



Predictors of quality of life and psychological health in infertile couples: the moderating role of duration of infertility

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Abstract

Purpose To investigate the influence of individual characteristics (age, gender, educational level, coping strategies), perceived couple's Dyadic Adjustment, type of diagnosis and duration of infertility on self-reported quality of life (QoL) and psychological health in infertile couples, examining the potential moderating role of duration of infertility.

Methods A questionnaire composed by socio-demographics, Coping Orientations to Problem Experienced, Dyadic Adjustment Scale, FertiQoL, State-Trait Anxiety Inventory and Edinburgh Depression Scale was submitted to 206 couples undergoing infertility treatments.

Results Female patients perceived significantly lower levels of QoL and higher levels of Anxiety and Depression. High Educational level and Social Support Coping strategy were associated with higher QoL and psychological health only in female patients. Problem Solving Coping strategy was associated with higher QoL and psychological health only in male patients. Positive Attitude and Avoidance/Distancing Coping strategies and perceived couple's Dyadic Adjustment were associated with higher QoL and psychological health in both male and female patients. Duration of infertility > 3 years was associated with a reduction of protective effects of all coping strategies but did not affect protective effects of Educational level and couple's Dyadic Adjustment.

Conclusions Both positive/active and avoiding/distancing coping strategies are effective to promote QoL and psychological health in infertile couples, but they are all compromised by a long duration of infertility. Conversely, positive effects of educational level and couple's Dyadic Adjustment persist and should be emphasised in the definition of interventions to promote well-being in couples undergoing long-term treatments.

Keywords Infertility · Quality of life · Coping strategies · Couple's dyadic adjustment · Anxiety · Depression

Introduction

Infertility is clinically described as a disease of the reproductive system defined by the failure to achieve a clinical pregnancy after 12 months or more of regular unprotected sexual intercourse [1], affecting 9–15% of couples worldwide [2].

Several studies highlighted that infertility is a deeply distressing experience, which may induce the perception of disruption in the developmental trajectory of adulthood and in personal, marital and social relationships [3–7], frequently determining mood disorders, anxiety and depression [8, 9]. The infertility process from suspicion to received diagnosis and treatments often endures over a long period of time, and involves the risk of experiences of repeated fluctuations between hope and delusion, perception of loss of control, loss of self-esteem, inability to plan future, changes in identity and worldviews and difficulties in social interactions. Therefore, being infertile and undergoing fertility treatments is a condition which affects all infertile couples' life domains, inducing couples to activate their resources, knowledge and skills to deal with infertility challenges and to preserve their individual and relational quality of life (QoL) [10–15].

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Quality of life is a multidimensional construct defined as the perception of individuals of their position in the context of their culture and values system, and in relation to their goals, expectations, standards and concerns, which comprises psychological, physical, social and environmental perceived functioning and health [16]. Initially, several studies investigated QoL in infertile patients using generic measurement tools [13, 17], such as the Health Survey Short Form-36 (SF-36) [18]. More recently, research developed the FertiQoL, a tool specifically focused on infertility-related QoL, which assesses Core QoL dimensions (i.e. perceived emotional, physical, relational and social QoL) and Treatment QoL dimensions (i.e. accessibility and perceived quality of services, quality of interactions with the medical staff, physical and psychological consequences of the medical treatments) [10–12]. In this direction, research has been developed to investigate the predictors of QoL and psychological health in infertile couples, identifying the role played by several individual, relational and situational dimensions [11, 12, 14, 19].

Concerning individual characteristics, research emphasised the role of gender differences and the stronger impact of infertility and treatment experience on women's perceived levels of stress, quality of life, anxiety and depression [13, 14, 17, 20–22]. Educational level has also been identified as a significant variable, due to its association, on the one hand, with greater understanding and perceived control of medical treatments, and, on the other hand, with higher possibilities to consider joyful aspects of the life other than maternity [13, 20, 23, 24]. Finally, coping strategies adopted to deal with infertility have also been explored [6, 25–28], highlighting the negative effect of the recourse to coping strategies focused on avoidance and passivity (i.e. Avoidance and Turning to religion) [26, 29] and the protective effects of coping strategies focused on activity and interaction with others (i.e. Problem Solving, Social Support and Positive Attitude) [30, 31].

Concerning relational variables, research showed the deep influence of couple's dyadic adjustment and perceived levels of intimacy and mutual support on quality of life and psychological health conditions of infertile couples [15, 32, 33].

Finally, concerning situational characteristics, research investigated the role played by the type of diagnosis [14, 32, 34] and emphasised the negative effect of duration of infertility [17, 24] and repeated experiences of treatment failure [17, 20, 24, 35] due to the burden of medical treatments and to the effect of increasing age on fertility parameters and chances of success of treatments [20, 24, 36, 37].

Aims

Taking into account the role played by individual, relational and situational variables on quality of life and psychological health of infertile couples, the present study aims at investigating the main and combined effects of individual characteristics (Age, Gender, Educational level, Coping strategies), perceived couple's Dyadic Adjustment and infertility-related characteristics (Type of diagnosis, Previous treatments, Duration of infertility) on quality of life and psychological health conditions of infertile patients. Moreover, considering the definition of moderators as variables that change the direction or strength of a relationship between other variables, or determine when certain responses will occur, including buffering or interactive effects [38], the study also aims at testing the moderating role of duration of infertility.

Methods

Study design and participants

The study was conducted between April 2014 and September 2016. Chairmen of different Italian Centres of Assisted Reproduction of Naples (6 centres), Udine (1 centre) and Brescia (2 centres) were contacted to enlist their participation to the project and to give the authorisation for submitting a questionnaire to the infertile couples undergoing treatments in their centres. Inclusion criteria were as follows: (a) couples who had been diagnosed with infertility (Male Factor; Female Factor; Combined Male and Female Factor or Unexplained); (b) all aetiologies of infertility with exception of infertility caused by chromosomal and genetic abnormalities; (c) couples who were undergoing an infertility treatment of Intra-Uterine Insemination (IUI), or In vitro Fertilisation (IVF), or Intracytoplasmic Sperm Injection (ICSI); (d) the agreement by both members of the couple to participate in the study in order to consider couple sharing infertility problems as research unit. About 500 subjects (both partners of 250 couples) were asked by their physician to participate in the study before their appointment. The questionnaire lasting 20–25 min (one session) was submitted individually to both members of the infertile couples in a quiet room setting in the medical centre and one of the authors was always present to answer any queries raised by participants. If one or both partners refused to complete the survey they were not included in the final dataset; therefore, 12 couples with male not responding and 32 couples with no response from either partner were excluded. Overall, 206 couples (206 male, 206 female) completed the questionnaire (response rate = 82.4%).

Measures

A questionnaire composed of six sections was submitted to all couples considered including: (1) demographic and infertility-related characteristics; (2) Coping Orientations to Problem Experienced—New Italian Version (COPE-NVI) [39, 40], to assess coping strategies adopted to deal with infertility; (3) *Dyadic Adjustment Scale* (DAS) [41, 42], to assess perceived levels of couple's dyadic adjustment; (4) *Fertility Quality of Life Questionnaire* (FertiQoL) [11, 12], to assess Quality of Life in infertile couples; (5) *State-Trait Anxiety Inventory* (STAI-Y) [43, 44], to assess perceived levels of State Anxiety and (6) *Edinburgh Depression Scale* (EDS) [45, 46], to assess perceived levels of perinatal depression. The description of all variables and measures considered in the questionnaire is displayed in Table 1.

Statistical analysis

In relation to the objectives of our research, SPSS (Version 21) was used for all data analyses. Firstly, a number of descriptive analyses of demographic and infertility-related characteristics were conducted. Secondly, analyses of differences in Coping Strategies, Total Dyadic Adjustment, FertiQoL subscales and Total FertiQoL, State Anxiety and Depression mean scores were carried out according to gender. Thirdly, analyses of differences in FertiQoL subscales (Core, Treatment and Total FertiQoL) and State Anxiety

and Depression mean scores between subgroups of male and female infertile patients divided by Age, Educational level (Junior Middle School; Senior School; College), Type of Diagnosis (Male Factor; Female Factor; Combined Factor; Unexplained Factor), Duration of Infertility (≤ 3 / > 3 years) and presence of previous treatments (No/Yes) were conducted (ANOVA test). Then, all study variables were dichotomised: Age was dichotomised referring to the mean of our sample ($M = 34.4$); Educational Level was divided into High (College) and Low (Junior Middle School and Senior School) groups; Coping strategies, Total Dyadic Adjustment, FertiQoL, Anxiety and Depression scores were dichotomised referring to the cut-off of the respective validation studies (see Table 1); finally, Duration of infertility was dichotomised referring to the mean of our sample ($M = 3.0$ Years). Therefore, a set of Logistic Regression Analyses (method: enter, first indicator contrast; entry criterion: $p < 0.05$; removal criterion: $p > 0.01$, and Hosmer and Lemeshow Goodness-of-fit statistic fixed at $p > 0.05$) were separately carried out to determine the main effects of each independent variable (Educational level, Coping strategies, Total Dyadic Adjustment and Duration of infertility) on perceived levels of Quality of Life (Core and Treatment FertiQoL), Anxiety and Depression in male and female infertile patients. Afterward, a further set of Logistic Regression Analyses were run to test the potential moderating effect of Duration of infertility, evaluating its interaction effects with Educational level, Coping strategies, and Total Dyadic

Table 1 Variables considered in the questionnaire and description of measures

Dimensions	Measures	Variables
Demographic Characteristics	Single-item questions (4 items)	Age Gender (Male/Female) Educational Level (Junior Middle School, Senior School, College) Marital Status (Marriage/Cohabitation)
Infertility-Related Characteristics	Single-item questions (3 items)	Type of Diagnosis (Male, Female, Combined, Unexplained) Presence of Previous Treatments (No/Yes) Duration of Infertility
Coping Strategies	<i>Coping Orientations to Problem Experienced- New Italian version</i> (COPE-NVI) [39, 40] (60 items, 5-point scale)	Avoidance (cut-off = 23.5) Social Support (cut-off = 27.7) Positive Attitude (cut-off = 30.9) Problem Solving (cut-off = 32.0) Turning to religion (cut-off = 22.7)
Dyadic Adjustment	<i>Dyadic Adjustment Scale</i> (DAS) [41, 42] (32 items, 6-point scale)	Total Score (satisfaction, cohesion, consensus, affective expression) (cut-off = 115.7)
Fertility Quality of Life	<i>Fertility Quality of Life Questionnaire</i> (FertiQoL) [11, 12] (36 items, 5-point scale)	Core FertiQoL (cut-off = 54.6) Treatment FertiQoL (cut-off = 60.4) Total FertiQoL (cut-off = 55.4)
Psychological Symptoms	<i>State Scale of the State-Trait Anxiety Inventory</i> (STAI-Y) [43, 44] (20 items, 4-point scale) <i>Edinburgh Depression Scale</i> (EDS) [45, 46] (10 items, 4-point scale)	State Anxiety (cut-off male = 36.0, female = 39.9) Depression (cut-off = 9.0)

Adjustment in the prediction of perceived levels of Quality of Life (Core and Treatment FertiQoL), Anxiety and Depression in male and female infertile patients. All the different hypotheses have been tested carrying out separated Logistic Regression Analyses.

Results

Demographic and infertility-related characteristics are provided in Table 2. The age of participants ranged from 22 to 48 years (Mean = 34.0, SD = 3.85). Duration of infertility ranged from 1 to 15 years (Mean = 3.0 years; SD = 2.40), and it was > 3 years in 24.5% of cases. All the 206 couples (both male and female) had a diagnosis of primary infertility.

Table 2 Demographic and infertility-related characteristics of participants ($N=206$ couples)

Characteristics	Value	<i>p</i> Value
Male age in years [<i>n</i> (%)]		
≤ 34	66 (32.0%)	<0.001
> 34	140 (68.0%)	
Female age in years [<i>n</i> (%)]		
≤ 34	119 (57.8%)	<0.05
> 34	87 (42.2%)	
Male Educational level [<i>n</i> (%)]		
Junior middle school	34 (16.5%)	0.369
Senior school	106 (51.5%)	
College	66 (32.0%)	
Female Educational level [<i>n</i> (%)]		
Junior Middle School	44 (21.4%)	0.565
Senior School	86 (41.7%)	
College	76 (36.9%)	
Marital Status		
Marriage	384 (93.4%)	<0.001
Cohabitation	28 (6.6%)	
Type of Diagnosis [<i>n</i> (%)]		
Male Factor	58 (28.2%)	0.969
Female Factor	66 (32.0%)	
Combined Factor	51 (24.8%)	
Unexplained	31 (15.0%)	
Type of treatment [<i>n</i> (%)]		
IVF	120 (58.3%)	0.936
ICSI	60 (29.1%)	
IUI	26 (12.6%)	
Previous treatments [<i>n</i> (%)]		
No	87 (42.3%)	0.544
Yes	119 (57.7%)	
Duration of infertility [<i>n</i> (%)]		
≤ 3 years	156 (75.5%)	<0.001
> 3 years	50 (24.5%)	

Concerning gender differences, Table 3 shows a similar recourse to coping strategies centred on Problem Solving, Positive Attitude and Turning to religion in male and female patients, and higher levels of recourse, respectively, to the Avoidance coping strategy among male patients ($p < 0.001$) and to the Social Support coping strategy among female patients ($p < 0.001$). Moreover, female infertile patients perceived significantly lower levels of Total Dyadic Adjustment ($p < 0.001$) and of Core, Treatment and Total QoL, and reported higher levels of State Anxiety and Depression than their partners.

Table 4 displays differences in perceived levels of Quality of Life, State Anxiety and Depression referring to individual characteristics (Age, Educational level) and infertility-related characteristics (Type of diagnosis, Duration of infertility and Previous treatments) in male and female patients.

Firstly, considering individual characteristics, increasing age was significantly associated with lower Total QoL in both male and female infertile patients and, respectively, with lower Core FertiQoL and higher Anxiety in male patients, and with lower Treatment FertiQoL and higher Depression in female patients. Moreover, increasing educational level was significantly associated with higher Treatment and Total QoL in both male and female infertile patients, and with higher Core QoL and lower Anxiety and Depression in female patients. Secondly, considering infertility-related characteristics, Male and Female Factor diagnoses were associated with significantly lower QoL and higher Anxiety and Depression, respectively, in male and female patients, and Unexplained Infertility Factor diagnosis was significantly associated with lower QoL and psychological health both in male and female patients. Moreover,

Table 3 Coping strategies and Total Dyadic Adjustment, FertiQoL, State Anxiety and Depression scores according to gender

	Female Mean ± SD	Male Mean ± SD	<i>p</i> Value
Coping strategies			
Problem Solving	28.43 ± 5.66	28.26 ± 6.80	0.458
Avoidance	24.07 ± 7.13	26.95 ± 6.77	<0.001
Positive Attitude	27.35 ± 6.63	27.04 ± 6.74	0.672
Social Support	27.20 ± 7.36	22.91 ± 7.09	<0.001
Turning to religion	11.70 ± 0.49	11.63 ± 0.52	0.683
Dyadic Adjustment Scale Total	109.04 ± 16.17	112.61 ± 16.60	<0.001
FertiQoL			
Core FertiQoL	53.47 ± 12.97	58.17 ± 12.53	<0.05
Treatment FertiQoL	60.48 ± 15.93	64.87 ± 14.32	<0.05
Total FertiQoL	52.66 ± 14.43	55.15 ± 13.52	<0.05
State Anxiety	46.43 ± 3.11	42.03 ± 4.61	<0.05
Depression	12.53 ± 2.93	8.33 ± 1.61	<0.05

Table 4 Differences in the FertiQoL scales, State Anxiety and Depression scores by Age, Educational levels, Type of diagnosis, Duration of infertility and Previous treatments in male and female patients

	Core FertiQoL		Treatment FertiQoL		Total FertiQoL		State Anxiety		Depression	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Age										
≤ 34 years	57.43 ± 11.63	53.58 ± 12.71	65.42 ± 15.71	61.06 ± 16.50	56.23 ± 14.32	54.09 ± 14.32	42.26 ± 3.32	46.91 ± 2.49	8.31 ± 2.51	12.82 ± 2.48
> 34 years	55.19 ± 13.10	52.76 ± 11.63	64.77 ± 15.42	58.34 ± 15.32	53.04 ± 14.73	51.92 ± 14.72	45.83 ± 2.13	47.04 ± 3.50	6.93 ± 2.42	14.97 ± 2.56
F	6.41*	2.82	.873	6.21*	6.23*	8.03**	7.02*	.066	7.44*	7.63*
Educational Level										
Junior Middle School	58.26 ± 12.15	52.66 ± 13.02	63.13 ± 14.35	58.54 ± 15.75	53.82 ± 15.25	51.71 ± 14.73	43.54 ± 2.64	47.23 ± 3.42	8.27 ± 2.42	13.92 ± 2.54
Senior School	57.28 ± 11.73	53.78 ± 12.84	65.34 ± 15.39	60.36 ± 16.37	55.34 ± 14.82	52.78 ± 15.05	43.67 ± 3.87	46.04 ± 3.56	7.22 ± 1.56	12.51 ± 1.33
College	59.12 ± 12.24	56.19 ± 13.17	66.12 ± 15.93	62.92 ± 16.71	57.26 ± 15.21	54.96 ± 14.97	42.83 ± 2.34	45.45 ± 3.61	8.28 ± 2.61	12.12 ± 2.67
F	1.76	5.38*	5.86*	5.88**	7.42*	6.23*	.344	5.35*	1.85	8.11**
Type of diagnosis										
Male Factor	54.14 ± 13.34	54.51 ± 15.31	62.11 ± 14.57	62.11 ± 15.82	52.91 ± 14.38	54.71 ± 13.47	44.23 ± 4.53	46.22 ± 5.34	9.86 ± 2.86	12.37 ± 1.43
Female Factor	58.55 ± 14.24	52.61 ± 14.36	66.22 ± 13.97	58.43 ± 14.43	56.73 ± 14.11	50.34 ± 14.72	42.02 ± 5.11	48.61 ± 4.36	6.54 ± 2.43	14.18 ± 1.65
Combined Factor	57.76 ± 14.69	54.81 ± 15.17	64.78 ± 14.26	60.21 ± 15.34	54.67 ± 15.52	52.33 ± 14.31	43.78 ± 5.52	46.91 ± 4.89	7.33 ± 3.32	13.49 ± 1.24
Unexplained	55.67 ± 13.92	52.96 ± 14.86	63.86 ± 15.29	59.95 ± 16.31	53.85 ± 14.33	51.27 ± 13.26	43.93 ± 5.33	48.07 ± 5.78	7.42 ± 1.04	13.97 ± 1.84
F	8.35*	7.53*	8.14**	6.13**	7.81*	8.23*	5.81*	6.16**	4.84*	6.43*
Duration of infertility										
≤ 3 years	58.96 ± 13.47	53.76 ± 15.42	65.06 ± 15.26	61.53 ± 16.72	56.34 ± 14.62	52.79 ± 14.78	42.24 ± 4.09	46.89 ± 6.23	7.31 ± 2.75	12.25 ± 1.83
> 3 years	56.36 ± 12.91	52.01 ± 16.82	64.22 ± 14.95	58.34 ± 15.38	54.10 ± 14.34	50.05 ± 14.67	46.64 ± 4.68	48.35 ± 5.46	9.91 ± 2.43	14.95 ± 2.21
F	5.16*	7.21**	2.29	5.49*	6.61**	5.64*	5.49*	8.24*	5.51*	5.64*
Previous treatments										
No	57.25 ± 11.26	54.44 ± 12.03	66.12 ± 14.83	61.28 ± 16.12	56.34 ± 14.11	54.29 ± 14.34	42.63 ± 3.26	46.62 ± 2.48	8.11 ± 2.51	12.28 ± 2.48
Yes	56.41 ± 11.82	53.67 ± 11.82	65.41 ± 15.02	58.31 ± 16.03	55.78 ± 14.33	51.87 ± 14.82	43.14 ± 2.96	48.14 ± 3.03	8.22 ± 2.43	15.03 ± 2.56
F	2.63	1.97	2.04	6.62*	1.83	7.43**	2.16	6.52*	1.84	8.04*

* $p < 0.05$; ** $p < 0.01$

Duration of infertility > 3 years was significantly associated with lower Core and Total FertiQoL and psychological health in male and female patients, and with lower perceived Treatment-related QoL in female patients. Finally, also the presence of previous treatments was associated with significantly lower Treatment and Total FertiQoL and higher perceived Anxiety and Depression in female patients.

Logistic Regression Analyses were carried out to evaluate main and interaction effects of Educational level, Coping Strategies, couple's Dyadic Adjustment and Duration of infertility on self-reported Quality of Life (Table 5) and Psychological health conditions (Table 6).

Considering main effects, High Educational level (College) and Social Support Coping strategy were associated with higher QoL and psychological health only in female patients; Problem Solving Coping strategy was associated with higher QoL and psychological health only in male patients; Positive Attitude and Avoidance/Distancing Coping strategies and perceived couple's Dyadic Adjustment

were associated with higher QoL and psychological health in both male and female patients and finally, Duration of infertility > 3 years was significantly associated with lower Quality of Life and higher perceived levels of Anxiety and Depression in both male and female patients.

Further analyses of interaction effects confirmed the hypothesis of a significant moderating role of Duration of infertility both in male and in female patients. Indeed, all Coping strategies considered in interaction with Duration of infertility > 3 years were associated with significantly lower levels of QoL and psychological health conditions in both male and female patients, highlighting a reduction of all their main protective effects. Conversely, Educational level and couple's Dyadic Adjustment, even when combined with Duration of infertility > 3 years were still associated with significantly higher levels of QoL and of psychological health conditions in both male and female patients, preserving their efficacy also in case of long duration of infertility.

Table 5 Regressions of Duration of infertility, Educational level, Coping strategies and perceived Total Dyadic Adjustment against self-reported Core and Treatment Quality of Life

	Male		Female	
	OR	95% CI	OR	95% CI
Core FertiQoL				
High Duration of Infertility	0.61**	0.31–0.82	0.42**	0.11–0.94
High Educational Level	2.67	0.79–3.06	3.85**	1.31–4.83
High Educational Level × High Duration of Infertility	2.42**	1.32–3.12	3.64**	2.53–4.89
High Problem Solving	3.78**	2.23–5.86	2.65	0.71–3.64
High Problem Solving × High Duration of Infertility	0.43**	0.21–0.87	0.32	0.18–1.64
High Avoidance	3.94**	1.97–6.31	3.42**	1.72–5.12
High Avoidance × High Duration of Infertility	0.52**	0.35–0.95	0.37**	0.24–0.69
High Positive Attitude	2.51	0.86–3.21	2.79	0.64–3.63
High Positive Attitude × High Duration of Infertility	0.38**	0.27–0.91	0.48**	0.17–0.71
High Social Support	2.07	0.52–1.83	3.26**	1.64–4.37
High Social Support × High Duration of Infertility	0.46	0.21–1.94	0.66	0.21–1.63
High DAS tot	3.52**	2.31–4.62	4.58**	2.12–5.83
High DAS tot × High Duration of Infertility	1.82**	1.06–2.76	1.64**	1.12–2.63
Treatment FertiQoL				
High Duration of Infertility	0.56**	0.24–0.78	0.42**	0.19–0.83
High Educational Level	2.46	0.74–3.76	3.52**	1.82–4.64
High Educational Level × High Duration of Infertility	0.43	0.13–2.03	2.57**	1.21–3.56
High Problem Solving	2.53**	1.72–3.21	2.02	0.24–3.14
High Problem Solving × High Duration of Infertility	0.53**	0.32–0.78	0.61**	0.26–0.81
High Avoidance	4.44**	2.68–6.68	3.25**	2.34–5.27
High Avoidance × High Duration of Infertility	0.61**	0.12–0.84	0.44**	0.28–0.76
High Positive Attitude	2.14	0.73–3.42	2.72**	1.67–3.91
High Positive Attitude × High Duration of Infertility	0.42**	0.18–0.89	0.51**	0.16–0.82
High DAS tot	2.95**	1.84–4.35	3.52**	1.93–5.57
High DAS tot × High Duration of Infertility	3.34**	2.61–4.85	3.72**	2.22–5.51

** $p < 0.01$ only significant associations were displayed

Table 6 Regressions of Duration of infertility, Educational Level, Coping strategies and perceived Total Dyadic Adjustment against self-reported State Anxiety and Depression

	Male		Female	
	OR	95% CI	OR	95% CI
State Anxiety				
High Duration of Infertility	3.25**	2.42–4.56	4.51**	2.93–6.67
High Educational Level	0.45	0.31–1.89	0.64	0.31–1.96
High Educational Level×High Duration of Infertility	0.66**	0.43–0.95	0.31**	0.12–0.82
High Problem Solving	0.51**	0.34–0.82	0.57	0.27–1.78
High Problem Solving×High Duration of Infertility	2.37**	1.03–4.11	2.01**	1.12–4.04
High Avoidance	0.43**	0.21–0.91	0.51**	0.27–0.85
High Avoidance×High Duration of Infertility	2.49**	1.53–4.39	2.04**	1.42–3.35
High Positive Attitude	0.61**	0.34–0.93	0.58	0.36–1.91
High Positive Attitude×High Duration of Infertility	1.91**	1.05–3.51	1.24**	1.11–3.02
High Social Support	1.51	0.72–2.32	0.28**	0.13–0.88
High Social Support×High Duration of Infertility	1.53	0.85–2.35	1.68	0.73–2.93
High DAS tot	0.47**	0.30–0.76	0.53**	0.27–0.96
High DAS tot×High Duration of Infertility	0.51**	0.32–0.85	0.36**	0.13–0.89
Depression				
High Duration of Infertility	4.56**	2.51–6.86	5.61**	2.35–7.89
High Educational Level	0.64	0.21–1.83	0.63**	0.32–0.94
High Educational Level×High Duration of Infertility	0.32	0.12–1.87	0.46	0.30–2.23
High Problem Solving	0.57**	0.31–0.87	0.51	0.33–2.71
High Problem Solving×High Duration of Infertility	1.47**	1.03–3.32	1.78**	1.12–3.25
High Avoidance	0.48**	0.25–0.92	0.38**	0.21–0.82
High Avoidance×High Duration of Infertility	3.89**	2.41–4.72	2.84**	2.11–4.06
High Positive Attitude	0.62	0.36–1.39	0.52	0.32–1.93
High Positive Attitude×High Duration of Infertility	1.53**	1.11–3.16	1.97**	1.32–3.63
High Social Support	0.35	0.13–1.87	0.42**	0.21–0.88
High Social Support×High Duration of Infertility	2.16	0.54–3.12	3.06	0.84–4.25
High DAS tot	0.61**	0.36–0.91	0.70**	0.31–0.94
High DAS tot×High Duration of Infertility	0.66**	0.21–0.85	0.52**	0.32–0.93

** $p < 0.01$ only significant associations were displayed

Discussion

Findings highlighted the significant role of individual characteristics, infertility-related characteristics and perceived couple's dyadic adjustment in predicting perceived levels of quality of life and psychological health conditions in male and female patients, also supporting the hypothesis of a moderating role of duration of infertility.

Firstly, in accordance with the literature which demonstrated the stronger impact of infertility experience among women [13, 14, 17, 22], our findings showed that female infertile patients perceived significantly lower levels of quality of life referring to core and treatment domains, as well as higher levels of anxiety and depression, supporting the interest of exploring their predictors addressing both male and female patients.

In this perspective, concerning the influence of individual characteristics, increasing age was found associated with a reduction of perceived total QoL and of psychological

health conditions in both male and female patients. More specifically, older male infertile patients perceived lower Core QoL (i.e. quality of emotional experience; physical health; partnership in terms of sexuality, communication and commitment and social inclusion, expectations and support) and higher Anxiety, while older female infertile patients perceived lower Treatment QoL (i.e. quality of all treatment-related environmental aspects and psychophysical consequences of treatment) and higher depression, indicating gender specificities in the impact of age-related perceived increasing risks of treatment failures and reduction of chances to achieve pregnancy.

Moreover, data showed that increasing educational level was associated with higher QoL in both male and female patients, and with better psychological health conditions in female patients, confirming a protective role of education which could be considered as related to higher possibility of satisfying the need of understanding and control of medical conditions/treatments, to higher possibility of

identifying paths of fulfilment and affirmation of identity representing an alternative to the achievement of parenting goal and, finally, to higher socio-economic status and consequent better possibilities of access to medical treatments [13, 20, 23, 24].

With respect to individual coping strategies, in contrast with literature which underlined that men adopted problem-focused strategies to a greater extent than women [27, 34], our data revealed a substantially similar recourse to active/positive coping strategies, such as Problem Solving and Positive Attitude, and to passive strategies, such as Turning to religion, in male and female patients. Otherwise, significant differences emerged concerning the recourse to Social Support, more frequent in female patients, and to Avoidance/Distancing strategies, more frequent in male patients. Moreover, concerning the effectiveness of adopted coping strategies, our data not only confirmed the importance for infertile couples of activating strategies centred on Problem Solving, Positive Attitude and Social Support [30, 31], but also demonstrated the effectiveness of adopting strategies centred on avoidance and distancing, inducing to reconsider their definition only as strategies centred on passivity and associated with lower perceived quality of life and psychological health [26, 29]. In this perspective, the present study agrees with Lazarus and Folkman's definition of adaptive behaviour and coping strategies as situation specific, underlining the risk of describing each strategy as adaptive or maladaptive in itself, independently from the interaction between individual and situation and, consequently, the risk of considering individuals as bad or good copers [47].

Considering infertility-related characteristics, data revealed the significant impact of the type of diagnosis (i.e. Male Factor, Female Factor and Unexplained Factor diagnosis), suggesting that both the awareness of the determining factor of infertility and the lack of the possibility to explain it can elicit sense of guilt, inadequacy, blame and perception of loss of control, deeply affecting quality of life and psychological health. High duration of infertility has also been confirmed as a significant risk factor affecting couple's Core QoL and psychological health. Additionally, repeated medical treatments related to a lengthened duration of infertility specifically compromised Treatment QoL in female patients, underlining the emotional burden of female physical involvement in infertility experience.

Considering the relational resource of perceived couple's dyadic adjustment, data emphasised its protective role indicating the importance of promoting and supporting a good couple's balance to improve their well-being.

Finally, beyond the effectiveness of individual resources, data confirmed the hypothesis of a moderating role of Duration of infertility. In particular, higher Duration of infertility overwhelmed buffering positive effects of all coping strategies, indicating that not only the lengthened recourse

to Avoidance/Distancing Coping strategies but even the recourse to Problem Solving and Positive Attitude may represent a risk factor in case of long duration of infertility.

Otherwise, data suggested to address the positive effect of the individual and relational resources of educational level and couple's dyadic adjustment, which persisted even in case of long duration of infertility.

Despite these merits, some limitations need to be underlined. Firstly, the present study has been structured with a cross-sectional design, so that actually no inferences concerning the temporal associations between predictors investigated and outcomes were made and no cause-effect relationships can be proposed. Secondly, only some individual characteristics (i.e. age, gender, educational level, coping strategies) have been explored in the present study, while further research could be developed taking into account the potential role of other variables which may play a role in predicting QoL and psychological health conditions in infertile patients, such as other demographic characteristics (e.g. employed/unemployed status), and other personality characteristics (e.g. defence mechanisms or attributional styles). Thirdly, the measurement tools used were self-report, increasing the risk of social desirability bias with particular reference to participants with high educational levels. Finally, due to the significant protective role of dyadic adjustment emerged in the present study, future research could also examine in more detail main and interaction effects of specific dimensions of couple's perceived adjustment (i.e. Dyadic Consensus, Dyadic Satisfaction, Dyadic Cohesion and Affectional Expression) with duration of infertility on perceived levels of QoL, Anxiety and Depression, to obtain further useful information for clinical practice and psychological interventions.

In conclusion, findings from the present study provided new evidence to define psychological care interventions with patients dealing with infertility. Indeed, interventions aiming to promote quality of life and psychological well-being in infertile couples undergoing treatments could consider the detailed risk profiles emerged for patients differing for Gender, Age, Educational level, Type of Diagnosis, Duration of Infertility and Previous treatments. Furthermore, data on the effects of different adopted coping strategies induce to define interventions focusing on the promotion not only of active but also of avoiding/distancing coping strategies to face medical treatments not being completely absorbed by infertility experience and maintaining other sources of interest useful to preserve quality of life and psychological health. Nevertheless, a particular attention should be also addressed to cases of long duration of infertility and repeated treatments, which may determine the break down of all adopted coping strategies to deal with infertility. In this perspective, data on the enduring protective role of educational level and couple's dyadic adjustment suggest

to define interventions aiming at supporting and enhancing these individual and relational resources to improve quality of life and psychological health in infertile couples undergoing long-term treatments.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval All procedures performed in the study were in accordance with ethical standards of the institutional research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Informed consent Informed consent was obtained from all individual participants included in the study.

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