infertility, and prognosis. Laughs and jokes were mainly recorded during history taking and information giving. Four core themes were identified, regarding the topic of laughs and jokes: health status, infertility treatment, organizational aspects, and doctor-patient interaction.

Conclusion: Laughs and jokes are common in doctor-couple ART visits and are frequently used during the dialogue, covering a wide range of topics. Results seem to show that laughs and jokes are related to doctor's personal characteristics (like gender), while are not associated with infertility aspects. Given the complexity of this communicative category, further studies are needed to explore the functions and the effects of laugh and jokes.

Keywords: assisted reproductive technology, doctor-couple communication, patient centered care, qualitative research, clinical psychology

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INTRODUCTION

The utilization of Assisted Reproductive Technology (ART) is steadily increasing across Europe (Ferraretti et al., 2017) and worldwide (Adamson et al., 2018). ART is a field that poses various challenges at different levels. Infertility, *per se*, causes high levels of stress for most couples (Hasanbeygi et al., 2017). Infertility treatments are a supplementary source of stress for patients

because they are long, complex, emotionally and physically demanding and associated with low success rates (Arya and Dibb, 2016; Ferraretti et al., 2017; Domar et al., 2018). As a consequence of distress, patients often discontinue pre-maturely (Gameiro et al., 2012, 2013).

Communication and relational aspects have been considered fundamental to involve patients in the decision-making process and to improve satisfaction and retention in care in ART (Malin et al., 2001; Dancet et al., 2010; Gameiro et al., 2012; Leone et al., 2018). Healthcare workers in ART face various challenges during interaction with the patients: to communicate bad news (e.g., infertility diagnosis, repeated failures in the treatment) (Leone et al., 2017); to address ethical issues (Brezina and Zhao, 2012); to handle patients complaints or distress, which may interfere with treatment routines (Grulke et al., 2009); to manage triadic consultations with two active patients.

Despite these elements highlight the complexity of ART visits, little is known about the communication characteristics of ART visits. In a previous study of our group (Leone et al., 2018), actual communication behavior during doctor-couple interaction was studied using video-recordings. Interestingly, the study highlighted that positive talk (a communication category that includes agreement, approvals, compliments, laughs, and jokes) was the second most representative category for patients (Leone et al., 2018). Generally, positive talk is seen as a response of the patient to the information provided by the physician (Roter, 1997). In a complex and stressful context such as infertility treatment the presence of laughs and jokes, in particular, may seem out of place. However, to date, no study has investigated this communication category in ART yet.

The literature on laughs and jokes in health-care interactions is scarce (Schöpf et al., 2017). Most research has focused on humor which is a complex and dynamic phenomenon that does not have a uniform definition. In the literature different constructs of humor have been investigated such as sense of humor, the personal experience of a humor or humor as a coping style (Schneider et al., 2018).

Regarding the use of humor in clinical interaction, different definitions and identification criteria have been adopted in studies analyzing recorded clinical consultation. For example, laughter has been used as a marker of humor (Sala et al., 2002) and has not been included in the analysis when it was not accompanied to an amusing statement (Schöpf et al., 2017; Phillips et al., 2018). However, laughs and jokes can occur together or be produced independently (Holt, 2011) and both are stereotypically connected with amusement even if they both can have different underlying interactional meanings (Haakana, 2001; Beach and Prickett, 2017; Schöpf et al., 2017). Therefore, the present study aims at investigating laughs and jokes as a broader communicative category, whose incidence in clinical video-recorded visits is still relatively underdetermined, especially in ART visits. Quantification of laughing practices in medical interactions might help to better understand the extent of this phenomenon and its pattern of occurrence, driving attention on its relevance.

The present study aims to investigate more in-depth the use of laughs and jokes during doctor-couple visits in ART. Specifically, the objectives are: (1) to quantify laughs and jokes, describing the contribution of doctors and couples (male and female) and identifying the timing in relation to the phase of the consultation; (2) to assess if there is an association between the number of laughs and jokes and variables like doctor's age and years of experience, cause of infertility, and prognosis; (3) to explore the thematic topic of laughs and jokes.

MATERIALS AND METHODS

The study adopts a quali-quantitative approach.

Participants and Data Collection

The study is based on the data collected in our previous research (Leone et al., 2018). Participants were recruited from eight Italian ART Centers, through a convenience sample. Patients who agreed to participate filled, before the consultations a sociodemographic form collecting age, level of education and relationship status. Patients' clinical data regarding the cause of infertility, duration of infertility, and prognosis were collected, after gaining the consent of the patients, from medical records. Physicians also signed an informed consent and completed a sociodemographic form regarding their age and their years of professional experience.

In total, 85 visits were videotaped. For the present study, only the visits with couples (including both male and female patients) were considered, resulting in a sample of 75 consultations (40 first visits and 35 check-ups) for a total of 150 patients and 24 physicians (see **Table 1** for socio-demographic characteristics). Visits have been verbatim transcribed.

The research project was approved by the Ethical Review Board of the University of Milan and by the Ethical Review Boards of the eight participating ART clinics.

Procedures

All the utterances coded as "LAUGH" in our previous study (Leone et al., 2018), which used the Roter Interaction Analysis System (RIAS) to analyzed data, have been included. LAUGH in the RIAS coding includes: "trying to amuse or entertain, friendly joke, kidding around, good-natured teasing, morbid jokes and laugh" (Roter and Larson, 2002). However, given the mutually exclusive nature of the RIAS coding system, all visits have been re-analyzed to include jokes and laughter that could have been categorized differently, giving priority to another code (e.g., in the RIAS coding system the utterances of "biomedical information" or "concern" have the priority on the coding of "laughs"). The overall corpus was used for the study.

Data Analysis

Both quantitative and qualitative analyses were conducted.

As far as quantitative analysis, LAUGH could be a single utterance without the participation of others or could result in a string of back-and-forth comments or laughs between two or more subjects. LAUGH utterances were quantified and compared to the overall utterances of the visits. A ratio between the number of LAUGH utterances of each subject (male patient, female patient, and doctor) and their total contribution to the dialogue

TABLE 1 | Participant sociodemographic and clinical characteristics.

Patient characteristics	Value
Gender, n (%)	
Female	75 (50)
Male	75 (50)
Participant age, mean years (SD), range	
Females	36.5 (4.8), 24–49
Males	38.5 (6.8), 24–64
Participant level of education, *n* (%)	
Females	
Elementary school	7 (9.3)
High school	38 (50.7)
Graduate and Post-graduate	30 (41)
Males	
Elementary school	10 (13.5)
High school	38 (51.4)
Graduate and Post-graduate	26 (35.1)
Unprotected sex	
Mean years (SD), range	3.6 (2.9), 0.5–18
Cause of infertility, *n* (%)	
Male	19 (25.7)
Female	19 (27.4)
Mixed	14 (18.9)
Idiopathic	16 (21.6)
Not evaluable	6 (8.1)
Therapeutic indication, *n* (%)	
First level	11 (14.9)
Second level	52 (70.3)
Not recommended	4 (5.4)
Waiting	4 (5.4)
Heterologous	3 (4.1)
Prognosis, *n* (%)	
Favorable	53 (71.6)
Unfavorable	17 (23)
Uncertain	4 (5.4)
Physician characteristics	**Value**
Gender, *n* (%)	
Female	15 (62.5)
Male	9 (37.5)
Participant age, mean years (SD), range	
Females	46.4 (10.7), 26–62
Males	51.9 (8.4), 41–61
Participant years in practice, mean years (SD), range	
Females	16.9 (10.4), 1–33
Males	20.7 (7.8), 11–30

was calculated. Utterances were then considered as pieces of conversation, which started with a laughter or a joke and were considered ended after a change of topic or a change of mood of all the three participants (e.g., shift in tone from amused or playful to serious). For each piece of conversation, the researcher recorded who introduced LAUGH (doctor, female patient, or male patient) and how many utterances were produced by the participants in the piece of conversation. The timing was recorded based on the stage of the visit where the exchange took place: introduction, history taking, physical examination, information giving and counseling, closing. Descriptive statistics were calculated for demographic and clinical characteristics and for laughs and jokes utterances. Comparisons between visits with male physicians and visits with female physicians were performed using *t*-test, regarding the number of pieces of conversation and the total number of LAUGH utterances. Pearson correlations were used to analyze relationships between pieces of conversation and LAUGH utterances and continuous variables (physicians' age and physicians' years of professional experience). A one-way ANOVA was used to analyze relationships between laughs and jokes variables (pieces of conversation and LAUGH utterances) and variables with more than two levels, namely, cause of infertility and prognosis. All the statistical analyses were performed with SPSS 24 for Windows.

As far as qualitative analysis, each piece of conversation has been transcribed verbatim (Bailey, 2008) and analyzed using inductive thematic analysis (Braun and Clarke, 2006) in order to identify the topic of laughter and jokes. Two authors (S.P and M.DS.) independently read the transcripts and identified an initial list of codes, which were descriptive words or phrases that summarized laughs and joke topics. All the researchers met to compare the emerging code, resolve discrepancies, and categorize the issues into larger codes. The codes were gradually elaborated into themes. In the next stage, themes, sub-themes, and their relations were examined, refined, and checked against the original data set. All researchers discussed until consensus was reached and they were satisfied with the thematic map. Excerpts from the visits were chosen to illustrate each theme.

RESULTS

Quantitative Results

Laughs and jokes were present in 72 out of 75 visits; 690 pieces of conversation composed of 1,282 total utterances were recorded. On average, each visit contained 9.2 pieces of conversation (SD = 6.3; range 0–27) and 17.1 utterances (SD = 12.9; range 0–52).

Compared to the total utterances, laughs and jokes account for 2.2% of the dialogue during the visits. Patients contributed for 64.7% of LAUGH (41.9% female, 22.8% male) while doctor accounted for 35.3%. As far as each participant contribution to the dialogue, the percentage of LAUGH utterances compared to the total utterances of the single individual was: 3.9% for the female, 4.4% for the male, 1.2% for the doctor.

Laughs and jokes were mainly initiated by doctors (40.6%) and women (40%); men introduced 19.4%. Half of the LAUGH (53.3%) did not elicit an answer, while the other half was an

exchange between the participants composed of two (25.2%), three (12.6%), or more utterances (8.8%).

As far as the timing, frequencies were: 7.8% during introduction, 41.7% history taking, 2.6% physical examination, 46.1% information giving, and counseling, 4.4% closing.

The *t*-tests showed that visits conducted by a female physician had a significantly greater number of total laughs and jokes utterances ($t = -3.8$, $p < 0.001$) and a greater number of pieces of conversations ($t = -4.5$, $p < 0.001$) than visits conducted by a male physician (**Table 2**).

LAUGH utterances did not correlate with physicians' age ($r = 0.027$, $p = 0.817$) nor with physicians' years of professional experience ($r = -0.051$, $p = 0.661$). Similarly, the number of pieces of conversation did not correlate with physicians' age physicians' ($r = 0.003$, $p = 0.977$) nor with physicians' years of professional experience ($r = -0.105$, $p = 0.370$).

The number of LAUGH utterances and the number of pieces of conversations did not differ by cause of infertility (respectively $F = 0.334$, $p = 0.855$; $F = 0.070$, $p = 0.991$) and by prognosis (respectively $F = 0.747$, $p = 0.478$; $F = 0.253$, $p = 0.777$).

Qualitative Results

Four core themes regarding the topic of laughs and jokes during ART visits were identified: health status, infertility treatment, organizational aspects, doctor-patient interaction (**Table 3**).

Each main theme is presented with sub-themes and excerpts (with the code of the visit in square bracket) used as examples. For reading the transcript consider the following transcription convention: (.) for silence lasting less than half a second, (..) for silence lasting <1 s, :: for lengthening of a sound; - for cut off or interruption of a sound, [ ] for notes and comments (Bailey, 2008).

Theme 1: Health Status

Gaining information from the patients about their health status is a basic goal of the visits. General health of the patients and reproductive health of the couple are one of the topics addressed with laughter and jokes.

Clinical information: laughs are often displayed when talking about diseases such as diabetes, previous surgical operations, and exam results.

> Female patient: the cholesterol was :: was even higher (laugh) [V43]

Lifestyle: Recurring topic are smoke, weight, dietary habits, and physical activity. Either virtuous or negative lifestyle are addressed with laughter.

> Doctor: so (.) you smoke 4 or 5 cigarettes a day (..) feeling a lot guilty (laugh) Male patient: (laugh) Female patient: not that much (laugh) [V55]

Age: Age is addressed with jokes or laugh. Discussing the role of age in the prognosis, having delayed treatment for a long time, being (or feeling) not young enough for the treatments are recurring topics.

> Doctor: okay (.) we are always happy when we see patients born in the 80 s because at least we have-
> Female patient: (laugh)
> Doctor: (laugh) on our-
> Female patient: (laugh) at least we have age [V55]

Theme 2: Infertility

Infertility related information: Clinical information and exam results regarding infertility diagnosis are jokingly commented or introduced with laughter. During the visits, doctor and patients laugh about the cause of infertility or not knowing the clinical condition underlying infertility; they also laugh about fertility-related clinical conditions (menstruation, number of follicles, retroverted uterus, semen quality) and clinical exam (e.g., spermiogram, hysterosalpingography), commenting on their results or on the procedure (feeling tense or uneasy, fearing or feeling pain).

> Male patient: well (.) the problem is me (laugh)
> Female patient: (laugh) [V2]

When couple describe their sexual life laughs or jokes also arise, regarding both low and high frequencies of sexual intercourse.

> Female patient: when the test signaled that the days of ovulation were over (.) we stopped [having sex] for about a week because-
> Doctor: you had enough (laugh) [V67]

Laughs are also displayed when talking about the reproductive history of the couple's family, such as difficulties during childbearing of their parents or their sibling's ease of getting pregnant.

> Female patient: my sister tried for <3 months and she got pregnant immediately (laugh) [V26]

Laughs and jokes occur also when talking about the couple's journey to become parents: for how long the couple has been trying to have a baby, unsuccessful assisted reproduction cycles or previous pregnancy.

> Female patient: one time too much one time not enough (laugh) from 15 to 1 (laugh) third and last try and then (.) then I do not know what else to do (laugh) [V25]

Treatment: laughs and jokes arise during the description of treatment options or during treatment planning.

> Female patient: you cannot put a cap on the tuba after you have done the insemination? (laugh) [V50]

Doctors and couples laugh about the number of required exams, or the characteristic of an examination (e.g., spermiogram), or details of interventions (e.g., anesthesia during oocyte retrieval, rest after transfer). Expectation, desire and fear the ART treatment are also introduced and discussed in a light-hearted way.

TABLE 2 | Quantitative analysis: association between physicians' gender and laughs and jokes using *t*-test.

	Mean (SD)	*t*-test	Mean difference	C.I. 95%	*p*-value
Number of laughs and jokes utterances		−3.8	−9.63	−14.76 to −4.51	<0.001
Females	20.2 (13.6)				
Males	10.5 (8.5)				
Number of pieces of conversations		−4.5	−5.46	−7.87 to −3.05	<0.001
Females	11.0 (6.4)				
Males	5.5 (3.9)				

Male patient: I have made several surgeries and we can say that I am not afraid but (.) aspirating the :: the semen from the testicles yes (laugh) [V36]

The role of the male in the treatment is also addressed with laughter.

Male patient: may I do something?
Doctor: be supportive
Female patient: (laugh) [V56]

Expected outcome and pregnancy: many variables play a role in the treatment and, even though pregnancy is a common goal of the couples and the physician, the prognosis is not certain; this is another area of jokes and laughs. To deal with uncertainty, optimism (e.g., how the couples feel) and superstition (e.g., beginning the adoption procedure to increase the chances) are introduced in a playful way. Doctors and couples jokingly comment about the eventuality of having twins, the risk of developing complications, or the couples' desire about their future child.

W: in case a tumor is formed during pregnancy?
D: you are a little pessimistic
W: yes I am very pessimistic (laugh) [V59]

Theme 3: Organizational Aspects

The practical and organizational aspects of a specific ART center and the legislation of treatments are a topic of the visits and a subject of jokes.

Set of the visit: The physical elements of the room (temperature, clothes hangers, lights) and their utilization during the visits are commented with laughs. Doctors and couples laugh about the slowness of the computer, or the obligation to insert the data in the informatic system of the center.

Doctor: I need to register you in a :: medical record that is electronical but unfortunately on one hand I am illiterate on this matter and on the other hand the desk is small I have to turn back and forth (laugh)
Female patient: (laugh)
Male patient: (laugh) [V19]

Organization of the ART center: The delivery and the continuity of care and the characteristic of the ART center is commented (e.g., being visited by different doctors). The cost of treatments is also a topic of laughs.

Doctor: and then the cost
Male patient: yes the cost (.) that was the question indeed
Doctor: that is the bad news usually it is communicated by the secretary (laugh)
Female patient: (laugh)
Male patient: (laughing) because first they tell you everything and then they tell you the cost or else you do not listen to them
Doctor: no no (laugh) [V8]

Legal aspects: Doctors and patients laugh about the obligation to sign the informed consent, and the imposition of treatment restrictions (egg donation, embryo freezing); differences between foreign Countries are also addressed.

Male patients: there has been a new law (laugh) was it the day before yesterday uh? [V71]

Theme 4: Doctor-Patient Interaction

This theme includes laughs and jokes concerning the actors of the visits or their interaction during the encounter.

Relational aspects: The relation between doctors and patient is commented with jokes. Doctor and couples laugh about their past interaction or their personal characteristics, preferences and inclination also commenting on the way this impact on the others and on the treatments.

Doctor: what could we do to deal with him [referring to the male patient]?
Female patient: it is impossible to deal with him (laugh) [V8]

Procedural aspects: In this case, the relation is not the focus but is the frame in which laughs are displayed. Situations and events that happen during the visits are commented and laughed.

Doctor: lay down
Female patient: now I will start coughing (laugh) [V21]

TABLE 3 | Qualitative analysis: themes, sub-themes, and excerpt from ART visits.

Main themes	Sub-themes	Excerpt	
Health status	Clinical information	F: [I have] bit of gastritis but I think 99.99% of Italians have it (laugh) no I have no health problems	[V19]
	Lifestyle	F: no I weighted 64 (..) 15 years ago M: yes around (.) W: when we met (.) more or less 15 years ago D: Then? What happened? F: Well I went on a diet D: ok ok (gesture with the hand) enough (laugh)	[V54]
	Age	D: you are young because you are my age so (.) you are really young (laugh) F: (laugh) M: (laugh)	[V71]
Infertility	Infertility related information	F: we never used contraception D: ok F: but let us say for a year and a half we- D: you focused F: we focused (laugh) but concentration does not work	[V26]
	Treatment	D: it seems to stab yourself (laugh) F: (laugh) D: if it is inclined it seems:: it still punches a hole but you know (laugh) it is less shocking	[V32]
	Expected outcome and pregnancy	D: it would take the crystal ball to tell you guys go ahead because surely this is the next cycle, or- M: exactly (.) and you do not have the glass ball here (laugh)?	[V35]
Organizational aspects	Set of the visit	D: there are mosquitoes (.) we got company M: eheh	[V38]
	Organization of the ART center	D: you have been here in July F: yes (.) there wa::s D: my colleague (.) F: I thought there was always the same doctor D: basically there is me and two other colleagues Female patient: (laugh) yes so (.) I have to	[V50]
	Legal aspects	D: yes [this drug] is not marketed in Italy (laugh) for this kind of things	[V1]
Doctor-patient interaction	Relational aspects	D: the couple makes me laugh (laugh) an engineer and a psychotherapist F: (laugh) D: the engineer is always precise (.) two plus two while a psychotherapist is mu::ch- M: yes in fact (laugh) let us say two different worlds F: (laugh)	[V21]
	Procedural aspects	D: have you ever been pregnant in your life? F: yes D: when and why? (.) I mean not why (laugh) how it went F: (laugh) M: (laugh)	[V64]
	Chatting	D: did you came by car? F: with the motorcycle Doctor: good because (laugh) knowing the city Female patient: (laugh)	[V2]

In the table the following transcription conventions and abbreviations have been used: F for female patient; M for male patient; D for Doctor; (.) for silence lasting less than half a second; (..) for silence lasting <1 s; :: for lengthening of a sound; - for cut off or interruption of a sound; [ ] for notes and comments.

Chatting: Laughs arise also when talking about topics unrelated to the visit such as the weather or the private life of patients and doctors (holidays, hobbies, hometown).

> Male patient: I work as a computer consultant
> Doctor: One of those that when you call them you do not understand anything of what they tell you
> Male patient: (laugh) [V6]

DISCUSSION

The present study aimed to quantitatively and qualitatively explore the use of laughs and jokes during doctor-couple visits in the ART field.

The quantitative findings showed that laughs and jokes were registered in the vast majority (96%) of the visits and were largely used during the interaction, with an average rate of 17

utterances per encounter. This finding is only partially consistent with the literature related to other settings as 94% of diabetes visits contained amusing comment (Schöpf et al., 2017), while only 60% of primary care and specialty care visits contained reciprocated and shared amusement (Phillips et al., 2018). These studies reported lower frequencies of target events per visit, ranging from two instances (Phillips et al., 2018) to six (Sala et al., 2002; Schöpf et al., 2017). One explanation could be the different definition and inclusion criteria, however, it could be hypothesized that the high frequency of laughs and jokes is due to the different setting analyzed: ART treatments are long and complex and infertility is a stressful and burdensome issue, therefore laughs and jokes might be used to strengthen the relationship between participants (Martin et al., 2003), create a partnership and to produce a more relaxed atmosphere (Joshua et al., 2005). Accordingly, the present study highlighted that laughs and jokes occurred in all moment of the dialogue from the introduction to the closing of the visit and that about half of the laughs and jokes registered were reciprocated resulting in an exchange between participants. It is interesting to note that half of the laughs occur in the interaction between at least two of the presents while the others appear as singular interventions. This may suggest than laughing is not always a way to communicate: people may not decode the messages in the same way: amusing comment could be unacknowledged or misinterpreted by the listener and laughs could be displayed by one person after interpreting as funny something that was not intended to be; laughs could also be an expression of stress or embarrassment (i.e., nervous laugh) experimented by one of the parties (Gervais and Wilson, 2005).

As observed in other studies (Sala et al., 2002; Schöpf et al., 2017), our results highlight that laughs and jokes are more frequently introduced and used by patients than physicians; however, one study did not found differences (Phillips et al., 2018). Nevertheless, considering each individual separately, doctors and female patients equally produce and initiate laughs and jokes, while male patients laugh and joke less frequently. As reported by Leone et al. (2018), male patients are less active than doctors and female patients. According to the limited scientific literature on men in ART, men would like equal involvement between partners and a more balanced dialogue with professionals (Mikkelsen et al., 2013) but they subjectively feel dismissed and disconnected from the treatment and unacknowledged in the dialogue (Mikkelsen et al., 2013; Arya and Dibb, 2016; Leone et al., 2018). Despite the wish to be more involved, medical professionals communicate primarily with female patients (Mikkelsen et al., 2013; Leone et al., 2018) probably because biologically women play a bigger part in the treatments (Gdanska et al., 2017). In the present study, comparing laugh utterances with the total talk of the individual, our results highlight that male patients seem to use laughs and jokes quite consistently in their discourse. In other words, male patients are less talkative, but their interventions are more frequently made of laughs or jokes. Laughter and jokes are a way to enhance relationship-building (Sala et al., 2002) and it could be hypothesized that male patients use it as a way to intervene in the conversation and feel more involved.

Visits with female physicians had significantly more laughs and jokes than visits with male doctors. This finding is consistent with the results found by Sala et al. (2002). The authors suggested that physicians play a role in setting the tone of the conversation, and, in the case of female physicians, patients are more encouraged to use laughs and jokes. This could be further explained by the literature regarding humor style that highlights that woman usually engage in positive forms of humor such as affiliative and self-enhancing humor (Martin et al., 2003). It would be interesting to investigate gender differences in terms of humor style during clinical encounters.

Interestingly, our results highlight that the presence of laughs and jokes is not associated with the cause of infertility or the prognosis, indicating that patients and physicians laugh regardless of the expected outcome of infertility treatments.

Qualitative analysis highlights that a wide range of topics are addressed with laughter encompassing clinical, personal, and contextual topics. Every aspect of ART care might be jokingly commented, even serious and sensitive topics such as unsuccessful assisted reproduction cycles, which can be surprising. Nevertheless, humor has been found in a variety of hospital settings including palliative care in relation to death and dying (Adamle and Ludwick, 2005; Dean and Gregory, 2005); it could be a way to discuss difficult topics in a less threatening way. This way of dealing with emotional issues could be the reason why funny comments arise also in relation to sexual behavior, which is a sensitive topic that can create embarrassment. Besides talking about serious topics, doctors and couple joke on topics that are not strictly related to treatments such as the context in which the visits is being held (e.g., the temperature of the room), the event that happens during the visits (e.g., receiving a call) or personal and general topics (e.g., hobbies). This could be a way to relieve the tension, taking a break from the seriousness of the visit and to foster relationship-building promoting connectedness and warmth (Phillips et al., 2018). Interestingly, the relationship between doctors and couples is also a topic addressed with laughter and jokes; this underlines the importance of the relation in ART treatment. In fact, a good relationship with the doctor is one of the major reported needs of couples in ART (Malin et al., 2001; Hasanbeygi et al., 2017; Borghi et al., 2019). Joking on personal characteristic and making funny comments about peculiar dynamics between the participant may minimize status differences and create a sense of partnership.

Even if laughs and jokes may be constructive, their positive effect should not be taken for granted. For example, the overuse of laughs and jokes as a strategy to deal with emotion-provoking topics could have a paradoxical effect: instead of making the discussion easier, it could divert the dialogue leading to the avoidance of the issue (Joshua et al., 2005). Physicians should, therefore, pay attention if an issue is addressed multiple times with a facade of amusement as it could hide deep concerns that need further investigation (Bennett, 2003). Likewise, being more conscious of the effect of laughs and jokes could be fundamental in a triadic communication, where jokes may have different effects on the participants.

The present study is preliminary and presents some limitations. First, the study is observational and based on a

previously collected dataset. Second, although our data derived from video-recorded visits, non-verbal clues were not always available due to the position of the camera, reducing the contextual elements that are needed to interpret the underlying dimensions of laughs and jokes. Moreover, the present study was not designed to explore the function of laughs and jokes that are, however, a crucial aspect in order to understand the multifaceted interactional role of laugh within the ART visits and eventually connect it to the humor literature. In this sense, the perspective of doctors and patients should be taken into account in future studies, in order to confirm the intent of laughs and jokes. Another limit to the present study is that data on psychological characteristics of the couple or of the physicians were not included in the study design; moreover, clinical outcomes such as retention in care or adherence have not been investigated.

Finally, visits have been collected in a specific context and, as laughs and jokes are often influenced by culture (Granek-Catarivas, 2005) it would be useful to repeat the study in other countries.

However, to the best of our knowledge, this is the first study to explore the use of laughs and jokes in assisted reproductive technology visits and one of the few studies addressing laughs and jokes in doctor-patient interaction using video-recordings of naturally occurring communication (Schöpf et al., 2017).

The present study highlighted that laughs and jokes are frequently used during doctor-couple ART visits addressing a wide range of topic and therefore this complex communication category should be further explored. Future studies are needed to clarify the functions of laughs and jokes in doctor-patients communication and to understand their effect on patients' clinical (e.g., satisfaction, retention in care or adherence) and psychological (e.g., depression, anxiety) variables.

DATA AVAILABILITY STATEMENT

The data analyzed in this study is subject to the following licenses/restrictions: Data are available on request due to privacy or other restrictions. Requests to access these datasets should be directed to Silvia Poli, silvia.poli@unimi.it.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Ethical Review Board of the University of Milan and by the Ethical Review Boards of the eight participating ART clinics. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

SP and MD contributed to the transcription of visits. SP, MD, and LB contributed to the data analysis. SP and LB contributed to the draft of the work. All authors contributed to the conception and design of the work, interpretation of data, revised draft of the work critically and gave their final approval of the version to be published.

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Misunderstandings in ART Triadic Interactions: A Qualitative Comparison of First and Follow-Up Visits

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Background: Misunderstandings in medical interactions can compromise the quality of communication and affect self-management, especially in complex interactions like those in the assisted reproductive technology (ART) field. This study aimed to detect and describe misunderstandings in ART triadic visits. We compared first and follow-up visits for frequency, type, speakers, and topics leading to misunderstandings.

Methods: We purposively sampled 20 triadic interactions from a corpus of 85 visits. We used a previously developed coding scheme to detect different types of misunderstandings (i.e., with strong, acceptable, and weak evidence). We analyzed also the different topics leading to strong misunderstandings (direct expressions of lack of understanding, pragmatic alternative understandings, semantic alternative understandings) to provide insights about the contents of the consultation that may need particular attention and care.

Findings: We detected an overall number of 1078 misunderstandings in the 20 selected visits. First visits contained almost two-third of the misunderstandings (n = 680, 63%). First visits were particularly rich in misunderstandings with acceptable evidence (e.g., clarifications and checks for understanding), compared to follow-up visits. In first visits, doctors' turns more frequently than couples' turns contained misunderstandings, while in follow-up visits it was the other way around. Looking at the couple, the majority of the misunderstandings were expressed by the woman (n = 241, 22%) rather than by the man (n = 194, 18%). However, when weighting for their number of turns, 9% of the men's turns included an expression of misunderstanding, compared to the 7% of the women's turns. Finally, more than half of the misunderstandings with strong evidence were about history-taking and treatment-related topics, and while the history-taking ones were particularly frequent in first visits the treatment-related ones were more present in follow-up visits.

Discussion: Findings indicate that first visits may deserve particular attention to avoid misunderstandings, as they are the moment where a shared understanding can be harder to reach. In particular, misunderstandings happening in first visits seem mostly

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related to physicians having to reconstruct the clinical history of patients, while those in the follow-up visits seem to reflect residual and unsolved doubts from the couple, especially concerning treatments.

Keywords: misunderstanding, doctor–couple communication, assisted reproductive technology (ART), infertility care, shared understanding

INTRODUCTION

Effective and efficient communication is paramount to improve patient trust and satisfaction with doctors (Chandra et al., 2018), patient safety and autonomy (Stewart, 1995; Street, 2013; Berger et al., 2017), patient adherence to treatment recommendations, and patients' physical and mental health (Hall et al., 1988; Stewart, 1995; Zolnierek and Dimatteo, 2009). Poor communication may compromise information disclosure and higher malpractice claims (Levinson et al., 1997), increase patients' dropout rates and doctor-shopping behaviors (Hagihara et al., 2005; Lynch et al., 2007), thus raising costs for healthcare systems. Communication has been also emphasized as the main tool for physicians to build their relationship with patients, fulfilling different functions in first and follow-up visits (Van Dulmen et al., 1997; Fossum and Arborelius, 2004; Graugaard et al., 2005). Building an affective connection and good relationship during the first visit has an important impact on follow-up visits, where less effort may be needed to maintain a positive and functional climate (Van Dulmen et al., 1997) and where patient evaluations may be particularly influenced by the affective connection with physicians established in first visits (Gulbrandsen et al., 2020). In particular, emotional and cognitive/informational aspects have been regarded to define mostly what counts as effective communication in the context of doctor–patient interactions (Di Blasi et al., 2001). This distinction has been used to emphasize the need to look after both contents and processes in clinical communication since what is communicated and how it is communicated are mutually interdependent factors (Cox and Li, 2020).

Communication is particularly challenging in the field of assisted reproductive technology (ART). A complex interlacement of medical, technical, and juridical language characterizes ART medical interactions. Besides, ART interactions are often triadic, with the physician handling the infertility problems of a couple. This implies dealing, most of the time, with two patients simultaneously, taking into account different or even contrasting socio-emotional and information needs in addition to diverse male/female infertility factors (e.g., to provide emotional support or to make informed decisions on semen collection, sperm washing vs. egg donation, fallopian tube examination). Previous research has focused primarily on the psychological effects of a diagnosis of infertility and ART care (Greil, 1997; Purewal et al., 2017; Samani et al., 2017; Stanhiser and Steiner, 2018; Courbiere et al., 2020). It is indeed well-known that fertility treatment is a source of stress both for couples and healthcare providers. From the couples' side, the high levels of stress are due to the infertility issue itself and to the treatments that are both emotionally and physically demanding (Van den Broeck et al., 2010; Gameiro et al., 2012). Success rates are low, around 30% per cycle, with couples interrupting treatment or change the clinic due to patient dissatisfaction and distress (Van den Broeck et al., 2009; Gameiro et al., 2012). Because of the low success rates and because ART treatment is generally not fully covered by national insurance systems, doctors have to both endorse their services, manage their clients' expectations, and, more often than not, deliver bad news, which means handling the psychological distress of patients (Leone et al., 2017). Gender differences in psychological reactions to infertility have been documented by various studies (Jordan and Revenson, 1999; Peterson et al., 2006; Nagórska et al., 2019), raising interesting questions on the role that male and female patients may play during ART visits. Evidence shows that male patients are less talkative during ART visits but also that lower male satisfaction is associated with the decision to change clinic (Borghi et al., 2019). Moreover, male partners are less likely to talk with other people about their experience of ART, which might explain why infertile men have high levels of psychological distress (Babore et al., 2017). All these aspects (uncertainty of outcomes, poor prognosis, socio-emotional and communication complexity, gender differences) might increase the risk for misunderstandings in ART triadic interactions. However, doctor-patient communication has been still poorly investigated in the field of ART (but see Rossi et al., 2017; Leone et al., 2018; Borghi et al., 2019), and there have been no studies looking at how understanding is interactionally achieved or detained in real-life ART consultations.

Shared or mutual understanding is a defining feature of effective communication. As a process of negotiation and co-construction of meanings, reaching shared understanding is indeed important in all phases of medical consultation and is one of the key communication goals in the medical context (Rossi and Macagno, 2020). Problems of understanding might lead to wrong or delayed diagnosis and suboptimal adherence to treatments (Street et al., 2009; Epstein and Street, 2011). To achieve a shared understanding, communication needs to be adjusted to each patient's individual needs and also to take into account the specific clinical tasks at different care stages. As mentioned before, first visits usually fulfill different functions from follow-up visits: they are longer, physicians may undertake extensive and quite complex segments of history-taking (Fossum and Arborelius, 2004), and tend to adopt a more task-focused communication style (Graugaard et al., 2005). We can therefore expect a major

difficulty in obtaining shared understanding in first visits, with the result of increasing misunderstandings' number and dangerousness. However, while misunderstandings have been deeply investigated in other communicative settings, and especially in multilingual and intercultural contexts (Angelelli, 2004; Roberts and Sarangi, 2005; Roberts et al., 2005; Schouten and Meeuwesen, 2006; Paternotte et al., 2015; Cox, 2017; Crawford et al., 2017; Cox and Li, 2020; Rossi and Macagno, 2021), only a few studies have systematically analyzed problems of understanding in healthcare settings (McCabe and Healey, 2018). Even beyond the ART context, to the best of our knowledge, no study compared difficulties in reaching a shared understanding between first and follow-up visits.

This study aimed to describe and compare problematic understandings in first and follow-up ART triadic visits. In particular, the study aimed to: (1) report how many misunderstandings were expressed in first and follow-up visits, of which type, and by whom; (2) identify topics leading to strong misunderstandings.

MATERIALS AND METHODS

Source Material

We purposively selected 20 videotaped interactions between 10 doctors and 20 couples from a corpus of 85 videos collected in eight private and public ART Italian clinics between 2013 and 2015. This subsample of interactions was selected based on the following criteria: (1) to contain triadic consultations only, and (2) to pair first and follow-up consultations performed by the same doctors. The latter criterion was chosen to make a comparison between first and follow-up visits possible and not biased by doctors' characteristics and communication styles. The demographic and clinical characteristics of the participants are shown in **Table 1**. Couples had unprotected sex for a mean of 3.2 years before the consultation (range, 1–9). Mixed and idiopathic were the most frequent causes of infertility in this group of patients. The second-level intervention (IVF/ICSI) was offered to 50% of participants, with a favorable prognosis in 60% of the cases.

The corpus was video recorded and collected with the informed consent of all participants, who gave their consent to use their video for communication studies. The research project was approved by the Ethical Review Board of the University of Milan and by the Ethical Review Boards of the eight participating ART clinics. The subsample of data was subsequently transcribed, following a simplified version of Jefferson's transcription system (Jefferson, 2004).

TABLE 1 | Participant sociodemographic and clinical characteristics.

Patient characteristics	Value
Participant age, mean years (SD), range	
Females	38.95 (4.1), 33–49
Males	41.75 (7.35), 32–64
Unprotected sex, mean years (SD), range	3.2 (2.6), 1–9
Cause of infertility, n (%)	
Female factor	6 (30)
Male factor	1 (5)
Other factors	13 (65)
Mixed	6 (30)
Idiopathic	6 (30)
Not evaluable	1 (5)
Therapeutic indications, n (%)	
IUI	1 (5)
IVF/ICSI	10 (50)
Not recommended	2 (10)
Waiting	3 (15)
Heterologous (use of donor gametes)	3 (15)
Prognosis, n (%)	
Favorable	12 (60)
Unfavorable	7 (35)
Unknown	1 (5)
Physician characteristics	
Gender, n (%)	
Female	8 (80)
Male	2 (20)
Participant age, mean years (SD), range	
Female	46.1 (9.3), 34–62
Male	51.5 (11), 42–61
Participant years in practice, mean years (SD), range	
Females	16.75 (10), 3–33
Males	16 (4.6), 12–20

Data Analysis

Analysis of Problematic Understanding

Different types of misunderstanding were systematically analyzed by adopting an already existing coding scheme grounded on an interactional view of communication (Rossi and Macagno, 2020). The coding scheme was developed to embrace a wide range of understanding failures, thus including not only strong misunderstandings but also potential misunderstandings with weak linguistic evidence, like irrelevant turns or lack of uptakes (see also Tzanne, 2000; Rossi and Macagno, 2020). Therefore, considering key distinctions made in pragmatics and linguistics (Bazzanella and Damiano, 1999a,b; Weigand, 1999; Yus, 1999; Verdonik, 2010), it included different types of problematic understandings, grouped into three main categories based on their strength of linguistic evidence.

Following the procedures described in previous studies (Macagno and Rossi, 2019; Rossi and Macagno, 2020), two researchers (MGR and JM) independently worked on the transcripts of the consultations and detected the seven different types of problematic understandings considered by the coding scheme. The two researchers met several times along the process to discuss doubts, and a third researcher (EV) was involved in case of disagreement. The final sample of identified misunderstandings was

TABLE 2 | Coding categories (name, description, example).

Main category and sub-categories	Description	Example
Strong evidence		
Lack of understanding (LACK)	The hearer acknowledges explicitly that s/he cannot understand, or that the interpretation that s/he has achieved is not acceptable	FIRST-VISIT Infertility cause: "unknown"; treatment: "waiting." D: So this is the only test that I suggest you do here or in "X" [name of another health care facility] *Questo ecco è l'unico esame che le consiglio di fare qui::(.) o in alternativa a "X" [nome di un'altra struttura sanitaria]* MP: uh *ah* D: not elsewhere because it's a test one of few tests that is still done manually *diciamo non da altre parti perché è un esame è uno dei pochissimi esami che ancora viene eseguito manualmente* MP: uh huh *mh mh* D: so the lab technician that looks at it and their experience is important *quindi l'operatore che lo vede e la sua esperienza è fondamentale* MP: uh huh *mh mh* D: since it's not a simple, pleasant test *dato che non è un esamino simpaticissimo* **MP: um I don't think I... what do you mean manually?** ***cioè non ho capito manualmente cosa vuol dire?***
Semantic alternative understanding (SEM ALT)	The hearer interprets the speaker's turn by specifying its meaning in a way that is not acceptable or accepted, and the speaker corrects this alternative interpretation. The interpretation is about the semantic representation of an utterance.	FIRST-VISIT Infertility cause: "female infertility"; prognosis: "unfavorable." FP: the doctor gave me these, they told I have to do preventive treatment *il dottore mi ha dato questi: mi ha detto che devo fare la [profilassi]* D: yes then you should take them *[si] li deve prendere, allora* FP: I should take them *Li devo prendere* D: yes, then you should take them *sí sí li deve prendere (.) allora (unint)* FP: I went to the bathroom, I saw blood it's norma- *sono andata in bagno ho visto sangue è norma-* D: that's normal, that's normal "FP surname" allright (.) "FP name" *è normale è normale (.) "cognome di FP" va bene (.) "nome di FP"* FP: yeah *si::* D: great, and so everything is fine *Benissimo (2.0) e quindi questo siamo apposto* (10.0)

(Continued)

TABLE 2 | Continued

Main category and sub-categories	Description	Example
		FP: do you say, um, that's totally normal? *quindi per lei cioè mh voglio sape- è norma- cioè è tutto: [non]* D: [no] listen ma'am it's not normal in the sense that having an FSH a little high being over 40, that happens, you have to see if it stays that way. Plus the main issue is that it plays against you a bit for your fertility *no ascolti signora non è normale nel senso (.) fsh un pochino elevato (.) dopo i 40 anni succede bisogna vedere se è una cosa fissa e poi soprattutto il problema è (.) che le gioca un pochino contro per la fertilità*
Pragmatic alternative understanding (PRAG ALT)	The hearer interprets the speaker's turn by drawing inferences that are not acceptable or accepted, and the speaker corrects this alternative interpretation. The interpretations is about the intended purpose of a speaker's utterance.	FOLLOW-UP Infertility cause: "mixed"; treatment: "second-level"; prognosis: "favorable" FP: uh the last question, from the day of the: sample til the transfer day is it better to take a few days off and stay home? *eh come ultima domanda dal giorno del: prelievo al giorno del transfert è meglio avere qualche giorno a casa?* **D: we can give you it [medical leave], if you wish, yes** *glielo diamo, se lo desidera sì* FP: no, I'm asking what's best *no io chiedo quello che è meglio*
Acceptable evidence		
Clarification (CLA)	The hearer asks the speaker to specify the meaning of an utterance, as it can have different interpretations. No interpretative hypothesis is advanced; only a question is asked to disambiguate a speaker's utterance (or one of its components).	FOLLOW-UP Infertility cause: "idiopathic"; treatment: "second-level"; prognosis: "unfavorable" MP: so there's another thing I needed- uh. after the transfer *ma c'è un'altra cosa che dovevo- ah. dopo il transfer* D: yes *sí* MP: she can walk no problem? *lei può: camminare [tranquillamente:?]* D: not a problem *[tranquillamente] =* MP: ok *[sì]* D: her daily life, we don't recommend rest *= una vita normale, noi non consigliamo riposo.* MP: so uh *cioè [mh:]* **FP: I mean because I drive, I mean can I go back to school without a problem** *[cioè] perchè io guido, cioè posso tornare a scuola [tranquillamente]* D: not a problem, of course *[tranquillamente, certo]*

(Continued)

TABLE 2 | Continued

Main category and sub-categories	Description	Example
Check for understanding (CHECK)	The hearer expresses a doubt of understanding, as s/he is uncertain to have understood correctly what the speaker said.	FIRST-VISIT Infertility cause: "idiopathic"; treatment: "second-level"; prognosis: "favorable" FP: really the appendix was fantastic and when they opened me up they said who decided this? So they decided to do it on me and when they obviously decided to take it out, they found a cyst on the right ovary *in realtà l'appendice era fantastica e quando mi hanno aperto hanno detto ma chi è quello che l'ha decisa? Che poi aveva decisa di farmela: e quando l'hanno ovviamente tolta () deciso di toglierla, hanno trovato una ciste sull'ovaia destra* **D: the right one** *destra* FP: yes *sì* **D: so your pain wasn't probably from your appendix** *(0.3) per cui lei aveva dolore probabilmente non per [l'appendice]* FP: exactly *[brava]* **D: but from the cyst** *ma per la ciste* FP: exactly *esatto*
Weak evidence		
Irrelevance (IRR)	The hearer continues the conversation with a turn that is incoherent either pragmatically (e.g., request of information followed by an acknowledgment) or for topic (change of subject) with the previous turn.	FIRST-VISIT Infertility cause: "female infertility"; treatment: "heterologous"; prognosis: "favorable" FP: because we found out that now in Italy the law has passed *perché abbiamo saputo che adesso in Italia: è stata consentita la legge =* D: you found out from the newspapers or *= l'avete sentito cosi sui giornali su* FP: yeah, from the newspapers and we wanted to know more about what you all do and where it's at *si sui giornali e volevamo capire anche ↑che cosa facevate voi e su che punto era:* **D: sure sure but listen why don't you tell me about your story?** *((nods)) certo certo ascoltate invece [mi raccontate pero la storia vostra?]*
no uptake (NO UP)	The hearer fails to take into account the other's turn by interrupting the dialogue (silence) or continuing the dialogue without considering the interlocutor's turn.	FIRST-VISIT Infertility cause: "mixed"; treatment: "second-level"; prognosis: "favorable" D: the second thing is the lesion caused by the needle Because you enter the belly with a needle, you know how IVF works

(Continued)

TABLE 2 | Continued

Main category and sub-categories	Description	Example
		seconda cosa lesione da ago no? perchè si entra con ago nella pancia, lei sa come funziona la fiveat?
		FP: yeah, a little, a little bit. But I would like you to explain it a little better, to him too, so that way we're
		un pochin sì un pochino si però vorrei che lo spiegasse un pò bene anche a lui perchè così siamo:-
		D: ok
		okey
		FP: we have no risk of misunderstanding *nonabbiamo rischi di fraintendimento*
		D: great um ((writes in folder)) married since?
		perfetto ehm: ((scrive cartella)) sposati dal?
		FP: uh officially since 2011
		ehm:ufficialmente dal [[2011]]

Evidence of problematic understanding is in bold.
D, doctor; FP, female patient; MP, male patient.
For all the details on the coding procedure see Supplementary Material annexed in Rossi and Macagno (2020).

then analyzed by grouping the seven types of problematic understandings in three main pre-defined and mutually exclusive categories, based on the misunderstandings' linguistic evidence: strong (lack of understanding, semantic alternative understanding, and pragmatic alternative understanding), acceptable (clarification and check for understanding), and weak (no uptake and irrelevance) evidence. The "strong evidence" category thus includes actual misunderstandings, while the "acceptable evidence" category captures cues of doubtful understandings. Finally, the "weak evidence" category captures indirect signs of potential misunderstandings, as a lack of coherence between interlocutors' turns. **Table 2** offers a brief description and an example for each coding category.

Videos of the consultations were stored in an encrypted hard disk at the University of Milan, and only the anonymized transcripts were used for the analysis. Types of problematic understandings were detected using Microsoft®Office Excel (Office 365) and reported by using descriptive statistics (frequency; average; percentage). Inter-rater reliability (IRR) was conducted on 12 interviews (60%) which were independently analyzed by two researchers (MGR and JM); one researcher (MGR) concluded the analysis on the remaining 8 visits. IRR was strong (agreement 98%, Cohen's Kappa > 0.80), except for the weak evidence for which Cohen's Kappa value was only 0.5 (26 disagreements; 5001 agreements) (McHugh, 2012).

Analysis of Topics

Strong misunderstandings were also further analyzed to detect the main connected topics. This analysis followed an inductive process and the principles of thematic analysis (Braun and Clarke, 2006). In particular, we detected the explicit contents of misunderstanding within the data, meaning the direct object of e.g., a lack of understanding or other types of strong misunderstandings. As a first step, the content of each misunderstanding was extracted using the exact words adopted by the speaker. This resulted in a list of word-by-word contents. Then, as a second step, more generic and brief codes were tagged to the items. The next step was the generation of themes based on the similarities/differences between codes. The last step was completing the allocation of codes in the emerging themes for all the items, and checking the entire analytical process. Therefore, the analysis was an iterative process of refinement of codes and themes, where first codes and themes were generated, checked within the entire dataset, revised, and finally applied to the sample of ART visits. This process was performed by one researcher (MGR) in a constant discussion of cases with a second researcher (JM). Emerging themes were discussed with a third researcher (EV) and doubts were solved through discussion. Descriptive statistics (frequency; average; percentage) were used also in this case to report data on the emerging themes.

RESULTS

Overall, we found 1078 (11%) turns with misunderstandings over a total of 9941 turns in the 20 analyzed consultations. On average, there were 54 misunderstandings per visit (median = 43; range = 18–145).

Type of Misunderstandings: Comparing First and Follow-Up Consultations

Most of the misunderstandings retrieved in the corpus were check for understandings (n = 641; 59%) and clarifications (n = 250; 23%) within the category of "acceptable evidence" (n = 891; 83%). Then, we retrieved 150 (14%) misunderstandings with a "strong evidence," and in particular pragmatic alternative understandings (n = 62; 6%), semantic alternative understandings (n = 59; 5%), and lack of understandings (n = 29; 3%). The least represented types of misunderstanding were no uptakes (n = 20; 2%) and irrelevance (n = 17; 2%), in the "weak evidence" category.

The 63% (n = 680, the 13% of the first visits' turns) of the misunderstandings occurred in the first visits compared to the 37% (n = 398, the 8% of the follow-ups' turns) retrieved in the follow-ups. When comparing first and follow-up consultations for the different types of misunderstandings, we found that misunderstandings with acceptable evidence (clarification and check for understanding) mostly occurred in the first visits (65% vs. 35% of follow-ups), while those with weak evidence (and in particular irrelevant turns) mostly happened during follow-up consultations (54% vs. 46% of first visits). Differences between first and follow-up visits for the "strong evidence" category were mixed: pragmatic alternative understandings tended to occur slightly more frequently in follow-ups than first visits, while semantic alternative understandings usually occurred during first visits. **Table 3** shows the frequency of the different types of misunderstandings in first visits and follow-ups.

TABLE 3 | Frequency (n, %) of the different types of misunderstanding in first and follow-up visits.

Types of misunderstanding	First visits	Follow-up visits	Tot
Strong evidence	**85 (57%)**	**65 (43%)**	**150 (14%)**
Lack of understanding	*18*	*11*	*29*
Semantic alternative understanding	*38*	*21*	*59*
Pragmatic alternative understanding	*29*	*33*	*62*
Acceptable evidence	**578 (65%)**	**313 (35%)**	**891 (83%)**
Clarification	*160*	*90*	*250*
Check for understanding	*418*	*223*	*641*
Weak evidence	**17 (46%)**	**20 (54%)**	**37 (3%)**
Irrelevance	*6*	*11*	*17*
No uptake	*11*	*9*	*20*
Tot misunderstandings	**680 (63%)**	**398 (37%)**	**1078 (100%)**
Turns tot	**5212 (52%)**	**4729 (48%)**	**9941 (100%)**
Misunderstandings/turns	**13%**	**8%**	**11%**

Misunderstandings in First and Follow-Up Consultations

When looking at who (doctor, female patient, male patient) expressed the misunderstanding, we found that misunderstandings were more frequently expressed by doctors (in doctors' turns) (n = 643/1078, 60%) rather than by couples (n = 435/1078, 40%). Within the couple, the majority of the misunderstandings were expressed in women's turns (n = 241/1078; 22%) rather than in men's turns (n = 194/1078, 18%). However, when weighting for the number of turns, 9% of the men's turns included an expression of a misunderstanding, compared to the 7% of the women's turns.

The distribution of misunderstandings between doctors and couples differed between first visits and follow-ups: if in the first visits the doctors contributed to more than the two-third of the misunderstandings (n = 469/680, 69%), in the follow-ups doctors' contributions went down to less than the half (n = 174/398, 44%). The reasons were clear when observing the types of misunderstandings: doctors expressed the majority of the requests for clarification and checks for understandings in the first visits (n = 422). For the other categories of misunderstandings, doctors and patients contributed more or less equally. Couples more frequently than doctors expressed strong types of misunderstandings both in first and follow-up visits, but there were no differences in the types of misunderstandings between female and male patients. **Table 4** shows the frequencies of the different types of misunderstandings for first visits and follow-ups, distinguishing between doctors and couples.

TABLE 4 | Types of misunderstanding in first and follow-up visits (n = 1078).

	First visits		Follow-ups	
Types of evidence	**Doctors**	**Couples**	**Doctors**	**Couples**
Strong evidence	**39 (26%)**	**46 (31%)**	**26 (17%)**	**39 (26%)**
Lack of understanding	8	10	5	6
Semantic alternative understanding	19	19	9	12
Pragmatic alternative understanding	12	17	12	21
Acceptable evidence	**422 (47%)**	**156 (18%)**	**138 (15%)**	**175 (20%)**
Clarification	116	44	34	56
Check for understanding	306	112	104	119
Weak evidence	**8 (22%)**	**9 (24%)**	**10 (27%)**	**10 (27%)**
Irrelevance	4	2	1	8
No uptake	4	7	9	2
Total	**469**	**211**	**174**	**224**

Challenging Topics in First and Follow-Up ART Visits

We detected six main areas of topics connected to the strong misunderstandings: (a) history-taking topics (n = 51/150; 34%); (b) treatment-related topics, meaning the timing and procedures of treatments (n = 32/150: 22%); (c) clinical consultation topics, meaning the medical information exchanged during the consultation (n = 24/150; 16%); (d) bureaucratic topics, meaning the country and center rules (n = 22/150; 15%); (e) emotional topics, meaning concerns and complaints (n = 14/150; 9%); (f) relationship-building topics (n = 6/150; 4%). Details about the categories and subcategories of topics are reported in **Appendix 1**. Strong misunderstandings about history-taking topics were more frequent in first visits (n = 39) than in follow-ups (n = 12), while those about treatments were slightly more frequent in follow-ups (n = 19) than first visits (n = 13). For the other topics, misunderstandings were detected more or less in the same amount in first visits and follow-ups. **Table 5** provides information about the topics and subtopics connected to the strong types of misunderstandings in first and follow-up visits.

Strong misunderstandings about history-taking topics were more frequently expressed by doctors (n = 32/51) than by patients (n = 19/51), as were those about emotional topics (n = 5/6 in doctors' turns) (**Table 6**). On the opposite, strong misunderstandings about bureaucratic, treatment-related, and clinical consultation topics were more frequently found in patients' turns (n = 17/22, n = 25/32, n = 16/24, respectively) than doctors' turns. While female patients expressed most of those about treatment-related and clinical consultation topics (n = 16/25 and n = 10/16, respectively), male patients

most frequently expressed those about bureaucratic topics (n = 10/17).

Unpacking the Technical, Informational, and Emotional Complexity

We detected various examples showing the complex interlacement between technical information exchange and emotionally charged experiences that feature the ART field and which can particularly generate misunderstandings. As an example of this, we present an extract of an analyzed consultation.

In this consultation, the doctor advised the male patient to perform the semen analysis. Being a "manual" examination, the experience of the person who performs the test is fundamental. The male patient explicit his doubts and concerns in interpreting the meaning of the term "manually."

1 D So this is the only test that I suggest you do here or in "X" [name of another health care facility]

Questo ecco è l'unico esame che le consiglio di fare qui::(.) o in alternativa a "X" [nome di un'altra struttura sanitaria]

2 MP uh

ah

3 D not elsewhere because it's a test one of few tests that is still done manually

diciamo non da altre parti perché è un esame è uno dei pochissimi esami che ancora viene eseguito manualmente

4 MP uh huh

mh mh

5 D so the lab technician that looks at it and their experience is important

quindi l'operatore che lo vede e la sua esperienza è fondamentale

6 MP uh huh

mh mh

7 D since it's not a simple, pleasant test

dato che non è un esamino simpaticissimo

8 MP um I don't think I understood what do you mean manually?

cioè non ho capito manualmente cosa vuol dire?

The patient explicitly stated that he was not able to understand what "manually" meant or that the interpretation he achieved was not acceptable. This misunderstanding might have been also facilitated by the combination of technical (e.g., "manually") and common (ambiguous) language (e.g., "pleasant test"). Overall, this example shows how both informative complexity and emotional concerns due to the intimate topics touched can explain (actual or potential) difficulties in understanding, and especially lack of understandings and semantic alternative understandings.

TABLE 5 | Topics connected to the strong types of misunderstanding in first and follow-up visits (n = 150).

Topics and sub-topics	First-visits	Follow-ups	Tot
(A) Bureaucratic topics: Country and center rules	10 (45%)	12 (55%)	22 (15%)
(B) Treatment topics: Timing and procedures	13 (41%)	19 (59%)	32 (22%)
(C) Clinical consultation topics: Medical information	12 (50%)	12 (50%)	24 (16%)
(D) History-taking topics	39 (76%)	12 (24%)	51 (34%)
(E) Emotional topics: Concerns and complaints	8 (57%)	6 (43%)	14 (9%)
(F) Rapport-building topics	3 (50%)	3 (50%)	6 (4%)
Total	**85 (57%)**	**65 (43%)**	**150 (100%)**
Number of turns	*5212 (52%)*	*4729 (48%)*	*9941 (100%)*
Misunderstandings/number of turns	*2%*	*1%*	*2%*

*(See **Appendix 1** for more details on the sub-categories used).*

TABLE 6 | Topics connected to the strong types of misunderstandings (n = 150).

	Doctors	Couples
(A) Bureaucratic topics: Country and center rules (n = 22)	5	17
(B) Treatment topics: Timing and procedures (n = 32)	7	25
(C) Clinical consultation topics: Medical information (n = 24)	8	16
(D) History-taking topics (n = 51)	32	19
(E) Emotional topics: Concerns and complaints (n = 15)	8	7
(F) Rapport-building topics (n = 6)	5	1
	65	**85**

DISCUSSION

The present study systematically analyzed the main communication problems affecting the co-construction of shared understanding in first and follow-up ART triadic visits. It shed light on the different types of misunderstandings in these consultations, thus providing indications on which types of misunderstandings most frequently occur, when, by whom, and (in case of strong misunderstandings) about what. This is a never-explored area in the ART field: doctor-patient communication, in general, has been poorly investigated in the ART field, and misunderstandings have rarely been explored in medical fields.

Findings from this study showed that misunderstandings with acceptable evidence (clarifications, checks for understanding) are the most represented in ART triadic consultations. This finding confirms results obtained in other medical settings: in another study using the same coding scheme on a corpus of consultations with patients affected by diabetes, "acceptable evidence" of misunderstandings were again the most represented (Rossi and Macagno, 2020). These findings are coherent also with what has been suggested in the field of applied linguistics: overt corrections are in general not predominant in human interactions, also beyond the medical setting (e.g., Schegloff et al., 1977; Healey and Thirlwell, 2002; Kitzinger, 2012; Dingemanse et al., 2015, 2016). The prevalence of misunderstandings with acceptable evidence in first visits can be seen as an indication of the complexity of these ART interactions, confirming that first visits are usually longer and with more complex information exchanges than follow-up visits (Fossum and Arborelius, 2004; Graugaard et al., 2005). Such complexity, at a time when the relationship between couples and doctors still needs to be

established, makes the efforts of reaching a shared understanding frequent and potentially challenging. Both clarifications and checks for understanding dropped drastically in the follow-up visits performed by the same doctors. For patients, however, numbers revealed a different trend: the same clarifications and checks slightly increased in follow-up visits, showing that efforts to build a shared understanding persist for patients in follow-ups.

The amount of semantic alternative understandings was remarkable in ART consultations and almost doubled those found in consultations with patients affected by type 2 diabetes using the same coding scheme (Rossi and Macagno, 2020), weighting for the number of turns. Indeed, in diabetic consultations, the pragmatic dimension was much more problematic than the semantic, suggesting diversity in clinical purposes more oriented toward self-management and lifestyle change that can more easily lead to wrong inferences about what the doctor says. Such prevalence of semantic alternative understandings in ART visits, at the opposite, may emphasize dialogic mismatches at the level of the specific semantic representation or content of what is said: alternative interpretations due to ambiguities, meanings interpreted too narrowly or broadly, or mistakes in identifying proper references are all phenomena falling in the semantic alternative understanding category. As shown by the example discussed in the previous section, this may indicate a greater complexity of the ART field at the level of the information and technical terms conveyed, also considering the complexity of treatments and procedures. We have found several examples in which a mixed-use of technical language and jargon language may have introduced ambiguity and caused problems of understanding, similarly to what was observed in the context of diabetes (Macagno and Rossi, 2019, 2021).

Concerning our findings related to who expressed the misunderstanding, we found that doctors may not completely understand patients' statements, especially in first visits. Previous studies have shown that first visits have extensive and quite complex segments of history-taking (Fossum and Arborelius, 2004; Graugaard et al., 2005), which can explain the high numbers of misunderstandings contained in doctors' turns. Within the couple, even if male patients participated overall less to the dialogue in terms of turns uttered compared to female patients, we found that they expressed a higher number of misunderstandings than female patients weighting for their number of turns. This may indicate that the quality of the contribution of male patients is high (i.e., they do not fear to express, potentially or problematic, alternative understandings, thus contributing to the shared effort of doctors and patients of resolving ambiguities and building a common understanding), even if they talk less. In the literature, it is known that male patients talk less than female patients in ART interactions (Leone et al., 2018; Borghi et al., 2019). The finding on male misunderstandings may shed light on the role of male patients in the ART consultation and care process. From the analysis of topics, we have also revealed how bureaucratic topics are frequently addressed by male patients, often introducing juridical complexity into the conversation. Male patients may provide important contributions to disambiguate specific contents of the medical visits that are relevant for the care process and that, if unclear, may result in dissatisfaction with ART care. Such specific conversational behavior expressed by male patients may be interpreted in the context of the social role theory (Eagly et al., 2000), with bureaucratic issues handled more often by male patients as a social role expectation to fulfill a family function more related to the practicalities of the daily life. However, their willingness to contribute especially when bureaucratic topics are discussed might also be interpreted as a way to convey their distress and anxiety in a more indirect way, by discussing less emotional topics. Our results may indirectly confirm findings about gender differences reported in previous studies, with male patients expressing in general less emotional reactions and psychological distress than female patients (Jordan and Revenson, 1999; Peterson et al., 2006; Nagórska et al., 2019). Further studies are needed to deepen and explore in other contexts the specific role of male patients in triadic consultations.

The analysis of topics of clearly expressed misunderstandings with strong evidence revealed the main contents of the consultations that may need specific attention: the long history-taking of the first visits can particularly generate ambiguities that doctors may need to explicit, and treatment- and consultation-related misunderstandings may particularly raise in follow-up visits by couples. Other topics that can generate difficulties in comprehension in ART interaction are bureaucratic, emotional, and relationship-building topics, revealing the unclear rules and administrations that feature the ART care together with emotionally and relationally charged aspects (probably due to the intimate aspects touched by the ART care). This overview of challenging topics may provide indications for ART doctors about contents that need particular clarity and attention to avoid ambiguities, and that can be also easily recognized and solved compared to more subtle types of misunderstandings.

LIMITATIONS

This study has some limitations. The sample of visits was collected in 2013–2015, thus reflecting ART care and regulations of that period. Regulations in Italy have changed after that period, and this may have changed some of the topics of the conversation and the related possibility of misunderstandings. This mostly concerns misunderstandings about bureaucratic topics. The same can apply to ART visits in Countries with other regulations.

Concerning the use of the coding scheme, Cohen's Kappa values were low for the two weak categories of no uptake and irrelevance. While these categories may need to be revised to fit the ART field or better defined, the low scores may depend on the fact that Cohen's Kappa values are sensitive to the low numbers of occurrences.

Then, we did not analyze if and how problems of understanding were solved within the interaction and repaired. In this sense, this study should be complemented by a further study assessing the use of different types of repair operations and repair strategies (Schegloff, 1988; Healey and Thirlwell, 2002;

Healey et al., 2005; Dingemanse et al., 2015; Albert and de Ruiter, 2018).

Finally, we have analyzed only misunderstandings as defined by Rossi and Macagno (2020). Other types of mismatches have been excluded by our analysis, like misconceptions and disagreements, which we, however, observed in the corpus. Further studies will extend the analysis of misunderstandings to other types of communication mismatches.

CONCLUSION

This study showed that understanding can be problematic in ART triadic interactions. Such difficulty involved mostly the history-taking part of first visits, with doctors' requests for clarification and checks, and the treatment-related and medical consultations topics in follow-up visits, with couples' direct expressions of misunderstanding. It also highlighted the role of male patients in contributing to expressing specific problems of understanding. Compared to other consultations, ART visits may be particularly rich in information exchanges and technicalities together with complex regulations and intimate, emotionally charged contents, thus explaining the different types of misunderstandings observed. ART doctors should be aware of this complexity, and try to disambiguate as much as possible terms and concepts in specific phases and topics of the consultation, as well as be sensitive to couples' signs of problematic understanding, which are usually direct and clear.

DATA AVAILABILITY STATEMENT

The data analyzed in this study is subject to the following licenses/restrictions: the datasets analyzed during the current study are available from the corresponding author on reasonable request. Requests to access these datasets should be directed to MGR, mgrazia.rossi@fcsh.unl.pt.

ETHICS STATEMENT

The research project was approved by the Ethical Review Board of the University of Milan and by the Ethical Review Boards of the eight participating ART clinics. Written informed consent was obtained from each participant included in the study, and patients and physicians were guaranteed the right to withdraw voluntarily if they so decide. Data were managed according to local regulations regarding privacy.

AUTHOR CONTRIBUTIONS

All the authors contributed to the conception and design of the work, revised it critically, and gave their final approval of the version to be published. EV contributed to the acquisition of data. MGR and JM contributed to the data analysis and the draft of the work.

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APPENDIX

TABLE A1 | Topics and subtopics used to classify strong types of misunderstandings.

Topics and sub-topics	
(A) Bureaucratic topics: Country and center rules	
Country rules	•Regulations in egg donation and heterologous insemination (Italy) •Regulations *in vitro* fertilization (Italy) •Identification of a foreign country allowing egg donation
Center rules	•Coordination •Treatment costs •Contact methods
B. Treatment topics: Timing and procedures	
Timing	•Examinations (spermiogram, blood test, fallopian tubes) •Waiting list duration •Medical visits
Procedures	•After getting pregnant •Treatments (sperm freezing, embryo transfer, stimulation) •Assessment of treatment options (egg and/or sperm donation) •In a foreign medical center •Informed consent compilation •Monitoring (number of patients, number of visits before embryo transfer or stimulation cycles of insemination)
(C) Clinical consultation topics: Medical information	
	•Assessment of current medical condition •Results of the fallopian tubes examination •Issues related to ovodonation •Issues related to ovulation and menstrual cycle •Issues related to embryo transfer •Issues related to (natural) insemination •Issues related to intrauterine pregnancy •Issues related to heterologous fecundation •Issues related to examinations •Fertility rate •Terminological issues (embryo freezing, karyotype, antagonist stimulation, follow up)
(D) History-taking topics	
	•Biographical information (location of couple's provenience, marital status, patients' age) •Familiar anamnestic information (parents' menopause threshold) •Patients' anamnestic information (menstrual cramps and/or menstrual cycle, previous pregnancies, male sexual problems, sexual intercourse, other health issues) •Previous examinations (sperm test, blood test, breast ultrasound examination) •Relevant documentation •Drug-taking (identification or dosage) •Previous access to a different medical center (discussion of previous treatment place, discussion of clinical issues in another center) •Previous treatment (*in vitro* fertilization, interruption of a treatment)
(E) Emotional topics: Concerns and complaints	
Concerns	•Ovulation and menstrual cycle •Preventive measures related to embryo transfer or stimulation cycles of insemination •Stress caused by the treatment process •Complications of heterologous fecundation (due to fibromas) •Medical limitations
Complaints	•Financial values in another medical center •Treatment in another medical center (overtreatment, embryo procedure, sperm freezing)
(F) Rapport-building topics	
	•Previous contact and presentation •Mutual acquaintances •Informal comments and jokes

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