FERTILITY-RELATED QUALITY OF LIFE IN MEN UNDERGOING MEDICALLY ASSISTED REPRODUCTION DURING THE PANDEMIC: PERFECTIONISM AND THOUGHT CONTROL BELIEFS MODERATE THE EFFECTS OF THE TYPE OF TREATMENT

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Abstract

Objective: After a diagnosis of infertility, an increasing number of couples turns to the Medically Assisted Reproduction (MAR) to achieve a pregnancy. A diagnosis of infertility has a negative impact on the individual's well-being and it can increase the risk of anxious-depressive symptoms, stress, and low self-esteem. Data associated with infertility-related Quality of Life (QoL) are lacking in men. Little is known about men's experience of infertility and its treatments during the pandemic. Among the variables potentially associated with infertility-related QoL, the role of obsessive beliefs is neglected, although preliminary studies considered perfectionistic traits.

Method: One hundred and fifty-one participants were included. Eighty men (mean age: 40.83 years) were attending a MAR pathway. Of these, 50 men (67.5%) were undergoing homologous MAR and 30 men (37.5%) were undergoing heterologous MAR. A control group consisting of 71 subjects (mean age: 36.69 years), paired by age, marital status, and number of children, was drawn from the general population. The Obsessive Beliefs Questionnaire-46, the Depression Anxiety Stress Scales-20, and the Fertility Quality of Life Questionnaire were administered.

Results: High levels of anxiety, depression and stress were moderately associated with lower infertility-related Quality of Life. For men undergoing homologous MAR, perfectionism beliefs represented a vulnerability factor for a lower fertility-related QoL, while for men undergoing heterologous MAR, high thought control beliefs represented a risk factor for a lower fertility-related QoL.

Conclusions: A focus on the obsessive beliefs should be included in the psychological treatment of infertile men, specifically perfectionism in homologous MAR and control of thoughts in heterologous MAR. Therefore, psychological assessment and support interventions should be personalized according to the MAR pathway and be focused on men's cognitive features in order to improve their QoL during the MAR pathway.

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Background

Infertility is defined as a failure to establish a clinical pregnancy after 12 months of regular, unprotected sexual intercourses, or due to an individual or couple impossibility to procreate (Zegers-Hochschild et al., 2017). It is a global health problem generating disability (Borght & Wyns, 2018; Zegers-Hochschild et al., 2017)

affecting between 10 and 15% of couples, half of which are due to male factor (Hayden et al., 2018). In Italy, one couple out of five - twice compared to 1996 - has difficulties to achieve a natural procreation (Ministry of Health, 2016).

The condition of infertility is particularly burdensome from a psychological point of view for both men and women. A diagnosis of infertility has a negative impact on both the individual's and the couple's wellbeing (Babore et al., 2017). In women, a diagnosis of infertility is associated with overwhelming feelings of anger and grief (Greil et al., 2010), stigma and shame (Loke et al., 2011), guilt (Gerrity, 2001) and loss of control over one's life (Cousineau & Domar, 2007). A significantly higher proportion of women than men report poorer marital adjustment, lower quality of life (Zurlo et al., 2018), higher sexual and relationship concerns (Luk & Loke, 2018), in addition to frustration, social isolation, stress (Greil et al., 2010), low self-esteem, psychological distress and suicidal thoughts (Ying et al., 2015).

Men suffering from fertility problems often develop self-blame, social isolation, sense of loss, self-stigma, lower levels of self-esteem (Babore et al., 2017), loss of sexual satisfaction (Luk & Loke, 2018; Schmidt, 2006), stress (Gerrity, 2001), premature ejection and erectile dysfunction (Ying et al., 2015) and, broadly, low Quality of Life (QoL) (Agostini et al., 2017; Chachamovich et al., 2010; Martins et al., 2016),

The construct of Fertility-related QoL considers different emotional (resentment, sadness, depression) cognitive (fatigue, pain, poor concentration, disrupted daily activities, delayed life plans), relational (sexuality, communication, and commitment in marital relationship), and social (social inclusion, expectations, stigma, and support) dimensions of QoL for men and women suffering from infertility and undergoing Medically Assisted Reproduction (MAR) pathways (Boivin et al., 2011; Volpini et al., 2019), that consist in the application of various procedures aimed to achieve a pregnancy (Ministry of Health, 2015, July 1). Different data indicate an increasing couple's adoption of the MAR that can be homologous and heterologous. In homologous MAR, the gametes that are implanted are those of the couple undergoing the treatment and, therefore, the couple usually has a mild or moderate degree of infertility. In heterologous MAR, instead, at least one of the two gametes do not belong to the couple and this path is usually recommended for couples in which at least one of the two partners has a moderate to severe degree of infertility (Ministry of Health, 2015, May 27; Ministry of Health, 2015, July 1).

Depressive and anxious symptoms are the most common reactions to infertility and the start of a MAR programme (Matthiesen et al., 2011). An Italian longitudinal study on the prevalence of depressive and anxious symptoms in participants undergoing MAR found that 17.9% of women suffered from depressive symptoms and 14.7% from anxious symptoms, whereas 6.9% of men suffered from depressive symptoms and 4.5% from anxious symptoms (Chiaffarino et al., 2011).

A study on 43 women shows that beliefs of motherhood and perfectionism as personality trait predict lower levels of fertility-related QoL (Zarbo et al., 2018). As compared with the heterologous group, individuals in homologous MAR show higher depressive and state-trait anxious symptoms and fertility-related stress (Pozza et al., 2019), higher obsessive-compulsive traits, hostility, psychoticism (El Kissi et al., 2013), and worse QoL (Pozza, Dèttore, & Coccia, 2020).

Once considered a specific vulnerability and

maintenance factor for obsessive-compulsive symptoms (Rachman, 1998; Salkovskis, 1985) and for QoL associated with this condition (Barahmand et al., 2014; Kumar et al., 2012; Pozza, Ferretti, & Coluccia, 2019; Pozza, Marazziti, et al., 2020), obsessive dysfunctional beliefs have been increasingly regarded as a transdiagnostic factor involved in a quite larger spectrum of psychological symptoms also including anxious and depressive symptoms (Gentes & Ruscio, 2011; Pozza et al., 2013; Pozza & Dèttore, 2014; Tolin et al., 2006). Further evidence showed that the intensity of the obsessive beliefs may be even higher in patients with a range of chronic medical diseases than patients with OCD (Baptista et al., 2011; Eisenberg et al., 2015). Such beliefs cover three main cognitive domains: (1) Importance/Control of Thoughts (i.e., the belief that one can and should control all their thoughts), (2) Overestimation of Threat/Inflated Responsibility (the perception that the occurrence of a negative event is highly probable, accompanied by an exaggerated sense of personal responsibility), and (3) Perfectionism/Intolerance for Uncertainty (the need to set exceedingly high personal standards to avoid failure and the intolerance towards all that is uncertain) (Obsessive Compulsive Cognitions Working Group [OCCWG], 2005).

In response to the Covid-19 pandemic (Giorli et al., 2020), scientific and professional fertility societies (ESHRE, 2020; IFFS, 2020) suggested that patients with infertility should consider deferring pregnancy (Souza et al., 2020). Although fertility-related stress is a stressor comparable to the pandemic itself (Pozza, Mucci, & Marazziti, 2020; Vaughan et al., 2020), the emotional impact of the pandemic cannot be underestimated in infertile patients (Turocy et al., 2020). Indeed, the closure of MAR clinics was evaluated as a threat to parenthood expectations. Infertile patients, perceiving missing out their one or very last opportunity to become pregnant, expressed anger and resentment at the unfairness of the situation and reported feelings of uncertainty, worry, frustration, hopelessness, and deteriorating quality of life (Boivin et al., 2020; Gordon & Balsom, 2020; Madjunkov et al., 2020). Micelli et al. (2020) report that about one-third of couples who were planning to have a child before the pandemic, decided to abandon their intention during the quarantine, due to worries regarding future economic difficulties (58%) or potential risks to a pregnancy (58%).

Rationale and aims of the study

Little is known about fertility-related QoL in men during the pandemic. Among the variables potentially associated with QoL, there is no evidence on the role of the obsessive beliefs, although some preliminary evidence was found for perfectionism (El Kissi et al., 2013; Pozza, Dèttore, & Coccia, 2020; Zarbo et al., 2018).

The present study compared the levels of obsessive beliefs and depressive-anxious and stress symptoms between a group of men with infertility undergoing a MAR pathway (homologous or heterologous) and a control group without infertility from the general population without infertility. We hypothesized that men undergoing a MAR pathway would report higher depressive-anxious and stress symptoms and obsessive beliefs, particularly perfectionism, than men from control group.

The second objective was to investigate whether the obsessive beliefs can moderate the effect of the type of

MAR on QoL dimensions controlling for depressive, anxious and stress symptoms. Since there was no clear, available evidence about the interaction between obsessive beliefs and MAR type, we did not have a specific hypothesis regarding these moderating effects.

Methods

Eligibility criteria and procedure

Participants were included in the clinical group if they: (a) were men undergoing homologous or heterologous MAR, (b) were capable of reading and correctly understanding written Italian, (c) provided signed informed consent to data management. The study was approved by the Institutional Ethics Committee of the Careggi University Hospital of Florence (Italy). All the men who came to the MAR Clinic during the period between October and December 2020 were asked if they would respond to a series of self-report questionnaires, whose completion took on average of 30 minutes.

Before completing the questionnaires, the participants were asked to respond to questions regarding their socio-demographic information, the affective relationship with their partner (duration of the relationship, cohabitation status, and duration of pregnancy seeking), the type of MAR (homologous or heterologous), and their general medical condition.

A control group was recruited from the general population through an online survey based on a convenience sampling by social media advertisements which provided an overview of the study aims and eligibility criteria. The control group consisted of men who were involved in a stable relationship with their partners/wives. The participants in the clinical group were matched with control subjects on age (an age range of ± 5 years was allowed), number of children and marital/cohabitation status. Participants in the control group completed the same questionnaires filled by the clinical group. Participants were excluded from the control group if they reported that they and/or their partners suffered from infertility and whether they were currently carrying on a pregnancy.

Measures

Obsessive Beliefs Questionnaire-46 (OBQ-46; Dorz et al., 2009)

The Obsessive Beliefs Questionnaire (OBQ) was designed by the Obsessive Compulsive Cognitions Working Group (OCCWG, 1997, 2001, 2003, 2005) to assess central cognitive domains in the development and maintenance of obsessing-compulsive symptoms. In the Italian version of this questionnaire, composed of 46 items, subject are asked to indicate their agreement, by using a 7-point Likert scale (1 = "Strongly Disagree"; 7 = "Strongly Agree"), with each of the sentences, subdivided into the following subscale: Perfectionism (11 items; the need to always do things perfectly and the perceived sense of failure when the proposed standards are not met); Responsibility for Damage (10 items; that sense of responsibility one feels when committing an action deemed immoral or harmful), Control of Thoughts (11 items; need to exert complete control over one's thoughts), Responsibility for Omission (7 items; excessive responsibility in relation to situations of harm prevention or damage by omission) and Importance of Thoughts (7 items; the degree of certainty that having a thought per se indicates that it is important). The OBQ-

46 showed satisfying values of internal consistency and stability at 30 days (Dorz et al., 2009; Novara et al., 2011)

Fertility Quality of Life Questionnaire (FertiQoL; Boivin et al., 2011)

The FertiQoL is a self-report questionnaire which measures QoL for women and men experiencing fertility problems (Boivin et al., 2011). The original version was developed by Boivin et al. (2011), who designed an instrument consisting of two modules, which assess respectively core aspects of fertility-related QoL (Core Fertility QoL) and Treatment tolerability and satisfaction with the treatment environment (Treatment-related Fertility QoL). The Core Fertility QoL is composed of 24 items divided into Emotional, Mind-body, Relational and Social subscales. The Treatment-related Fertility QoL (optional) is composed of 10 items divided into Environment and Tolerability subscales. The Likert-type item format consists of 5 choices (0-4). The Italian version showed good internal consistency, with Cronbach's alpha equal to .92 for the Core FertiQoL, .81 for the Treatment FertiQoL, and .92 for the Total FertiQoL. In line with the original model (Boivin et al., 2011), the Italian version shows good construct validity and reliability (Donarelli et al., 2016; Volpini et al., 2019).

Depression Anxiety Stress Scale (DASS-2; Lovibond & Lovibond, 1995)

The Depression Anxiety Stress Scale (DASS-21) is a 21-item self-report questionnaire designed to differentiate between the core symptoms of anxiety, depression, and stress, and it is form of the 42-item questionnaire developed by Lovibond and Lovibond (1995), is considered a measure of general distress plus three additional orthogonal dimensions (anxiety, depression, and stress) (Osman et al., 2012). Studies on the DASS-21 showed excellent internal consistency across the three scales (.80 < Cronbach's alpha < .91) and high convergent and divergent validity, respectively $0.50 < $ Pearson's $r < .80$ and $- .16 < $ Pearson's $r < - .48$. The Italian version, validated by Bottesi et al. (2015), supported the three-factor model and showed a two-week test-retest reliability of Pearson's $r = .74$, with Cronbach's alpha $> .70$. Therefore, the DASS-21 scale can provide a good indicator of anxiety, depression, and stress in a meaningful and efficient manner (Bottesi et al., 2015).

Data analyses

The analyses were conducted through Statistical Package for Social Sciences (SPSS) version 25.00. To compare the MAR and control groups, a series of independent-group Student's *t*-tests were calculated on the scores of the OBQ-46, DASS-21, and FertiQoL. Statistical significance level for this analysis was set at $p<.006$ after the Bonferroni correction for multiple comparisons. For this analysis, a-priori power calculations suggested that for a medium effect size, 70% power, and a significance level set at $p<.006$, the required sample size was 152.

The associations between the scores of the OBQ-46, DASS-21 and FertiQoL were calculated in the MAR group using Pearson's bivariate correlation. Values on the correlation coefficients were interpreted according

to the following criteria provided by Cohen et al. (1988): $0 < |r| < .30$ =weak; $.30 < |r| < .50$ = moderate; $.50 < |r| < .70$ = strong; $.70 < |r| < 1$ = very strong. Power calculations were run for the correlational analysis: for a medium effect size, 70% power, and a significance set at $p < .05$, the required sample size for bivariate correlations was at least 65 participants.

To analyse the moderating effects of the obsessive beliefs on the relation between the MAR type and fertility-related QoL, a series of generalised linear models was carried out entering OBQ-46, DASS-21 and MAR type as predictors (main effects of MAR type, OBQ-46 and DASS-21 scores and MAR type x OBQ-46 scores interaction effects) and including FertiQoL scores as dependent variables. Statistical significance level for this analysis was set at $p < .05$.

Results

Descriptive characteristics of the participants

Overall, one hundred and fifty-one participants were included (**table 1**). Eighty men who met the inclusion criterion (i.e., a MAR pathway) attended the infertility services in the designated period. Of these, 50 men (67.5%) were undergoing homologous MAR and 30 men (37.5%) were undergoing heterologous MAR. All these men completed and returned the questionnaires. Only seventy-one men were eligible for the control group. The participants' flow is presented in **figure 1** according to the STROBE flowchart (von Elm et al., 2007).

Obsessive beliefs and depressive/anxious symptoms between clinical and control groups

Subjects undergoing a MAR pathway showed similar scores on all subscales to control men except for the OBQ-46 Responsibility for Omission subscale, where they reported significantly higher scores than the control group (**table 2**). Therefore, men in MAR showed higher levels of excessive responsibility in relation to situations of harm prevention or damage by omission. However, this comparison resulted significant only at a *p*-value of 0.05 and it disappeared when a Bonferroni correction was applied ($p < .006$).

The clinical group showed significantly lower scores on all the DASS-21 scales than the control group (**table 2**). This indicated a higher level of depression, anxiety and stress in the group from the general population as compared with men undergoing MAR.

Associations between obsessive beliefs, depressive/anxious and stress symptoms and fertility-related QoL in men undergoing MAR pathways

To determine the associations between obsessive beliefs, depressive-anxious and stress symptoms and fertility-related QoL in the clinical group, bivariate correlation indices were calculated between OBQ-46, DASS-21 and FertiQoL subscale scores (**table 3**). The results pointed out significant associations between the scores on the OBQ-46 Perfectionism scale and

Figure 1. *Flowchart according to STROBE reccomendation*
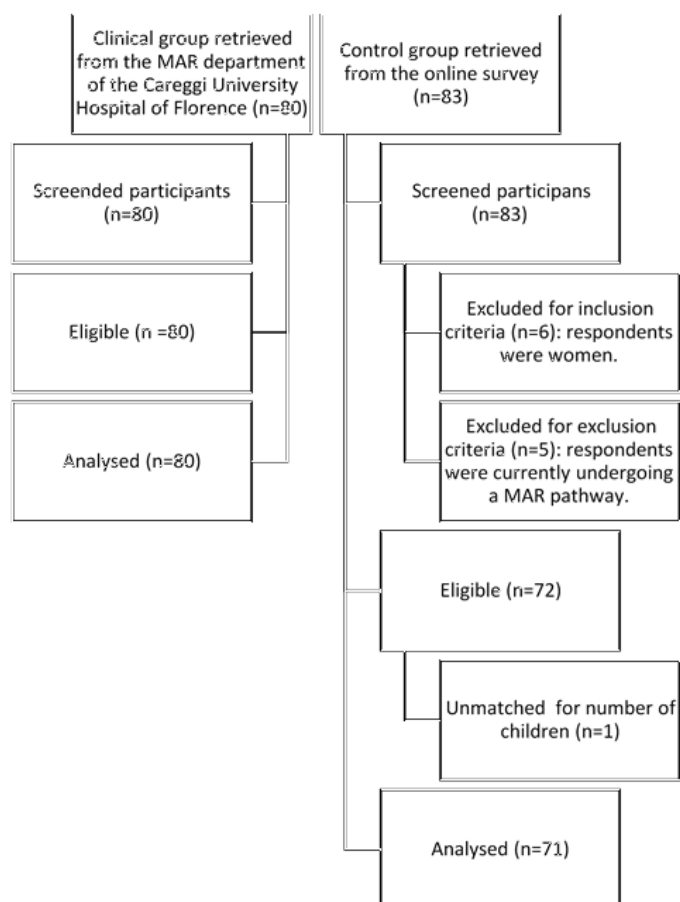
Table 1. *Sociodemographic and clinical characteristics of the two groups (n=151)*

		Clinical group		Control group	
		n / Mean	% / Range	*n* / Mean	% / Range
Age (years)		40.83 ± 7.04	28 – 59	36.69 ± 8.20	24 – 63
Marital status	Married	54	67,5%	24	34%
	Cohabitant	26	32,5%	23	32%
	In a stable relationship (non-cohabiting)	0	0%	24	34%
Education level	Primary school licence	1	1%	3	4%
	Secondary school licence	21	26%	4	6%
	High-school licence	31	39%	36	52%
	Academic degree	22	28%	24	34%
	Advanced degree	5	6%	3	4%
Working status	Student	0	0%	4	5.63%
	Unemployed	3	3.75%	2	2.82%
	Employed	76	95%	64	90.14%
	Retired	1	1.25%	1	1.41%
Relationship duration (months)		131.42 ± 76.68	12 – 324	108.98 ± 79.46	12 – 456
Duration of pregnancy seeking (years)		48.6 ± 50.61	6 - 324	/	/
MAR pathway	Homologous	50	62.5%	/	/
	Heterologous	30	37.5%	/	/
Pharmacological treatment for other conditions different from infertility	Antidepressants	3	3,75%	1	1.41%
	Beta-blockers	3	3,75%	0	0%
Mental disorders	Depressive disorders	2	2.5%	2	2.82%
	Anxiety disorders	5	6.25%	2	2.82%

Note. MAR = Medically assisted reproduction.

the FertiQoL Core scores. Specifically, there was a weak negative significant correlation between OBQ-46 Perfectionism subscale and the Core FertiQoL scores. Moreover, OBQ-46 Perfectionism scores were moderately negatively correlated with the Mind-body FertiQoL subscale and weakly correlated with the FertiQoL Social subscale scores. There was also a negative association between the OBQ-46 Responsibility for Omission subscale and the FertiQoL Social subcale scores.

The scores on the Core FertiQoL and scores on the Emotional, Mind-body, Relational and Social subscales were significantly, moderately negatively associated with the scores on all the DASS-21 subscales, except for the association between FertiQoL Social subscale scores and DASS-21 Anxiety scores.

Lastly, age (*r* = .10), number of children (*r* = .06), duration of the relationship (*r* = .15), and duration of pregnancy seeking (*r* = .06) were not associated with FertiQoL scores.

The moderation effects of the obsessive beliefs on the link between MAR and QoL dimensions

The results (**table 4**) showed that, regardless of the effect of the type of MAR pathway, high levels of depressive symptoms were significantly associated with lower overall QoL, depicted by the Core FertiQoL scale. In association with high levels of Perfectionism, the homologous MAR represented a vulnerability factor for a lower QoL. In association with high levels of Control of Thoughts, the heterologous MAR represents a risk factor for a lower QoL. The interaction between the homologous MAR and Perfectionism predicts lower scores to the FertiQoL Emotional subscale, which corresponds to a higher frequency of negative emotion linked to infertility. Higher levels of depressive symptoms were associated with a lower effect of infertility on physical health, which is depicted by the FertiQoL Mind-body subscale. Still in the Mind-body dimension, Perfectionism negatively moderates the effect of the homologous MAR on QoL. In addition, the interaction between the homologous MAR and the anxious symptoms was associated with lower levels of physical health and concentration. None of the obsessive beliefs were associated with the impact of infertility on marital relationship (e.g., sexuality, communication, and commitment), which is depicted by the score at the FertiQoL Relational subscale. Regardless of MAR typology, participants with higher levels of Control of Thoughts and Responsibility for Omission were those who had lower scores at the FertiQoL Social subscale, meanwhile, in the same subscale, participants with high levels of Perfectionism and Responsibility for Damage showed higher scores. Furthermore, the interaction between Perfectionism and homologous MAR significantly predicts a negative impact of infertility on social relationships. Finally, the interaction between Control of Thoughts and heterologous MAR significantly predicts a negative effect of infertility on social aspects (e.g., social inclusion, expectations, and perceived support).

Table 2. *Comparison of the clinical scales across the clinical and control groups (n=151)*

Clinical scales	Groups	n	Mean	SD	$t_{(df)}$	p-value
OBQ-46 Perfectionism/ Intolerance of Uncertainty	Clinical	80	32.10	11.89	$-1.81_{(149)}$	.071
	Control	71	35.87	13.65		
OBQ-46 Responsibility for Damage	Clinical	80	43.51	12.12	$1.46_{(149)}$	.147
	Control	71	40.63	12.13		
OBQ-46 Control of Thoughts	Clinical	80	36.68	12.98	$0.21_{(149)}$	.904
	Control	71	36.42	12.69		
OBQ-46 Responsibility for Omission	Clinical	80	21.24	8.26	$2.04_{(149)}$	.043
	Control	71	18.73	6.57		
OBQ-46 Importance of Thoughts	Clinical	80	17.88	7.26	$0.68_{(149)}$	.499
	Control	71	17.08	7.04		
DASS-21 Depression	Clinical	80	2.03	2.90	$-3.81_{(121.773)}$	.000
	Control	71	4.30	4.22		
DASS-21 Anxiety	Clinical	80	1.61	2.20	$-2.64_{(130.657)}$	0.36
	Control	71	2.72	2.85		
DASS-21 Stress	Clinical	80	5.01	3.88	$-3.30_{(131.684)}$	.016
	Control	71	7.44	4.99		

Note. OBQ-46 = Obsessive Beliefs Questionnaire-46, DASS-21 = Depression Anxiety Stress Scale-21

Table. 3. *Bivariate correlation between the scores on the OBQ-46 and DASS-21 scales and the FertiQoL scores in men undergoing MAR pathways (n = 81)*

	OBQ-46 P	OBQ-46 RD	OBQ-46 CT	OBQ-46 RO	OBQ-46 IT	DASS-21 D	DASS-21 A	DASS-21 S	Age	Number of children	Duration of the relationship	Duration of pregnancy seeking
FertiQoL Emotional	-.16	.09	-.08	-.06	.02	**-.50****	**-.32****	**-.41****	.12	.20	.18	.04
FertiQoL Mind-body	**-.32****	-.15	-.21	-.19	-.06	**-.55****	**-.44****	**-.42****	.10	.05	.09	.09
FertiQoL Relational	.01	.04	.01	.07	.12	**-.47****	**-.36****	**-.38****	-.06	-.12	.02	.09
FertiQoL Social	**-.28***	-.08	-.19	**-.24***	-.06	**-.45****	-.19	**-.37****	.14	.03	.20	-.04
Core FertiQoL	**-.24***	-.04	-.15	-.14	-.01	**-.61****	**-.40****	**-.48****	.10	.06	.14	.05

Note. ** p < 0.01, * p < 0.05. OBQ-46 = Obsessive Beliefs Questionnaire-46 (P = Perfectionism, RD = Responsibility for Damage, CT = Control of Thoughts, RO = Responsibility for Omission, IT = Importance of Thoughts); DASS-21 = Depression Anxiety Stress Scale-21 (D = Depression, A = Anxiety, S = Stress)..

Discussion

The general aim of the present study was to explore the experience of men related to infertility and its treatments (i.e., fertility-related QoL), a neglected aspect in the literature, as most of the available studies focused on women's experience. To our knowledge, this is the first study that compared obsessive beliefs and fertility-related QoL across homologous and heterologous MAR and investigated whether the obsessive beliefs moderate the effect of the MAR type on QoL dimensions.

Three main findings emerged. First, men undergoing a MAR pathway had lower depressive-anxious and stress symptoms than the control group from the general population without infertility. Second, amongst men undergoing any type of MAR, inflated responsibility beliefs for damage and omission were associated respectively with higher and lower fertility-related QoL. Finally, men with high levels of perfectionism and uncertainty intolerance undergoing homologous

Table 4. *Generalised linear models using FertiQoL total/subscale scores as dependent variables in men undergoing MAR pathways (n = 81)*

Dependent variable Core FertiQoL		B	Standard Error	95% CI Lower	95% CI Upper	Wald χ²(1)	p-value
Intercept		82.188	6.5233	69.402	94.973	158.735	.000
Homologous MAR		4.020	8.2309	-12.113	20.152	.239	.625
Heterologous MAR		0ᵃ	0ᵃ	0ᵃ	0ᵃ	0ᵃ	0ᵃ
OBQ-46	P	.526	.2700	-.003	1.055	3.793	.051
	RD	.323	.2392	-.146	.791	1.820	.177
	CT	-.237	.2659	-.758	.284	.795	.373
	RO	-.594	.4571	-1.490	.302	1.687	.194
	IT	.015	.3905	-.750	.780	.001	.969
DASS-21	D	**-2.079**	**.7976**	**-3.642**	**-.516**	**6.794**	**.009**
	A	-.001	.9613	-1.885	1.883	.000	.999
	S	-.486	.6349	-1.730	.759	.586	.444
Homologous MAR * P		**-.871**	**.3099**	**-1.478**	**-.263**	**7.892**	**.005**
Homologous MAR * RD		-.083	.2784	-.629	.462	.090	.764
Homologous MAR * CT		**.696**	**.3126**	**.083**	**1.308**	**4.953**	**.026**
Homologous MAR * RO		-.032	.5444	-1.099	1.035	.003	.953
Homologous MAR * IT		-.025	.4631	-.932	.883	.003	.958
Homologous MAR * D		-.172	.9719	-2.077	1.733	.031	.859
Homologous MAR * A		-1.119	1.1929	-3.457	1.219	.880	.348
Homologous MAR * S		.431	.7523	-1.043	1.906	.328	.567
Dependent variable FertiQoL Emotional		**B**	**Standard Error**	**95% CI Lower**	**95% CI Upper**	**Wald χ²(1)**	**p-value**
Intercept		76.949	8.7897	59.722	94.177	76.641	.000
Homologous MAR		2.957	11.0905	-18.780	24.694	.071	.790
Heterologous MAR		0ᵃ	0ᵃ	0ᵃ	0ᵃ	0ᵃ	0ᵃ
OBQ-46	P	.576	.3638	-.136	1.289	2.511	.113
	RD	**.807**	**.3223**	**.176**	**1.439**	**6.277**	**.012**
	CT	-.263	.3582	-.965	.440	.537	.464
	RO	-1.024	.6159	-2.231	.183	2.766	.096
	IT	-.271	.5261	-1.302	.760	.265	.607
DASS-21	D	-1.547	1.0747	-3.653	.559	2.072	.150
	A	-.882	1.2953	-3.421	1.657	.464	.496
	S	-1.088	.8555	-2.765	.589	1.617	.203
Homologous MAR * P		**-.870**	**.4175**	**-1.689**	**-.052**	**4.343**	**.037**
Homologous MAR * RD		-.446	.3751	-1.182	.289	1.415	.234
Homologous MAR * CT		.777	.4212	-.048	1.603	3.407	.065
Homologous MAR * RO		.362	.7335	-1.075	1.800	.244	.621
Homologous MAR * IT		.190	.6240	-1.033	1.413	.093	.760
Homologous MAR * D		-.834	1.3095	-3.400	1.733	.405	.524
Homologous MAR * A		.160	1.6074	-2.991	3.310	.010	.921
Homologous MAR * S		.986	1.0137	-1.001	2.973	.947	.331
Dependent variable FertiQoL Mind-body		**B**	**Standard Error**	**95% CI Lower**	**95% CI Upper**	**Wald χ²(1)**	**p-value**
Intercept		99.351	9.0786	81.558	117.145	119.760	.000
Homologous MAR		-5.659	11.4550	-28.111	16.792	.244	.621
Heterologous MAR		0ᵃ	0ᵃ	0ᵃ	0ᵃ	0ᵃ	0ᵃ

Table 4. *Continued*

		B	Standard Error	95% CI Lower	95% CI Upper	Wald $\chi^2_{(1)}$	p-value
OBQ-46	P	.324	.3757	-.413	1.060	.742	.389
	RD	-.312	.3329	-.965	.340	.880	.348
	CT	.022	.3700	-.703	.747	.003	.953
	RO	.244	.6362	-1.003	1.491	.147	.701
	IT	-.332	.5434	-1.397	.733	.372	.542
DASS-21	D	**-3.558**	**1.1100**	**-5.734**	**-1.382**	**10.274**	**.001**
	A	.848	1.3379	-1.774	3.470	.402	.526
	S	-.386	.8836	-2.118	1.346	.191	.662
Homologous MAR * P		**-.956**	**.4313**	**-1.801**	**-.111**	**4.916**	**.027**
Homologous MAR * RD		.636	.3875	-.123	1.396	2.698	.100
Homologous MAR * CT		.405	.4351	-.448	1.258	.867	.352
Homologous MAR * RO		-1.153	.7577	-2.638	.332	2.315	.128
Homologous MAR * IT		.716	.6445	-.547	1.980	1.236	.266
Homologous MAR * D		1.650	1.3526	-1.001	4.301	1.489	.222
Homologous MAR * A		**-3.628**	**1.6602**	**-6.882**	**-.375**	**4.777**	**.029**
Homologous MAR * S		.927	1.0470	-1.125	2.979	.785	.376

Dependent variable FertiQoL Social		B	Standard Error	95% CI Lower	95% CI Upper	Wald $\chi^2_{(1)}$	p-value
Intercept		71.252	8.1032	55.370	87.134	77.319	.000
Homologous MAR		17.634	10.2243	-2.405	37.673	2.975	.085
Heterologous MAR		0ᵃ	0ᵃ	0ᵃ	0ᵃ	0ᵃ	0ᵃ
OBQ-46	P	**.934**	**.3354**	**.277**	**1.591**	**7.760**	**.005**
	RD	**.820**	**.2971**	**.238**	**1.403**	**7.624**	**.006**
	CT	**-.880**	**.3302**	**-1.527**	**-.233**	**7.099**	**.008**
	RO	**-1.333**	**.5678**	**-2.446**	**-.220**	**5.514**	**.019**
	IT	.499	.4850	-.451	1.450	1.060	.303
DASS-21	D	-1.524	.9908	-3.466	.417	2.368	.124
	A	1.592	1.1942	-.749	3.932	1.777	.183
	S	-.342	.7887	-1.888	1.203	.189	.664
Homologous MAR * P		**-1.534**	**.3849**	**-2.288**	**-.779**	**15.872**	**.000**
Homologous MAR * RD		-.560	.3458	-1.238	.118	2.619	.106
Homologous MAR * CT		**1.533**	**.3883**	**.771**	**2.294**	**15.576**	**.000**
Homologous MAR * RO		.493	.6763	-.833	1.818	.531	.466
Homologous MAR * IT		-.621	.5753	-1.749	.506	1.166	.280
Homologous MAR * D		-1.445	1.2073	-3.812	.921	1.433	.231
Homologous MAR * A		-1.678	1.4818	-4.582	1.227	1.282	.258
Homologous MAR * S		.294	.9345	-1.538	2.126	.099	.753

Note. a. Set to zero because this parameter is redundant.
b. Computed based on the Pearson chi-square.
OBQ-46 = Obsessive Beliefs Questionnaire-46 (P = Perfectionism, RD = Responsibility for Damage, CT = Control of Thoughts, RO = Responsibility for Omission, IT = Importance of Thoughts); DASS-21 = Depression Anxiety Stress Scale-21 (D = Depression, A = Anxiety, S = Stress).

MAR reported lower levels of emotional, cognitive, and social fertility-related QoL than men undergoing heterologous MAR.

The finding that men undergoing MAR reported lower depressive-anxious symptoms than control men was somewhat unexpected. An explanation for this surprising result might be that the prevalence rates of anxious and depressive symptoms significantly increased also in the general population during the pandemic (Lakhan et al., 2020; Salari et al., 2020). We should also consider that if life planning and most of daily activities are suspended during the pandemic, this might have a more stressful impact on control couples than infertile couples undergoing a MAR pathway,

as the latter couples may be more used to uncertainty because they have been facing it for a long time.

The result that for men undergoing any type of MAR, inflated responsibility beliefs for damage and omission were associated with, respectively, higher and lower QoL would indicate that they would endorse inflated beliefs of responsibility for damage to feel able to cope with infertility and get control over the MAR pathway and its outcomes. Conversely, the MAR pathway might be experienced by men as a stressful pathway due to their tendency to feel themselves excessively responsible for any possible mistake during the pathway that might impact negatively on the outcome, i.e., inflated responsibility beliefs for damage.

The finding that amongst men with high perfectionism and uncertainty intolerance, the homologous MAR represented a vulnerability factor for lower emotional, cognitive, and social fertility-related QoL might suggest that, as compared with men in heterologous MAR, those in homologous MAR experience a worse QoL. This might be related to the fact that their gametes are used for fertilization, particularly if they need that the treatment course is perfect and any risk associated with the outcome is prevented. The strong desire to achieve a pregnancy and the fear of a failure if personal standards are not met can be associated with a poorer fertility-related QoL consisting of a range of unpleasant feelings including jealousy, pain and resentment, poor concentration, disrupted daily activities, social isolation, and inadequate perceived support.

Amongst men with high levels of thought control beliefs, the heterologous MAR seems to be associated with a lower overall QoL and its social dimension. Differently from homologous pathways, in heterologous MAR, the outcome of treatment does not depend directly on men's behaviours. Perhaps, the only way men can get some control over the pathway might be trying to control their own thoughts and worrying about the MAR outcome.

Implications for psychological support practice

According to the Italian guidelines (Ministry of Health, 2015, July 1), public MAR services should provide couples undergoing the pathway the opportunity of psychological assessment and support. The results of the present study suggest that psychological support interventions should be specifically adapted to the men's needs according to the MAR type with the aim to improve their cognitive, emotional and behavioural responses to infertility and MAR pathways. Perfectionism beliefs in infertile men undergoing homologous MAR should be considered a key target of the psychological assessment and support intervention, as such beliefs may be associated with fertility-related QoL. Conversely, psychological support of men undergoing heterologous MAR should focus on thought control beliefs to improve their QoL, especially in terms of social inclusion, expectations, stigma, and perceived support.

Limitations and future directions

The cross-sectional design of the present study allows to draw conclusions only about the associations between the variables. Through a longitudinal design, the role of beliefs as vulnerability factors for QoL changes over time may be tested in a more reliable way. In addition, such a design might allow the changes

of QoL to be assessed over time across the different phases of MAR (diagnostic, stimulation, and transfer) for each MAR pathway. Another limitation is the use of self-report measures. Further studies should combine self-report instruments with clinician-administered measures, such as semi-structured clinical interviews. By using additional clinical instruments, further research should also assess the role of other clinical variables related to the obsessive beliefs, such as the obsessive symptom dimensions (Abramowitz et al., 2010; Cervin et al., 2020; Pozza et al., 2017).

Another issue that deserves further exploration involves the effects of the beliefs and MAR type on couple satisfaction and, potentially, sexual dysfunctions since such beliefs have been found to be related to sexual functioning (Pozza, Veale, et al., 2020 2020b). Finally, another area that should be assessed in future research concerns the experience of spouses that should be integrated in the research protocol to have a broader picture of the couple's experience and its link with the experience of men.

Conclusions

In summary, the present study suggests that perfectionism beliefs and high thought control beliefs represent vulnerability factors for a lower fertility-related QoL amongst men undergoing, respectively, homologous and heterologous MAR. Therefore, psychological assessment and support interventions during clinical practice should be personalized according to the MAR pathway and be focused on men's cognitive features to improve their QoL during MAR pathways.

List of abbreviations
DASS-21 = Depression Anxiety Stress Scale
FertiQoL = Fertility Quality of Life Questionnaire
MAR = Medically Assisted Reproduction
OBQ = Obsessive Beliefs Questionnaire
OBQ-46 = Obsessive Beliefs Questionnaire-46
QoL = Quality of Life
SPSS = Statistical Package for Social Science

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