

# The dyadic interaction model of relationship quality and the impact of attachment orientation and empathy on infertile couples in China

Kun Du | Yuezhi Dong 

Reproductive Medical Center, The First Affiliated Hospital of Zhengzhou University, Zhengzhou, China

## Correspondence

Yuezhi Dong, Reproductive Medical Center, The First Affiliated Hospital of Zhengzhou University, Zhengzhou 450000, China.  
Email: dyz62295@163.com

## Abstract

**Aim:** The study was conducted to examine the effect of attachment orientation and empathy on the relationship quality of infertile couples and assess the interdependency model of these factors.

**Design:** A cross-sectional survey.

**Method:** In this study, 168 infertile couples (336 individuals) were enrolled and asked to finish the following questionnaires: the revised Adult Attachment Scales, the Interpersonal Response Index questionnaire and the Relationship Quality sub-scale of the Fertility Quality of Life (FertiQoL). Hierarchical regression and path analysis were used to analyse the unique and combined contribution of the independent variables to relationship quality of couples.

**Results:** The attachment orientation of infertile couples can influence their relationship quality, and empathetic wives and husbands have actor and partner effects on the infertile couples' relationship quality. Empathetic infertile couples are conducive to the harmony of the relationship.

## KEYWORDS

adult attachment, empathy, infertility, relationship quality

## 1 | INTRODUCTION

Infertility is a disease historically defined by the failure to achieve a successful pregnancy after 12 months or more of regular, unprotected sexual intercourse or due to an impairment of a person's capacity to reproduce either as an individual or with her/his partner (World Health Organization, n.d.). According to the evidence-based results of the 2013 Infertility Survey for Couples of child-bearing age in China, 5.7%–12.5% of Chinese couples were suffering from infertility (Meng et al., 2013). Although infertility cannot threaten one's life, it can be one of the most stressful

events affecting the involved couple's daily life, and the topic of infertility has received extensive attention from researchers around the world. The results of the psychological stress, such as anxiety (Rooney & Domar, 2018; Sut & Kaplan, 2014), depression (Rooney & Domar, 2018; Sut & Kaplan, 2014), humiliation (Jiang et al., 2018), social exclusion (Ergin et al., 2018), sexual dysfunction (Lotti & Maggi, 2018), sleep disorder (Kloss et al., 2015; Palnitkar et al., 2018) and so on were well reported by many researchers; moreover, these psychological disorders bring serious consequences that cannot be underestimated to infertile couples' relationships (Rahebi et al., 2019).

This is an open access article under the terms of the Creative Commons Attribution-NonCommercial-NoDerivs License, which permits use and distribution in any medium, provided the original work is properly cited, the use is non-commercial and no modifications or adaptations are made.

© 2021 The Authors. *Nursing Open* published by John Wiley & Sons Ltd.

## 2 | BACKGROUND

As statistics show, the divorce rate for infertile couples is 2.2 times higher than the general population; marital adjustment and marital satisfaction were significantly influenced by the diagnosis of infertility and assistant reproductive therapy in the Chinese population (Yu et al., 2012). There are also studies which found that infertility affects the marital bond and leads to poorer resilience, which causes lower scores in relationship quality (Afshani et al., 2020; Li et al., 2019). Some quantitative studies showed that infertile couple cannot control their lives because infertility is so frustrating (Tiu et al., 2018). Despite advances in medical technology, it is not worth it for some infertile families to divorce because of infertility before they can get effective help.

Attachment theory is an integral part of the study of intimate relationship, which was found by John Bowlby from the personality development of inadequate maternal care during early childhood (Bowlby, 1982; Khalifian & Barry, 2016). With the development of the research, more and more researchers accept attachment avoidance and attachment anxiety as the dimensionality distinguishing methods to describe adult attachment (Donarelli et al., 2012; Skvirsky et al., 2019). According to the description of Donarelli et al. (2012): "Attachment anxiety is defined as involving a fear of interpersonal rejection or abandonment, an excessive need for approval from others, and distress when one's partner is unavailable or unresponsive; Attachment avoidance is defined as involving fear of dependence and interpersonal intimacy, an excessive need for self-reliance, and reluctance to self-disclose." When discussing romantic relationships, the influence of adult attachment orientation is especially important (Brenner et al., 2019; Campbell & Stanton, 2019). So far, there are few studies in Chinese research that have focussed on the effects of attachment in the romantic relationship of infertile couples.

Empathy is defined as a person's ability to understand another person's situation, to share in what another person is feeling, and act on that understanding in a helpful way (Abbasi, 2017; Howick & Rees, 2017). Empathy is a significant ingredient in the development of social relations because it could facilitate good communication and manage conflict events successfully in close relationships (Hastings et al., 2019). Natalie's study showed that in the parents of newborn babies, the couples with high levels of empathy also had high levels of sexual and relationship satisfaction (Rosen et al., 2017). According to the result of the study of Sun et al. (2018) study on how empathy and relationship type interact with pain, the pain test survey showed that romantic partners recovered faster than friends, and empathy may modulate psychological and physiological responses in romantic relationships (Sun et al., 2018). The results of Lingdan's study also verified that empathy can lead to the enhancement of earlier posterior negativity (EPN) and late positive potential (LPP) components in brain processing signals due to pain signals received by partners; this explains the possible role of empathy in dealing with stress stimuli in marital relationships from the perspective of neurotic electrophysiology (Wu et al., 2017). However, few studies have focussed on the

effect of empathy on the relationship between infertile couples, especially in Chinese populations.

The purpose of this study is to examine the associations between attachment orientation, empathy and the relationship quality in a sample of infertile couples. The results of this study may be helpful to nurses in identifying such effects and providing baseline information to develop nursing interventions for couples facing fertility problems.

## 3 | METHOD

### 3.1 | Design and participants

This cross-sectional research was conducted on infertile couples who came to the \* Affiliated Hospital Reproductive Medicine Centre of \*\* University in \*\* province from August–September 2020. The final sample was 168 couples (336 individuals). Based on the study of Hair et al, the sample size of path analysis is adequate whether the participant number is between 100–150 (Hair et al., 1998). According to that viewpoint, the sample size in our study is acceptable.

All of the couples meet the following criteria for inclusion: fit the definition of infertility and obtain the diagnosis from a clinician; married and in a heterosexual relationship; participate in the study voluntarily; no children, births or adoptions; experienced more than one cycle of assisted reproductive therapy; and able to understand Chinese well enough to complete the questionnaires. The exclusion criteria are a history of similar research, experiencing a major life event over the past 12 months, or a history of mental illness.

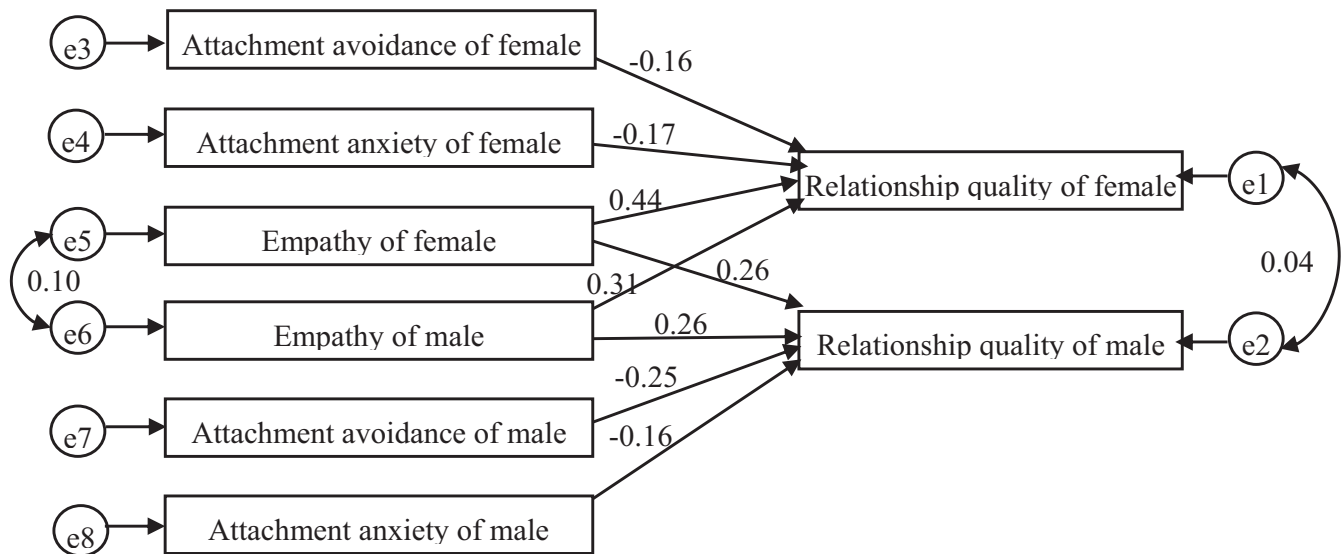
### 3.2 | Measures

#### 3.2.1 | Demographic information questionnaire

A self-made questionnaire was designed to collect demographic information, such as the socio-demographics factors and information related to infertility. The socio-demographic section was constructed by age, educational background, economy state and so on. The infertility-related section was constructed by duration of infertility, cause of infertility (male, female, both, unknown) and so on.

#### 3.2.2 | Relationship quality

The Relationship Quality scale is a sub-scale of Fertility Quality of Life (FertiQoL), which was developed by the European Society of Human Reproduction and Embryology and the American Society of Reproductive Medicine (Boivin et al., 2011). This measure has been translated into 26 languages, including Chinese, and it is available free at <http://www.fertiqol.org/>. The Relationship quality scale is a sub-scale of the core FertiQoL. It consists of 6 items scored according to 5 response categories, which shows the impact that fertility



**FIGURE 1** Path diagram of empathy, attachment orientation and relationship quality

problems have on certain components of a relationship or partnership, such as sexuality, communication and commitment. Cronbach's alpha in this study was 0.86.

### 3.2.3 | Revised adult attachment scale

The Adult Attachment Scale (AAS) was originally developed by Collins, and it was tested by Wu Weilin from China in 1996; however, the coefficient and retest reliability of the questionnaire are insufficient (Collins, 1996). In this study, we used the revised AAS which was culturally adjusted by Chinese researchers to include attachment anxiety and attachment avoidance (Du et al., 2015). In this version, the scale consists of 13 items, which are rated on a 5-point Likert-type scale. 1 meaning the statement is very inconsistent to 5 meaning the statement is very consistent with the participant. The attachment anxiety and avoidance scale Cronbach alpha were 0.75 and 0.79.

### 3.2.4 | Interpersonal Reactivity Index (IRI)

The IRI scale was initially developed by Davis, but Taiwanese scholar Zhan Zhiyu later translated and revised the scale in Chinese to include a total of 22 questions (Zhang et al., 2010). A Likert 5-point rating method is adopted for each item, from 0–4, respectively, meaning inappropriate to very appropriate. Cronbach's alpha in this study was 0.71.

## 3.3 | Data collection

To identify any potential problems, we conducted a pre-investigation before the formal investigation. Some typographical errors were

found in the pre-investigation, and all of them were corrected after researchers carefully checked the references. When administering the preliminary survey, we found that most of the surveyed couples could complete the questionnaire within 15–20 min, so we determined the time limit for the participants to complete the questionnaire.

Researchers invited infertile couples who met the inclusion criteria into a quiet conference room to voluntarily participate in the study. After signing the informed consent, the researchers gave the respondents standardized directions and asked the participants to finish the questionnaire in 20 min or less. The questionnaires were collected on the spot, and the researchers timely checked them for completeness. To ensure the integrity of the questionnaires, participants were asked to complete missing items immediately. To ensure the quality of the data, if any participants refuse to answer the questionnaire completely, we will eliminate the questionnaire. All the data were entered into the computer by Epi Data software using the double entry system. After a consistency check, we review the original material and modify the errors.

## 3.4 | Data analyses

Descriptive statistics, chi-square tests, paired sample *t* tests, independent sample *t* tests, one-way ANOVA and Pearson correlations were used to analyse general characteristics and variables. The independent variables were attachment anxiety, attachment avoidance and empathy; the dependent variable was the relationship quality of female and male. We used hierarchical regression to examine the unique and combined contribution of the independent variables to relationship quality of couples.

According to the result of Pearson correlations and stepwise regression, we set up the model (Figure 1) to assess the actor and partner effects of independent variables on the relationship quality.

We conducted path analysis using AMOS 24.0 software, and path analysis model test indexes include ( $\chi^2/df$ ), goodness of fit index (GFI), comparative fit index (CFI), Tucker–Lewis index (TLI) and the root mean square error of approximation (RMSEA). The criteria for a well-fit model are that the values of ( $\chi^2/df$ ) < 5, GFI, CFI and TLI are higher than 0.9 and the RMSEA is lower than 0.05 (Wu, 2010).

## 4 | ETHICS

This protocol was approved by the clinical ethics committee from the \* Affiliated Hospital of \*\* University. All the participants were informed of the objectives of this study and were assured that all the information they provided would only be used in the study. All of the respondents signed informed consent before filling out the questionnaire.

## 5 | RESULTS

### 5.1 | Demographic and infertility-related characteristics

The demographic and infertility-related characteristics of males and females are presented in Table 1. On average, wives aged 35 years older constituted for 39.3% of the participants and husbands aged

35 years older accounted for 47.0% ( $\chi^2 = 16.84, p < .001$ ). The wives that possessed an academic education was 53%, and the husbands that had the same educational level was 53.6% ( $\chi^2 = 14.58, p < .001$ ).

Out of 31.5% infertile couples who had experienced more than 3 cycles of assisted reproductive technology (ART) treatment. 27.4% of males were the cause of infertility; 45.8% of females were the cause of infertility; 12.5% was attributed to both, and 14.3% were unknown.

### 5.2 | Common method biases

In SPSS software, the Harman test was used to access common method bias, and all variables were included into exploratory factor analysis. The results of the unrotated factor analysis showed that the variation of the first factor was 28.64%, which was less than the critical value of 40%. Therefore, there was no serious common method bias in this study.

### 5.3 | Relationship quality, attachment orientation and empathy

The gender differences in relationship quality, attachment orientation, and empathy of wives and husbands are presented in Table 2. Wives reported lower levels of relationship quality

**TABLE 1** Demographic and infertility characteristics (N = 336)

Variable	Categories	Male (n = 168)	Female (n = 168)	$\chi^2$	p
Age (years)	≤35	89 (53.0)	102 (60.7)	16.84	<.001
	>35	79 (47.0)	66 (39.3)		
Educational level	None academic	78 (46.4)	79 (47.0)	14.58	<.001
	Academic	90 (53.6)	89 (53.0)		
Family monthly income	<5,000 RMB	23 (13.7)			
	5,000–8,000 RMB	103 (61.3)			
	>8,000 RMB	42 (25.0)			
Duration of Marriage (Y)	<3	70 (41.7)			
	≥3	98 (58.3)			
Duration of Infertility (Y)	<3	77 (45.8)			
	≥3	91 (54.2)			
Number of infertility treatment cycles	<3	115 (68.5)			
	≥3	53 (31.5)			
Type of infertility	Primary	103 (61.3)			
	Secondary	65 (38.7)			
Cause of infertility	Male	46 (27.4)			
	Female	77 (45.8)			
	Both	21 (12.5)			
	Unknown	24 (14.3)			

Note: Data are presented as “n (%).”

Variable	Male (n = 168) (mean ± SD)	Female (n = 168) (mean ± SD)	T	p
Relationship quality	70.73 ± 13.48	60.71 ± 15.85	7.66	<.001
Attachment anxiety	17.68 ± 3.51	15.56 ± 3.74	5.59	<.001
Attachment avoidance	14.65 ± 4.43	18.04 ± 3.65	-7.69	<.001
Empathy	46.85 ± 13.33	47.90 ± 12.85	-0.78	.435

**TABLE 2** Gender differences in relationship quality, adult attachment and empathy

( $t = 7.66, p < .001$ ) and attachment anxiety ( $t = 5.59, p < .001$ ) and higher levels of attachment avoidance ( $t = -7.69, p < .001$ ) compared with their husband's results. The empathy scores of the husbands and their wives were similar ( $t = -0.78, p = .435$ ). The results of single factor analysis of demographic characteristics are shown in Table 3. The duration of infertility was the only factor which was statistically significant both in the wives' relationship quality ( $t = 4.81, p = .03 < .05$ ) and the husbands' relationship quality ( $t = 5.87, p = .02 < .05$ ). The empathy in wives was correlated with both their own relationship quality ( $r = .492, p < .001$ ) and their husbands' relationship quality ( $r = .334, p < .001$ ). Empathy

in husbands was also correlated with both their own relationship quality ( $r = .325, p < .001$ ) and the husband's marital satisfaction ( $r = .405, p < .001$ ) (Table 4).

## 5.4 | Hierarchical regression

Table 5 and Table 6 present the results of the regression analysis. According to the result of single factor analysis of demographic characteristics and Pearson correlations, duration of infertility was entered into the regression of relationship quality. The results showed

**TABLE 3** Analysis of infertile couples' relationship quality in demographic and clinical data

Categories	Relationship quality of male (mean ± SD)	t/F	p	Relationship quality of female (mean ± SD)	t/F	p
Age (years)						
≤35	72.07 ± 14.09	1.86	.17	61.25 ± 16.43	0.30	.58
>35	69.23 ± 12.68			59.88 ± 15.01		
Educational level						
None academic	70.58 ± 13.18	0.02	.89	59.09 ± 16.23	1.57	.21
Academic	70.86 ± 13.81			62.16 ± 15.46		
Family monthly income						
<5,000 RMB	69.32 ± 12.26	0.49	.61	56.91 ± 14.34	1.07	.35
5,000–8,000 RMB	70.36 ± 13.14			61.97 ± 16.22		
>8,000 RMB	72.43 ± 15.02			59.71 ± 15.67		
Duration of marriage (years)						
<3	70.39 ± 12.79	0.08	.78	61.41 ± 16.06	0.23	.63
≥3	70.98 ± 14.01			60.21 ± 15.77		
Duration of infertility (years)						
<3	73.43 ± 13.89	5.87	.02	63.60 ± 15.28	4.81	.03
≥3	68.45 ± 12.76			58.27 ± 16.01		
Number of infertility treatment cycles						
<3	71.24 ± 13.62	0.52	.47	61.72 ± 16.56	1.47	.22
≥3	69.63 ± 13.24			58.53 ± 14.11		
Type of infertility						
Primary	71.77 ± 14.18	1.57	.21	61.96 ± 15.94	1.65	.20
Secondary	69.09 ± 12.22			58.74 ± 15.64		
Cause of infertility						
Male	69.29 ± 13.58	0.94	.42	61.91 ± 17.85	0.85	.47
Female	72.53 ± 13.19			61.64 ± 15.44		
Both	70.35 ± 13.73			59.90 ± 14.04		
Unknown	68.08 ± 14.06			56.17 ± 14.63		

**TABLE 4** Correlations among predictors and outcomes in dyads for male and female

Categories	Relationship quality of male	Relationship quality of female
Male		
Attachment anxiety	-0.219***	-0.109
Attachment avoidance	-0.315***	-0.139
Empathy	0.325***	0.405***
Female		
Attachment anxiety	-0.144	-0.230***
Attachment avoidance	-0.051	-0.271***
Empathy	0.334***	0.492***

\*\*\* $p < .001$  found to be statistically significantly.

**TABLE 5** Hierarchical regression of female relationship quality

Variables	First step				Second step			
	$\beta$	SE	T	p	$\beta$	SE	t	p
Female								
Duration of infertility	-1.20	-0.04	-0.43	.56	-0.69	-0.02	-0.36	.72
Attachment anxiety	-0.91	-0.22	-3.26	<.05	-0.75	-0.18	-2.95	<.05
Attachment avoidance	-0.87	-0.20	-2.95	<.05	-0.69	-0.16	-2.59	<.05
Empathy	0.56	0.45	7.44	<.001	0.53	0.43	6.99	<.001
Male								
Empathy					0.37	0.31	5.11	<.001
F	20.34***				23.99***			
R <sup>2</sup>	0.33				0.42			
$\Delta R^2$					0.09***			

\*\*\* $p < .001$  found to be statistically significantly.

**TABLE 6** Hierarchical regression of male relationship quality

Variables	First step				Second step			
	$\beta$	SE	t	p	$\beta$	S.E	t	p
Female								
Duration of infertility	-2.91	-0.11	-1.55	.12	-1.62	-0.06	-0.87	.38
Attachment anxiety	-0.69	-0.18	-2.62	.01	-0.61	-0.16	-2.37	<.05
Attachment avoidance	-0.83	-0.27	-3.96	<.001	-0.77	-0.25	-3.80	<.001
Empathy	0.28	0.28	4.01	<.001	0.26	0.26	3.88	<.001
Male								
Empathy					0.26	0.25	3.61	<.001
F	12.58***				13.42***			
R <sup>2</sup>	0.23				0.29			
$\Delta R^2$					0.06***			

\*\*\* $p < .001$  found to be statistically significantly.

that the duration of infertility was not a significant cause of relationship quality among couples. The variables explained 42% of the difference in female's relationship quality and 29% of the difference in male's relationship quality.

## 5.5 | Path analysis

To access the infertile couples' relationship quality and binary interaction relations between the influencing factors, we used Amos 24.0 software to analyse the structural equation model shown in Figure 1. The model indexes reach the standard criteria:  $\chi^2/df = 1.18$ , GFI = 0.97, CFI = 0.97, TLI = 0.96, RMSEA = 0.03.

## 6 | DISCUSSION

The objectives of this study were to evaluate whether attachment orientation and empathy were factors affecting the quality of the relationship between infertile Chinese couples, and assess a model

of the interactions of these factors on the quality of relationships. The data of the present research verified the significant effects of attachment orientation and empathy on the quality of the relationship. However, only the empathy of infertile couples has actor and

partner effects on the quality of the relationship. The survey data basically supported the purpose of this study. To the best of our knowledge, this is the first time that the attachment orientation and empathy in infertile Chinese couples were investigated. In addition, evaluating the effect of these variables on the quality of relationships was also an innovative component of the present research.

Assisted reproductive technology is generally divided into two types, one is in vitro fertilization and embryo transfer technology (IVF-ET) and the other is Artificial Insemination with semen from either the husband or a donor (AIH/AID). After the development of in vitro embryo screening and selection technology, the clinical pregnancy rate of IVF-ET was reported to be much higher than AIH/AID (Zhou et al., 2019). Based on the limited literature available on the subject, the IVF-ET clinical pregnancy rate was not more than 60% and the rate of AIH/AID was less than 30% (Lee et al., 2018; Li et al., 2015). Similar to the above results, according to data reported in 2016 by the Society for Assisted Reproductive Technology (SART), among woman under the age of 35 years, following ART treatment the live-born delivery rates were less than 50%. The success rate for woman over 35 was much lower than that (Toner et al., 2016). The success rate of assisted reproduction is similar to the success rate of flipping a coin in a positive direction. Infertile couples, especially those with more than one cycle, often experience a rollercoaster of emotions during assisted reproduction treatment. How can infertile couples maintain healthy relationships despite such emotional highs and lows? This means that our research has some social implications.

The same like previous studies about relationship quality of infertile couples, the relationship quality of wives was lower than their husbands (Goker et al., 2018; Zhou, 2016). The results indicate that women are likely to be less confident than men in their relationship when they experience repeated pregnancy failures. This may be related to the influence of Chinese culture and the one-child policy introduced by the government in the 1980s, where fertility is traditionally one of the role expectations of wives in the family environment and giving birth to a baby boy is important to the continuity of a family (Zhu, 2008). Despite the importance of girls for spreading the rearing of the family communicated by social media such as TikTok and WeChat, the importance of giving birth to boys is still deeply rooted in most rural areas. The one-child policy resulted in some families having only one male in the next generation of child-bearing age. If a woman finds it difficult to have a child in such a family or to have a boy, it may affect her judgement on the quality of the relationship with her husband. The fact that role identity and role expectations collide among women may explain the lower relationship quality score among the women than the men. Moreover, though there were no significant effects in the duration of infertility on relationship quality, the *t* test result showed significant differences among groups. This suggests that couples who had been diagnosed with infertility problems for longer than 3 years could not judge the quality of their relationship and couples who were infertile for <3 years.

According to the results of the gender differences in adult attachment, compared with their spouse, infertile Chinese women are more prone to take attachment avoidance strategy in dealing with

adult attachment relationships, while men are more likely to show attachment anxiety than their wives. Avoidant attachment means that women are unwilling to reveal their inner pain to their partners and choose to be more introverted in dealing with fertility problems. This is similar to the previous qualitative interview results of Chinese infertile women, who chose to avoid communication in order to alleviate their pain, which can cause more loneliness (Tiu et al., 2018). The results of this study show that attachment avoidance is a negative predictor of relationship quality. One thing that may be helpful in solving this problem is encouraging infertile women to openly share their feelings with their husbands. After all, previous studies have shown that self-disclosure promotes coping strategies among infertile women (Mosalanejad et al., 2012). Based on the definition of attachment anxiety, we could infer that infertile husbands are more likely to show the attachment anxiety; they are eager to get positive interactive responses from their partners. In China, male chauvinism is not uncommon, and the frustration of not being able to have children may increase attachment anxiety in men. This means that males with infertility express their points more directly in relationships, and they do not want fertility problems to interfere with their happiness. Chinese men traditionally like to maintain control of any problems within the family structure.

The results of this study showed that the wives' ability to empathize was higher than that of the husbands' ability; this means that wives may have a more innate ability than husbands to be understanding and compassionate, which are very important for the relationship quality while trying to solve fertility problems. Women mainly receive the assisted reproductive technology treatment and seem to be the ones most blamed for issues in the traditional Chinese family environment. The findings suggest that infertile women fare worse than infertile men in being misunderstood by their partners. Developing interventions is vital. An example is, asking the partners of infertile patients who are receiving counselling, to participate in the psychological intervention. This is so that they understand the importance of having empathy for their partner in the regulation of their emotions and the management of the relationship. Another intervention in clinical work is to organize regular training courses on empathy for couples. Infertile couples will be able to learn the importance of mutual understanding and support for the success of their pregnancy. Another is to invite an empathetic infertile couple who have successfully given birth to a child, to attend a meeting and assist infertile couples with their relationship problems. These can be beneficial in helping infertile women get effective social support and enhance their relationship confidence. This could be valuable in helping families with infertility to maintain stability and harmony until effective medical help is available and may point the way for future research.

## 7 | CONCLUSIONS

The findings in this research suggest that the wife should be encouraged to reveal her thoughts to the object of attachment and the



husband needs to increase empathy, so as to understand the difficulty of the wife and promote social support for the wife. Infertile couples should understand each other and expressing understanding behaviour is conducive to the harmony of the relationship. Empathetic infertile couples are conducive to the harmony of the relationship. In order to provide better psychological services for patients, the clinical personnel should consider the infertile couple as a team both experiencing the stress of infertility together and then should evaluate their ability for empathy systematically.

## 8 | LIMITATIONS

There are still limitations in our study. Although the Reproductive Center of the \* Affiliated Hospital of \*\* University is one of the largest reproductive treatment centres in China, the participants of our study were limited to infertile couples who came to the hospital, and the infertile couples who did not come to the hospital and those in other provinces were not included in the study. One of our limitations is that the research on the impact of relationship quality of infertile couples does not include the impact of social support in traditional settings, such as parents. Moreover, in the present study, we mixed up the causes of infertility to analyse the attachment of adult couples. The percentage of infertility due to causes affecting males was lower than those affecting females. This may have affected our perception of male attachment orientation. Therefore, future studies should include those variables and focus on the attachment orientation of men when only the male is the cause of the infertility.

## ACKNOWLEDGEMENTS

We thank the infertile couples who made this study possible for their participation in this study. We also thank Feijing Zhou and Zhimin Sun for their help in collecting specimens.

## CONFLICT OF INTERESTS

The authors declare that there is no conflict of interest.

## AUTHOR CONTRIBUTIONS

All authors were involved in the study design and data collection. Kun Du analysed the data and wrote the first draft of the manuscript. Yuezhi Dong reviewed and edited the manuscript. All authors read and approved the final manuscript.

## ETHICAL APPROVAL

This study was completed under the supervision of the Ethics Committee for Scientific Research and Clinical Trials of the First Affiliated Hospital of Zhengzhou University. The research process is consistent with the Helsinki Declaration. The ethical review number of this project is 2020-KY-484. The researchers fully informed the respondents of the purpose and content of this study, and all the respondents signed the informed consent.

## DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

## ORCID

Yuezhi Dong  <https://orcid.org/0000-0001-6532-1778>

## REFERENCES

- Abbasi, K. (2017). Why empathy is an upside-down concept. *Journal of the Royal Society of Medicine*, 110(9), 347. <https://doi.org/10.1177/0141076817729995>
- Afshani, S. A., Mohammadi, S. M. R. G., Khani, P., & Khosravi, A. (2020). Role of resilience training on compromising of infertile couples' applicant for divorce: a cross-sectional study. *International Journal of Reproductive BioMedicine*, 18(3), 193–200. <https://doi.org/10.18502/ijrm.v18i3.6717>
- Boivin, J., Takefman, J., & Braverman, A. (2011). The fertility quality of life (FertiQoL) tool: development and general psychometric properties. *Human Reproduction*, 26(8), 2084–2091. <https://doi.org/10.1093/humrep/der171>
- Bowlby, J. (1982). Attachment and loss: Retrospect and prospect. *American Journal of Orthopsychiatry*, 52(4), 664–678. <https://doi.org/10.1111/j.1939-0025.1982.tb01456.x>
- Brenner, I., Bachner-Melman, R., Lev-Ari, L., Levi-Ogolic, M., Tolmacz, R., & Ben-Amitay, G. (2019). Attachment, sense of entitlement in romantic relationships, and sexual revictimization among adult CSA survivors. *Journal of Interpersonal Violence*. <https://doi.org/10.1177/0886260519875558>
- Campbell, L., & Stanton, S. C. (2019). Adult attachment and trust in romantic relationships. *Current Opinion in Psychology*, 25, 148–151. <https://doi.org/10.1016/j.copsyc.2018.08.004>
- Collins, N. L. (1996). Working models of attachment: Implications for explanation, emotion, and behavior. *Journal of Personality and Social Psychology*, 71(4), 810–832. <https://doi.org/10.1037/0022-3514.71.4.810>
- Donarelli, Z., Lo Coco, G., Gullo, S., Marino, A., Volpes, A., & Allegra, A. (2012). Are attachment dimensions associated with infertility-related stress in couples undergoing their first IVF treatment? A study on the individual and cross-partner effect. *Human Reproduction*, 27(11), 3215–3225. <https://doi.org/10.1093/humrep/des307>
- Du, J. H., Wang, H. X., & Li, Y. X. (2015). The revision of adult attachment scale (AAS) in Chinese college students sample. *Journal of Huzhou University*, 37(1), 63–69. (In Chinese).
- Ergin, R. N., Polat, A., Kars, B., Öztekin, D., Sofuoğlu, K., & Çalışkan, E. (2018). Social stigma and familial attitudes related to infertility. *Turkish Journal of Obstetrics and Gynecology*, 15(1), 46–49. <https://doi.org/10.4274/tjod.04307>
- Goker, A., Yanikkerem, E., Birge, O., & Kuscun, N. K. (2018). Quality of life in Turkish infertile couples and related factors. *Human Fertility*, 21(3), 195–203. <https://doi.org/10.1080/14647273.2017.1322223>
- Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. (1998). *Multivariate data analysis: A global perspective* (7th ed.). Prentice Hall.
- Hastings, T. J., Kavookjian, J., & Ekong, G. (2019). Associations among student conflict management style and attitudes toward empathy. *Currents in Pharmacy Teaching and Learning*, 11(1), 25–32. <https://doi.org/10.1016/j.cptl.2018.09.019>
- Howick, J., & Rees, S. (2017). Overthrowing barriers to empathy in healthcare: Empathy in the age of the internet. *Journal of the Royal Society of Medicine*, 110(9), 352–357. <https://doi.org/10.1177/0141076817714443>



- Jiang, P. Z., Liu, J. E., & Han, J. (2018). Investigation on the level of stigma and its influencing factors in female infertility patients. *Chinese Journal of Nursing*, 53(6), 698–703. (In Chinese).
- Khalifian, C. E., & Barry, R. A. (2016). Trust, attachment, and mindfulness influence intimacy and disengagement during newlyweds' discussions of relationship transgressions. *Journal of Family Psychology*, 30(5), 592–601. <https://doi.org/10.1037/fam0000194>
- Kloss, J. D., Perlis, M. L., Zamzow, J. A., Culnan, E. J., & Gracia, C. R. (2015). Sleep, sleep disturbance, and fertility in women. *Sleep Medicine Reviews*, 22, 78–87. <https://doi.org/10.1016/j.smr.2014.10.005>
- Lee, J., Hwang, S., Lee, J., Yoo, J., Jang, D., Hwang, K., & Kim, M. (2018). Effect of insemination timing on pregnancy outcome in association with female age, sperm motility, sperm morphology and sperm concentration in intrauterine insemination. *Journal of Obstetrics and Gynaecology Research*, 44(6), 1100–1106. <https://doi.org/10.1111/jog.13625>
- Li, X. F., Fan, H. R., Sheng, Y., & Sun, M. (2015). Factors affecting the success rate of artificial insemination with donor sperm. *National Journal of Andrology*, 21(3), 234–238. (In Chinese).
- Li, Y., Zhang, X., Shi, M., Guo, S., & Wang, L. (2019). Resilience acts as a moderator in the relationship between infertility-related stress and fertility quality of life among women with infertility: A cross-sectional study. *Health and Quality of Life Outcomes*, 17(1), 38. <https://doi.org/10.1186/s12955-019-1099-8>
- Lotti, F., & Maggi, M. (2018). Sexual dysfunction and male infertility. *Nature Reviews Urology*, 15(5), 287–307. <https://doi.org/10.1038/nrurol.2018.20>
- Meng, Q., Zhang, Y., & Ren, P. (2013). A systematic review of infertility rates among couples of childbearing age in China. *Chinese Journal of Epidemiology*, 34(8), 826–831. (In Chinese).
- Mosalanejad, L., Koolae, A. K., & Behbahani, B. M. (2012). Looking out for the secret wound: the effect of E-cognitive group therapy with emotional disclosure on the status of mental health in infertile women. *International Journal of Fertility & Sterility*, 6(2), 87–94.
- Palnitkar, G., Phillips, C. L., Hoyos, C. M., Marren, A. J., Bowman, M. C., & Yee, B. J. (2018). Linking sleep disturbance to idiopathic male infertility. *Sleep Medicine Reviews*, 42, 149–159. <https://doi.org/10.1016/j.smr.2018.07.006>
- Rahebi, S. M., Rahnavardi, M., Rezaie-Chamani, S., Nazari, M., & Sabetghadam, S. (2019). Relationship between domestic violence and infertility. *Eastern Mediterranean Health Journal*, 25(8), 537–542. <https://doi.org/10.26719/emhj.19.001>
- Rooney, K. L., & Domar, A. D. (2018). The relationship between stress and infertility. *Dialogues in Clinical Neuroscience*, 20, 41–46.
- Rosen, N. O., Mooney, K., & Muise, A. (2017). Dyadic empathy predicts sexual and relationship well-being in couples transitioning to parenthood. *Journal of Sex & Marital Therapy*, 43(6), 543–559. <https://doi.org/10.1080/0092623X.2016.1208698>
- Skvirsky, V., Taubman – Ben-Ari, O., Ben Shlomo, S., Azuri, J., & Horowitz, E. (2019). Contributors to women's perceived stress at the start of assisted reproductive technology. *The Journal of Psychology*, 153(1), 23–36. <https://doi.org/10.1080/00223980.2018.1471037>
- Sun, B., Zhou, L., Xiao, W., Zhao, X., Zhang, W., & Li, W. (2018). Accurate empathy of romantic partners increases pain ratings but promotes recovery. *Psychology Research and Behavior Management*, 11, 403–410. (In Chinese).
- Sut, H. K., & Kaplan, P. B. (2014). Quality of life in women with infertility via the FertiQoL and the Hospital Anxiety and Depression Scales. *Nursing & Health Sciences*, 17(1), 84–89. <https://doi.org/10.1111/nhs.12167>
- Tiu, M. M. H., Hong, J. Y. F., Cheng, V. S., Kam, C. Y. C., & Ng, B. T. Y. (2018). Lived experience of infertility among Hong Kong Chinese women. *International Journal of Qualitative Studies on Health and Well-being*, 13(1), 1554023. <https://doi.org/10.1080/17482631.2018.1554023>
- Toner, J. P., Coddington, C. C., Doody, K., Van Voorhis, B., Seifer, D. B., Ball, G. D., Luke, B., & Wantman, E. (2016). Society for assisted reproductive technology and assisted reproductive technology in the United States: A 2016 update. *Fertility and Sterility*, 106(3), 541–546. <https://doi.org/10.1016/j.fertnstert.2016.05.026>
- World Health Organization (n.d.). *Infertility definitions and terminology*. Retrieved from <http://www.who.int/reproductivehealth/topics/infertility/definitions/en/>
- Wu, L., Kirmse, U., Flaisch, T., Boiandina, G., Kenter, A., & Schupp, H. T. (2017). Empathy, pain and attention: Cues that predict pain stimulation to the partner and the self capture visual attention. *Front Human Neuroscience*, 11, 465. <https://doi.org/10.3389/fnhum.2017.00465>
- Wu, M. L. (2010). *Structural equation model: The operation and application of AMOS* (2nd ed.). Chongqing University Press. (In Chinese).
- Yu, L., Sheng, Y., & Peng, T. (2012). Research on marital quality and sexual status of infertile couples. *Chinese Journal of Sex Science*, 21(3), 43–45, 53. (In Chinese).
- Zhang, F., Dong, Y., & Wang, K. (2010). Reliability and validity of the Chinese version of the Interpersonal Reactivity Index -C. *Chinese Journal of Clinical Psychology*, 18(2), 155–157. (In Chinese).
- Zhou, F. (2016). *Research on the correlation between fertility related stress and quality of life in infertile couples*. Master's thesis, Zhengzhou University. (In Chinese).
- Zhou, F., Cai, Y. N., & Dong, Y. (2019). Stress increases the risk of pregnancy failure in couples undergoing IVF. *Stress*, 22(4), 414–420. <https://doi.org/10.1080/10253890.2019.1584181>
- Zhu, J. (2008). *Differences in role expectations and conflicts between husband and wife—A case study of dual-career families in Beijing*. Master's thesis. (In Chinese). Renmin University of China.

**How to cite this article:** Du K, Dong Y. The dyadic interaction model of relationship quality and the impact of attachment orientation and empathy on infertile couples in China. *Nurs Open*. 2021;8:2664–2672. <https://doi.org/10.1002/nop2.819>