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Running head: INFERTILITY & SEXUAL SATISFACTION

Infertility-related stress as a predictor of sexual satisfaction: a dyadic approach

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Infertility-related stress and sexual satisfaction: a dyadic approach**Abstract**

Purpose of the study: to examine whether women's and men's infertility-related stress, and specifically its sexual concerns aspect, is related to their and their partner's sexual satisfaction.

Materials and methods: In a cross-sectional study, 94 couples experiencing infertility filled out the New Sexual Satisfaction Scale and Fertility Problem Inventory, which measures infertility-related stress with dimensions of social, sexual and relationship concerns, rejection of childfree lifestyle, and need for parenthood. Dyadic analyses were performed following the Actor-Partner Interdependence Model (APIM).

Results: The dyadic analysis revealed that women's and men's greater infertility-related stress contributed to their lower levels of sexual satisfaction (actor effect). Moreover, women's and men's greater sexual concerns (as the aspect of infertility-related stress) contributed to their own and their partner's lower levels of sexual satisfaction (actor and partner effect).

Conclusions: The findings suggest that both individual and relational processes are important in the association between the specific dimension of infertility-related stress and sexual satisfaction. These findings could guide the psychosocial support for couples experiencing infertility.

Keywords: infertility; sexual satisfaction; sexuality; stress; dyadic analysis; APIM

Introduction

Infertility is defined by the World Health Organization as a disease of reproductive system manifested in the impossibility to conceive a pregnancy after 12 months of regular unprotected sexual activity¹. Approximately 10-13% of women and men have problems with infertility and one in two couples seeks for help². An increasing number of couples engage in a wide range of techniques of assisted reproductive technology (ART) to achieve pregnancy³. Infertility treatment and infertility itself can be a traumatic life event^{4,5}. It is especially stressful given that it can take years to be diagnosed in the first place, and for some couples, it may not be resolved⁶. The profile of psychological consequences resulting from infertility can range from anxiety and irritability, sadness, guilt, and anger to social isolation and sensitivity in interpersonal relations^{6,7}.

Studies agree that women experience higher levels of depression, anxiety, and emotional distress related to infertility than men⁸⁻¹⁰. Nevertheless, when examining sex differences, the cause of infertility should be taken into account, as infertility is a heterogeneous health problem. About 40% of infertility problems are attributed to female and male factors each, and the remaining 20% are of shared aetiology or due to unknown causes¹¹. However, findings on causes of infertility are still inconclusive. Some studies show that male infertility has the most adverse effect on infertility-related stress and sexuality but that both women and men are equally affected^{12,13}.

Stress due to infertility can be examined within the Bodenmann's theory of Dyadic Coping¹⁴, which defines dyadic stress and coping as interpersonal processes including both partners. The theory describes dyadic stress with three dimensions: (i) dyadic stress as direct or indirect, (ii) origin of stress as internal or external, and (iii) time sequence as simultaneous or sequential¹⁴. Within this theory, we can conceptualise infertility (i) as both direct and indirect dyadic stressor depending on the cause of infertility (female factors, male factors or

both), where one partner may be affected by infertility personally or he/she may be affected indirectly through the partner's infertility; (ii) as internal stressor, given that it is a health problem shared by a couple; and (iii) as affecting both partners simultaneously.

Bodenmann et al.^{15,16} found daily stress to be associated with decreased sexual satisfaction and activity, while dyadic coping (as opposed to individual coping) predicted more frequent and satisfying sexual activity. Sexual satisfaction is recognised as an essential dimension of sexual health¹⁷ and well-being¹⁸. Lawrence and Byers^{19(p268)} define sexual satisfaction as 'an affective response arising from one's subjective evaluation of the positive and negative dimensions associated with one's sexual relationship'.

The prevalence of sexual dysfunction is higher among couples with infertility problems compared to the control group²², at least in men²³. Literature shows mixed findings with respect to sexual well-being between couples with and without infertility problems. Some studies showed that infertility can have an adverse effect on the emotional and sexual relationship²⁴⁻²⁷. Spontaneity in the sexual relationship may be affected by the timed intercourse and couples report losing privacy over their sex life²⁴. However, on the other hand, a recent study showed that couples with infertility problems have higher levels of sexual and marital satisfaction compared to couples without them²⁸. Furthermore, a recent review study²⁹ concluded that there are inconsistent findings with respect to sex differences in sexual satisfaction among couples with infertility problems, where studies showed lower sexual satisfaction in women³⁰, lower satisfaction in men³¹, or no sex differences²⁷.

Infertility-related stress was found to be predictive for marital satisfaction³², although literature review²⁹ found that in majority of studies, couples reported high levels of marital adjustment. Sexual satisfaction is one aspect of marital satisfaction¹⁸ and a recent meta-analysis showed differential adverse effects of infertility on marital and sexual satisfaction³³, implying that sexual satisfaction should be in focus *per se*. However, to the authors' best

knowledge, there have been no studies that examined specifically the associations of infertility-related stress with sexual satisfaction. Moreover, although sexual satisfaction was previously examined in both partners of the couples experiencing infertility^{12,28,31,34,35}, this was mostly done without taking the dyadic perspective. However, there are several reasons that make the dyadic approach necessary. Sexual satisfaction is a two-dimensional construct with a *personal* positive physical and emotional experience and *dyadic processes* associated with close relationship and intimacy³⁶. Moreover, as infertility is a health condition that affects both partners, the dyadic analysis provides an opportunity to obtain more information about relational and interactive processes³⁷. However, the data from couples are non-independent and should be treated with a specific statistical analysis. The Actor-Partner Interdependence Model (APIM) provides the conceptual and statistical framework for dealing with dyadic dependence³⁸. The model recognizes the influence of individual score on the outcome (called the “actor effect”) and the influence of the partner’s score (called the “partner effect”)³⁹.

This study aimed to examine whether women’s and men’s infertility-related stress was associated with their own, as well as their partner’s global sexual satisfaction. Given that one of the infertility-related stress dimensions refers to sexual concerns¹⁰, we wanted to examine more specifically how the sexual concerns are related to global sexual satisfaction. We expected infertility-related aspects of stress to be significantly associated with sexual satisfaction, especially sexual concerns.

Methods

Participants

Of 105 couples that were approached, 11 declined to participate. In total, 94 heterosexual couples entered the study (89.5%). The inclusion criterion was seeking infertility treatment at

the clinic for infertile couples. The average age of women was 34.0 and of men 35.9 years (Table 1). The majority were married (84.0%) and the remaining couples were living in cohabitation. The couples had on average been in a relationship for 10.5 years ($SD = 4.3$) and married/cohabiting for 5.8 years ($SD = 3.7$). The majority lived in a city (76.6%), was employed (over 84.0%), and reported to be of average socio-economic status (67.0%). All participants were Caucasians.

Most couples did not have children (over 80%). The participants had been trying to get pregnant for 4.2 years ($SD = 2.8$). Regarding the cause of infertility, 29.8% of the couples reported female factors, 28.7% reported both female and male factors, 26.6% reported unknown factors (26.6%), while 14.9% reported male factors only. Most couples had been in treatment for less than a year (44.7%). As for the type of treatment, the majority had been treated with *in vitro fertilization* (IVF) (65.9%), 16.0% with insemination, while 18.1% had not been involved in ART so far. The preliminary analysis revealed that there were no differences between women and men who were already enrolled in ART compared to women and men who did not receive treatment so far in any of the studied variables.

Instruments

New Sexual Satisfaction Scale (NSSS)^{40,41} measures sexual satisfaction across five theoretical dimensions, including sexual sensations and sexual awareness (representing individual aspects), sexual exchange and emotional closeness (representing interpersonal aspects), and sexual activity (representing behavioural aspect). The NSSS consists of 20 items with responses ranging from 1 (*not at all satisfied*) to 5 (*extremely satisfied*). Across several different samples in Croatia and the USA, the NSSS showed a two-factor structure with *ego-centred subscale* (10 items; e.g., ‘My body’s sexual functioning’) and *the partner- and sexual activity-centred subscale* (10 items; e.g., ‘My partner’s emotional opening up during sex’).

Cronbach's α coefficient was in the range .94-.96 for the full scale⁴¹. In the current study, the total score was used with the Cronbach's $\alpha = .95$.

Fertility Problem Inventory (FPI)¹³ is a 46-item scale that measures perceived stress related to infertility. It consists of five dimensions: 1) *social concern*, referring to the awareness of other's comments about infertility, distancing from friends and family, and sense of social isolation (10 items; e.g., 'I find it hard to spend time with friends who have young children.');

2) *sexual concern*, relating to the decreased sexual enjoyment or sexual self-esteem, including problems with having sexual relations on schedule (8 items; e.g., 'I find I've lost my enjoyment of sex because of the fertility problem.');

3) *relationship concern*, referring to the difficulties in communication with the partner about infertility and worries about the impact of infertility on relationship (10 items; e.g., 'My partner doesn't understand the way the fertility problem affects me.');

4) *rejection of childfree lifestyle*, referring to a negative attitude toward life without a child (8 items; e.g., 'Couples without a child are just as happy as those with children.' *reversely coded*);

5) and *need for parenthood*, referring to a strong identification with the parental role, in which parenting is the main and crucial goal in life (10 items; e.g., 'Having a child (or another child) is not the major focus of my life.' *reversely coded*). The total score can be measured as the global stress related to infertility. Each item is scored on a 6-point scale (1 – *completely disagree*, 6 – *completely agree*), and some items are reversely coded, so the higher score on each scale/subscale, the higher the stress. Cronbach's α ranged from .77 to .87 for subscales and .94 for global scale¹³. The FPI was back-translated into Croatian for the first time and its factor structure was examined. The confirmatory factor analysis (CFA) showed that fit indices for the original five-factor structure were not completely satisfactory ($\chi^2(979) = 2022.99, p < .0001$; CFI = 0.69; RMSEA = .075 (90% confidence interval (CI) 0.07-0.08); SRMR = 0.098). However, all items loaded onto their correspondent latent construct ($p < 0.05$) and the proposed model with two second-

order factors^{42,43} did not yield a better model fit ($\chi^2(989) = 2189.82, p < .0001$; CFI = 0.65; RMSEA = .08 (90% CI: 0.08-0.09); SRMR = 0.143). Therefore, the original five-factor structure was applied. Cronbach's α coefficients were .79, .83, .78, .80 and .85 for social concern, sexual concern, relationship concern, rejection of childfree lifestyle, and need for parenthood, respectively. Cronbach's α for the whole scale was .90.

The general data sheet was designed for this study, with some questions specific for couples with infertility problems proposed by Ohl et al.⁴⁴. The sheet comprised questions on sex, age, marital status, length of relationship and marriage/cohabiting, education level, place of living, employment (*yes/no*), and perceived socio-economic status (*below average, average, above average*). Questions about infertility included questions on duration of conceiving the pregnancy, duration of treatment (*less than 1 year, 1-2 year, 2-3 years, more than 3 years*), the cause of infertility (*female factors, male factors, both female and male factors, unknown factors*), type of treatment (*no treatment so far, insemination, IVF*), and having children (*yes, no; if yes, were the children from the current relationship or a previous one*).

Procedure

The study was conducted at the Department of Obstetrics & Gynaecology at the [removed for blind review]. Croatia. The study was approved by the Ethical Committee of the [removed for blind review]. The couples were approached by a fertility specialist at the [removed for blind review]. After signing the informed consent, they filled out the set of questionnaires at the clinic. The participation was anonymous, and the partners filled out the booklets separately but put them into the same envelope and sealed it. In that way, the responses from both partners could be matched, while retaining the anonymity of the participants.

Statistical analysis

Data distribution analysis showed that sexual satisfaction was negatively skewed, while the sexual and relationship concerns were positively skewed. However, skewness and kurtosis indices for all variables were under 3 and 10, respectively, and were therefore considered suitable for parametric analysis⁴⁵. Mixed design ANOVA examined the differences in sexual satisfaction with respect to sex (as a repeated measure to control the non-independence within the couple) and cause of infertility (independent variable). The correlations were analysed by Pearson's coefficient correlation. To examine the associations between women's and men's infertility-related stress and sexual satisfaction the actor-partner interdependence model (APIM)³⁸ was tested, with a couple as the unit of analysis, using MPlus, version 8.2. Factor structure was examined by Confirmatory Factor Analysis with MPlus. All other analyses were performed using IBM SPSS Statistics 21.0 for Windows.

Results

Differences in sexual satisfaction

Sexual satisfaction was examined in respect to the *cause of infertility* (female factors, male factors, both female and male factors, unknown factors) and sex. A mixed design ANOVA showed that there was no main effect of gender ($F(1, 90) = 0.32, p = .5747, \eta^2_p = .00$), no main effect of diagnosis ($F(3, 90) = 1.57, p = .2034, \eta^2_p = .05$), and no interaction effect between sex and diagnosis on sexual satisfaction ($F(3, 90) = 0.07, p = .9740, \eta^2_p = .00$). In other words, there was no differences in sexual satisfaction scores between women and men who reported different causes of infertility.

Associations between infertility-related stress and sexual satisfaction

The correlations of women's and men's sexual satisfaction were examined in relation to global infertility-related stress and its specific aspects (Table 2). Higher levels of sexual satisfaction in both women and men were related to lower levels of global infertility-related stress and subscales of sexual and relationship concerns. However, sexual satisfaction was not related to the rejection of childfree lifestyle and need for parenthood. Furthermore, women's sexual satisfaction and infertility-related stress were significantly associated with men's scores.

Also, sexual satisfaction was examined in relation to some demographic variables (not presented in the table). However, sexual satisfaction was not related to age, duration of relationship/marriage, education, having children, or any other demographic variable in women or men.

Actor and Partner Interdependence Model of infertility-related stress and sexual satisfaction

We examined the association of women's and men's infertility-related stress and sexual satisfaction with an Actor and Partner Interdependence Model. When global infertility-related stress was included in the model (Figure 1a), lower levels of sexual satisfaction were associated with the actor's greater stress. The partner effect, however, was not significant. The model had an excellent fit ($\chi^2(2) = 0.96, p = .6191$; CFI = 1.00; RMSEA = .00 (90% CI 0.00-0.16); SRMR = 0.0) and explained 22.3% of women's and 19.5% of men's sexual satisfaction.

On the other hand, when we entered sexual concerns as the aspect of the infertility-related stress, instead of global infertility-related stress, both actor and partner effects were significant (Figure 1b). Women's and men's lower levels of sexual satisfaction were associated with both their own and their partner's greater sexual concerns. The model had an

excellent fit ($\chi^2(2) = 0.79, p = .6733$; CFI = 1.00; RMSEA = .00 (90% CI 0.00-0.16); SRMR = 0.02) and explained 45.9% of women's and 38.2% of men's sexual satisfaction.

Discussion

This study aimed to examine, by using a dyadic approach, the association between infertility-related stress and sexual satisfaction in couples experiencing infertility. The key findings were that both individual and relational process play a role in the relation between the specific dimension of infertility-related stress and sexual satisfaction. These results are further discussed.

First of all, in our sample sexual satisfaction was shifted toward higher scores, meaning that couples from the study reported high satisfaction. The mean scores were even somewhat higher than in normative community samples of women and men from Croatia and the USA⁴¹. However, no sex differences in sexual satisfaction were found, which is in line with previous findings on married couples⁴⁶. Nevertheless, the meta-analysis from over 800 individual samples, in general, revealed greater sexual satisfaction in men⁴⁷. Nonetheless, couples struggling with fertility issues are specific, and a recent study with infertile couples showed that lower sexual satisfaction was observed in men than in their female partners but only in men older than 35 years³⁵. Furthermore, the latter study showed that infertile couples involved in different therapeutic procedures for infertility also had significantly lower sexual satisfaction. Therefore, this population is rather specific, with timed sexual intercourse and particular sources of stress.

Moreover, our results revealed that the specific dimension of infertility-related stress that invokes sexual concerns has a direct effect on women's and men's sexual satisfaction both by the individual and the partner's scores. Sexual concerns, as a dimension of infertility-related stress, refer to lack of sexual enjoyment due to infertility and relating sex to pressure,

disappointment, and failure¹³. Using the dyadic approach by APIM³⁸, we revealed both actor and partner effect. In other words, women's and men's lower levels of sexual concerns contributed to their own and their partner's greater sexual satisfaction. What was interesting was that global infertility-related stress had only actor effect on sexual satisfaction, showing that the partner's global stress did not spill over to the individual's sexual satisfaction. Within the context of the Bodenmann's theory of Dyadic Coping¹⁴, our results have shown that dyadic general stress has only direct effect on sexual satisfaction, while sexual concerns have both direct and indirect effect on sexual satisfaction via partner's sexual concerns. Also, this finding can be explained by two dimensions of sexual satisfaction: *personal* experience and *dyadic processes* associated with close relationship and intimacy³⁶. The global infertility-related stress comprises five domains¹³, some of which measure individual experience (social concerns, need for parenthood, and rejection of childfree lifestyle), while the remaining sexual and relationship concerns extend to relational aspects of infertility-related stress. Specifically, through these relational aspects, the sexual concerns itself have a direct effect on both individual and the partner's sexual satisfaction.

These results are difficult to compare to the literature, given that previous studies did not relate stress to sexual satisfaction in couples experiencing infertility. However, a systematic review on sexual satisfaction, in general, did point out that stress, different health conditions, and infertility were associated with sexual satisfaction^{16,21}. Also, Bodenmann et al. have established the link between stress and sexual problems. More precisely, problems have been associated less with external daily stress (i.e. stress evoked by the stressors outside the couple) and more with internal daily stress (i.e. stress arising within the couple)¹⁵, like infertility as a dyadic stressor which has an impact on couples on daily basis. Moreover, in individuals with infertility problems, infertility-related stress was predictive of marital satisfaction³². Using the dyad analysis in couples, it was revealed that partners with congruent

levels of infertility-related stress reported greater marital satisfaction⁴⁸. However, sexual satisfaction is only one aspect of marital satisfaction⁴⁹, and a recent meta-analysis found differential adverse effects of infertility on marital and sexual satisfaction³³. Therefore, findings from our study add to the literature on the specific impact of infertility-related stress to sexual satisfaction.

When interpreting the findings presented here, several shortcomings should be kept in mind. First, this was a cross-sectional study, so the cause-effect relationship cannot be assumed. Moreover, we examined infertility-related stress as a predictor of sexual satisfaction. However, it is possible that higher sexual satisfaction is related to lower infertility-related stress, especially the sexual concerns, where partners with better sexual communication and higher intimacy could be more resilient to sexual concerns due to infertility problems. Secondly, the study was conducted in a single health unit, and the convenience sample of couples who were seeking medical treatment for infertility was involved. Given that one in two infertile couples does not seek medical care⁵⁰, the findings could not be generalised to all couples with infertility problems. Furthermore, the sample was quite heterogeneous, with some couples preparing to receive treatment for the first time, while others had been enrolled in the procedure for some time. Literature review shows that couples experience an emotional roller-coaster through different phases of the therapy⁵¹, and therefore, there might be pronounced differences among the couples, other than the ones we examined. Therefore, future studies would benefit from applying a longitudinal design that would encompass several assessment points at the diagnostic phase: before treatment, after treatment, immediately after results, and later on.

In conclusion, as sexual concerns in both women and men contribute to their own and their partner's sexual satisfaction, these factors can be further discussed with the couples through counselling. A dyadic approach is promising in revealing both individual and

relational processes within the couple and should be continuously applied to the research on couples with infertility problems. Given that positive forms of dyadic coping has been associated with relational well-being in general⁵² and in couples with infertility⁵³, coping mechanisms should be taken into account when examining association of stress and sexuality in future studies. It is necessary to provide couples with both psychosocial support and medical care while going through challenging life-experience of infertility.

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Table 1
Sample Characteristics for 94 couples experiencing infertility

	Women (<i>n</i> =94) <i>M</i> (<i>SD</i>)	Men (<i>n</i> =94) <i>M</i> (<i>SD</i>)
Age (years)	34.0 (3.9)	35.9 (5.4)
	<i>n</i> (%)	<i>n</i> (%)
<i>Education</i>		
Secondary school	40 (42.6%)	59 (62.8%)
College or university	54 (57.4%)	35 (37.2%)
<i>Working status</i>		
Employed	79 (84.0%)	85 (90.4%)
Unemployed	15 (16.0%)	9 (9.6%)
<i>Children</i>		
No	79 (84.0%)	77 (81.9%)
Yes, from the same relationship	15 (16.0%)	14 (14.9%)
Yes, from the previous relationship	0 (0%)	3 (3.2%)
<i>Cause of infertility</i>		
Female factors	28 (29.8%)	
Male factors	14 (14.9%)	
Both female and male factors	27 (28.7%)	
Unknown factors	25 (26.6%)	
<i>Duration of treatment</i>		
Less than 1 year	42 (44.7%)	
1-2 years	23 (24.5%)	
2-3 years	7 (7.4%)	
More than 3 years	22 (23.4%)	
<i>Type of treatment</i>		
No treatment so far	17 (18.1%)	
Insemination	15 (16.0%)	
<i>In vitro fertilization</i> (IVF)	62 (65.9%)	

Table 2

Pearson's correlation coefficients, means and standard deviations for women's and men's sexual satisfaction and fertility-related stress (N = 94)

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.
1. Women's sexual satisfaction	-	-.29**	-.63**	-.51**	-.19	-.12	-.48**	.68**	-.21	-.50**	-.39**	-.02	-.10	-.35**
2. Women's social concern		-	.41**	.44**	.13	.30**	.67**	-.12	.56**	.17	.22*	.00	.20	.35**
3. Women's sexual concern			-	.62**	.21	.37**	.75**	-.44**	.18	.43**	.39**	.04	.27**	.39**
4. Women's relationship concern				-	.06	.28**	.68**	-.34**	.26	.36**	.51**	-.03	.20	.39**
5. Women's rejection of childfree lifestyle					-	.55**	.56**	-.01	-.01	-.11	-.03	.24*	.22*	.12
6. Women's need for parenting						-	.76**	-.15	.13	.12	.16	.16	.46**	.34**
7. Women's infertility-related stress (total)							-	-.29**	.32**	.28**	.36**	.12	.41**	.47**
8. Men's sexual satisfaction								-	-.15	-.58**	-.52**	-.02	-.09	-.39**
9. Men's social concern									-	.35**	.27**	.14	.27**	.61**
10. Men's sexual concern										-	.56**	.19	.31**	.69**
11. Men's relationship concern											-	.05	.23*	.62**
12. Men's rejection of childfree lifestyle												-	.51**	.58**
13. Men's need for parenting													-	.77**
14. Men's infertility-related stress (total)														-
<i>M</i>	82.39	23.79	16.74	19.01	30.33	37.93	125.23	83.05	19.68	13.39	18.56	31.50	36.91	117.60
<i>SD</i>	14.90	9.11	8.36	8.07	8.28	10.77	29.98	14.60	8.29	6.56	7.97	8.33	11.32	27.14

*Note: *p < .05; **p < .01.*

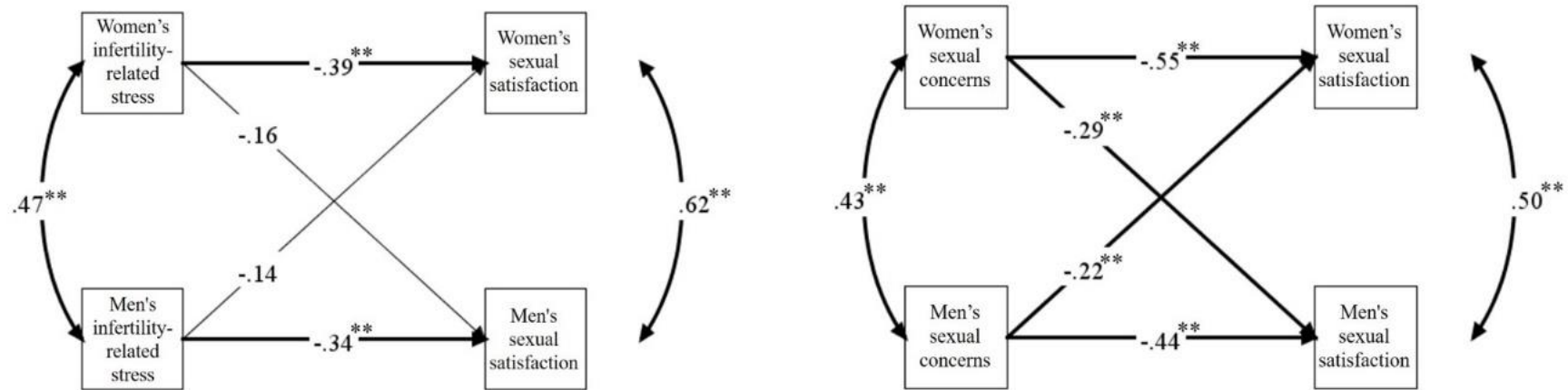


Figure 1. Results of the dyadic Actor-Partner Interdependence Model (APIM) between global infertility-related stress and sexual satisfaction (Figure 1a) and sexual concerns and sexual satisfaction (Figure 1b). Standardised coefficients are presented. $**p < .01$.

Current knowledge on the subject

- Infertility is stressful and it has an adverse effect on the emotional and sexual relationship.
- Sexual satisfaction is a two-dimensional construct with a personal experience and dyadic processes associated with a close relationship.
- Although infertility-related stress is predictive for marital satisfaction, its association with sexual satisfaction is not yet examined.

What this study adds:

- Sexual satisfaction in couples with infertility should be analysed with a dyadic approach by Actor-Partner Interdependence Model (APIM).
- Infertility-related stress is associated with lower levels of sexual satisfaction.
- Both individual and relational process play a role in the association between the specific dimension of infertility-related stress and sexual satisfaction.