Psychological Aspects of Infertility – Results from an Actor–Partner Interdependence Analysis

Psychische Aspekte bei unerfülltem Kinderwunsch – Ergebnisse einer Akteur-Partner-Interdependenz-Analyse

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🌐 Deutsche Version unter:
https://doi.org/10.1055/a-2041-2831.

ABSTRACT

Introduction For some patients, undergoing medical treatment for infertility is a cause of major emotional stress which the couple needs to deal with together; it can be said that infertility is a shared stressor. From the literature it is known that a subjectively perceived sense of self-efficacy supports the patient's ability to cope adaptively with an illness. As the basis for this study, we assumed that high levels of self-efficacy are associated with low psychological risk scores (e.g., for anxiety or depressiveness), both in the patient themselves and in their partner. Accordingly, in infertility patients, targeted support to promote helpful self-efficacy expectations could represent a new counselling strategy that could enable psychologically vulnerable patients to better cope with the treatment procedure and treatment failures of medically assisted reproduction, making these patients less at risk with regard to psychosocial factors.

Methods 721 women and men attending five fertility centers in Germany (Heidelberg, Berlin), Austria (Innsbruck), and Switzerland (St. Gallen, Basel) completed the SCREENIVF-R questionnaire to identify psychological risk factors for amplified emotional problems, as well as the ISE scale to measure self-efficacy. Using paired t-tests and the actor–partner interdependence model, we analyzed the data of 320 couples.

Results Considering the study participants as couples, women had a higher risk score than men for four out of five risk factors (depressiveness, anxiety, lack of acceptance, helplessness). In all of the risk areas, it was possible to identify a protective effect from self-efficacy on the patient's own risk factors (actor effect). There was a negative correlation between the men's self-efficacy level and the women's feelings of depressiveness and helplessness (partner effect, man → woman). The women's self-efficacy levels had a positive correlation with acceptance and access to social support in the men (partner effect, woman → man).

Conclusion Because infertility is generally something that a couple has to deal with together, future studies should focus on couples as the unit of analysis instead of just analyzing the men and women separately. In addition, couples therapy should be the gold standard in psychotherapy for infertility patients.

ZUSAMMENFASSUNG

Einleitung Unerfüllter Kinderwunsch und die anschließende medizinische Therapie führt bei einem Teil der Patient*innen zu starken emotionalen Belastungen, die vom Paar gemeinsam bewältigt werden müssen: „Infertility is a shared stressor". Aus der Forschungsliteratur ist bekannt, dass die subjektiv wahrgenommene Selbstwirksamkeit die adaptive Bewältigung einer Erkrankung unterstützt. Als Fragestellung in dieser Studie wurde angenommen, dass hohe Selbstwirksamkeitswerte mit niedrigen psychischen Risikoscores (wie Ängstlichkeit oder Depressivität) sowohl bei der eigenen Person als auch beim Partner bzw. der Partnerin einhergehen. Eine gezielte Förderung der hilfreichen Selbstwirksamkeitserwartung könnte somit auch bei unerfülltem Kinderwunsch eine neue Beratungs-

strategie darstellen, durch die psychisch vulnerable Patient*innen Behandlungsablauf und Behandlungsmisserfolge medizinisch assistierter Reproduktion besser bewältigen können und damit weniger als Risikopatient*innen bezüglich psychosozialer Faktoren gelten müssen.

Methoden 721 Frauen und Männer, die an 5 Kinderwunschzentren in Deutschland (Heidelberg, Berlin), Österreich (Innsbruck) und der Schweiz (St. Gallen, Basel) vorstellig wurden, haben den SCREENIVF-R-Fragebogen zur Identifizierung von psychischen Risikofaktoren für verstärkte emotionale Probleme und die SWUK-Skala zur Messung der Selbstwirksamkeit ausgefüllt. Mithilfe von gepaarten t-Tests und des Akteur-Partner-Interdependenz-Modells wurden die Daten von 320 Paaren paarbezogen ausgewertet.

Ergebnisse Auf Paarebene wiesen Frauen im Vergleich zu Männern in 4 von 5 Risikofaktoren (Depressivität, Ängstlichkeit, Mangel an Akzeptanz, Hilflosigkeit) höhere Risikowerte auf. In allen Risikobereichen konnten protektive Effekte der Selbstwirksamkeit auf den jeweiligen eigenen Risikofaktor identifiziert werden (Akteureffekt). Die Selbstwirksamkeitswerte des Mannes zeigten einen negativen Zusammenhang mit den Depressivitäts- und Hilflosigkeitswerten der Frau (Partnereffekt Mann → Frau). Die Selbstwirksamkeitswerte der Frau korrelierten positiv mit der Akzeptanz und sozialen Unterstützung bei Männern (Partnereffekt Frau → Mann).

Schlussfolgerung Da die Bewältigung des unerfüllten Kinderwunsches in der Regel durch das Paar geleistet wird, sollten in zukünftigen Studien nicht mehr nur Frauen und Männer getrennt in die Analysen einbezogen werden, sondern das Paar als Analyseeinheit im Fokus stehen. Zudem sollte in der psychosozialen Kinderwunschberatung das Paarsetting Goldstandard sein.

Introduction

Approximately 9 % of all men and women of reproductive age are affected by infertility [1]. Men and women generally experience a high level of psychological stress when undergoing medical treatment for infertility; in some patients, this can manifest in emotional disorders [2, 3, 4, 5]. To date it appears that women find dealing with infertility more stressful than men (or at least women show this more), and have higher levels of depression and stress due to the infertility [3, 6, 7].

The development of assisted reproductive technologies (ART) has made it possible to help couples with infertility problems achieve their desire to have children. In 2018 the ESHRE Consortium reported pregnancy rates from in vitro fertilization (IVF), intracytoplasmic sperm injection (ICSI), and frozen embryo transfer (FER) of 25.5 %, 22.5 %, and 28.8 % respectively per aspiration [8]. Undergoing treatment without success often leads women to experience an increase in negative emotions which can persist after subsequent consecutive cycles of unsuccessful fertility treatment [2]. Also, (repeated) miscarriages during ART therapy often take a strong emotional toll [9].

The ESHRE Guidelines recommend using the SCREENIVF questionnaire to identify patients who are at risk of emotional problems prior to IVF treatment, so that they can be referred for specialized psychosocial support (fertility counselling or psychotherapy) [6].

Self-efficacy is the realization that you, as an individual, are able to make use of cognitive, affective, and motivational self-regulation processes; as a psychological resource, it is correlated with the ability to cope successfully with having an illness [10]. In recent studies, self-efficacy has been observed to have a psychological protective effect, enhancing resilience to infertility-related stress in couples dealing with infertility; these couples were also found to maintain psychological well-being within their relationship [11, 12].

Patients suffering from involuntary childlessness who decide to undergo fertility treatment can also benefit from a high level of subjectively perceived self-efficacy in relation to coping with the challenges of the treatment and communicating with their partner; accordingly, these patients would have to be considered less at risk with regard to psychosocial risk factors [13, 14].

The aim of this study was to test the differences between men and women in relation to both self-efficacy as a protective factor and to emotional stress (anxiety, depressiveness, lack of social support, negative cognitive distortions in the form of helplessness and lack of acceptance) in cases of infertility. In addition, we sought to determine the effects of self-efficacy in men and in women suffering from involuntary childlessness, both in the individuals and between the partners, in relation to potential psychosocial risks. As a hypothesis, we assumed that high levels of self-efficacy are associated with low risk scores, both for the patient themselves and for their partner.

Materials and Methods

Setting and questionnaires

This was a multicenter, non-interventional, quantitative cross-sectional study. The questionnaires (SCREENIVF-R and ISE, as well as a social demographics questionnaire) were distributed to five fertility centers in Germany (Heidelberg and Berlin), Austria (Innsbruck), and Switzerland (St. Gallen and Basel). All 321 couples and 79 single people taking part in fertility treatment were recruited through personal contact at the fertility center they attended. The data collection period was from May 2018 to July 2019. A positive vote from the Ethics Committee of the Medical Faculty of Heidelberg, with the reference S-123/2018, was obtained on 12 March 2018. The study was entered in the German Clinical Trials Register (GermanCTR) under number DRKS00014260.

SCREENIVF-R

SCREENIVF was used to identity patients who were at an increased risk of anxiety and depression at the start of IVF treatment [15]. Prior to this, anxiety, depression, negative cognitive distortions in the form of helplessness and reduced acceptance of fertility problems, and a lack of social support had been identified as risk factors for increasing emotional problems [16]. Based on these five risk factors, SCREENIVF was developed in 2010. It has a sensitivity of 69% and a specificity of 77% [15].

The SCREENIVF-R questionnaire consists of 34 items in total, with five items for state anxiety and five items for trait anxiety, based on a short version of the Spielberger State-Trait Anxiety Inventory (STAI) [17], seven items for depression as a shortened version of the Beck Depression Inventory (in this study we used the second revised version, BDI-II) [18], five items for social support, derived from the "Inventory of Social Involvement" (ISI) [19], and 12 items for negative cognitive distortion relating to helpless and acceptance of fertility problems, taken from the Illness Cognition Questionnaire for IVF patients [16]. For scaling we used a four-level Likert scale (1–4), and the sum score for each risk factor was calculated as the sum of the answers for each item. Accordingly, the total sum scores ranged from 10 to 40 for anxiety (with higher values corresponding to a higher risk), 5 to 20 for social support (with lower values corresponding to a higher risk), and 6 to 24 for helplessness (with higher values correlating to a higher risk) and acceptance (with lower values corresponding to a higher risk). For depression we used a scale from 0–3. This meant the
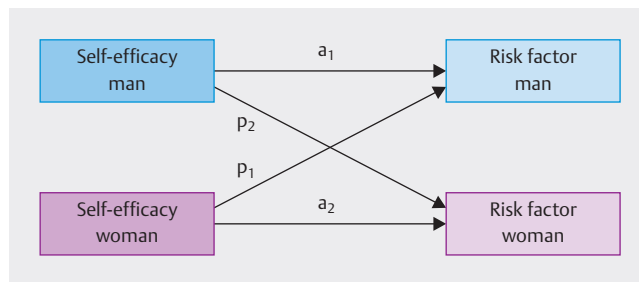
▶ **Fig. 1** Fig. Actor–partner interdependence model. a_1 and a_2 = actor effect, p_1 = partner effect (woman → man), p_2 = partner effect (man → woman).

total scores for depression ranged from 0 to 21 (with higher values corresponding to a higher risk).

ISE

To measure self-efficacy in the context of infertility and its medical treatment, Cousineau et al. developed and validated the Infertility Self Efficacy scale (ISE) [13]. This self-disclosure instrument can be used by both women and men affected by infertility; two versions are available, adapted linguistically for each sex.

The scale consists of 16 items which capture the participant's perceptions and beliefs relating to infertility and their ability to make use of cognitive, emotional, and behavioral skills. The scale used is a Likert scale ranging from "no confidence at all" (1) to "very confident" (9). To evaluate results, we added up the individual items; possible total scores ranged from 16 to 144.

Sociodemographic data

The sociodemographic data included age, level of education, occupation, time structure of work activity, family situation, existing child(ren), length of the couple's relationship, of their desire to have children, and of the fertility treatment, as well as the subjective cause of childlessness. In addition, the strength of the desire to have children and the stress caused by the infertility was determined using a continuous scale measuring 5 cm.

Data analysis

Only the 320 heterosexual couples were taken into account for the descriptive analysis of sociodemographic parameters and comparison of couples. Participants who did not answer at least 80% of the items were excluded from the analysis in question. Depending on the scale of measurement of the variables, the sociodemographic parameters were analyzed using either an unpaired t-test, or Mann-Whitney U test, or the χ^2 test. The paired sample t-test, or the Wilcoxon signed-rank test, were used to compare couples in terms of their risk factors from the SCREENIVF and self-efficacy score from the ISE. Using the actor–partner interdependence model (APIM) we were able to consider the couples as units of analysis; this allowed us to gain a better understanding of the interpersonal factors in the context of psychological stress associated with infertility. In its analysis the APIM (▶ **Fig. 1**) takes into account two central effects: the actor effect (a_1 and a_2), and the partner effect (p_1 and p_2).

▶ **Table 1** Overview of sociodemographic data for the analyzed couples.

	Women		Men		
	M ± SD	n	M ± SD	n	P
Age	33.04 ± 4.39	318	35.93 ± 5.86	316	< 0.001
Childlessness	82.8%	264/319	77.9%	247/317	NS
Higher secondary school qualification (≥ entrance qualification for university/technical college)	75.0%	237/316	72.8%	230/316	NS
Length of intention to conceive (in years)	2.66 ± 2.19	314	2.66 ± 2.18	310	NS
Length of fertility treatment (in years)	0.82 ± 1.37	267	0.88 ± 1.62	267	NS
Strength of desire to conceive	4.22 ± 0.79	318	4.04 ± 0.84	318	= 0.005
Stress caused by infertility	3.31 ± 1.19	316	2.57 ± 1.33	317	< 0.001

The data are reported as mean ± standard deviation or n (%). Where applicable the statistical analysis was performed using the independent t-test or the χ^2 test. NS = not significant

The actor effect is defined as the influence of one spouse's independent variables on their own dependent variables, while the partner effect is the influence of one spouse's independent variables on their partner's dependent variables. In our APIM analyses, self-efficacy scores were seen as independent variables and psychosocial risk factors (anxiety, depression, lack of social support, lack of acceptance, helplessness) were considered dependent variables; both were analyzed separately for women and men.

For all analyses except for the APIM analysis, we used the software program IBM SPSS Statistics Version 27. To calculate the APIM model we used the APIM_SEM web application for distinguishable dyads: *Stas L, Kenny DA, Mayer A, Loeys T (in press). Giving Dyadic Data Analysis Away: A User-Friendly App for Actor-Partner Interdependence Models. Personal Relationships. Available from:* https://apimsem.ugent.be/shiny/apim_sem/. A P value <0.05 was considered statistically significant.

Results

Sociodemographic data

A total of 614 questionnaires were handed out at the infertility outpatient clinic of the Heidelberg University Women's Hospital; of these, 217 were completed by people taking part in the study (response rate = 35.3%). We only have the response rate for Heidelberg. A total of 721 patients were included in the study overall; these were 391 women (54.2%) and 330 men (45.8%). Among the 721 participants there were 321 couples, of which 320 were heterosexual, and 79 single people. Among the 320 couples, 63.2% were from Germany (D), 17.2% were from Austria (A), and 19.7% were from Switzerland (CH). The sociodemographic data for the heterosexual couples participating in the study are set out in ▶ **Table 1**. Among the study participants, 60.4% were married and 38.1% were living with their partner. The mean length of relationship among the participating couples was 7.81 ± 4.5 years.

Overall, 64.9% of the women and 91.2% of the men reported that they work full time.

Risk factors and self-efficacy – differences between men and women

Overall scores for self-efficacy and the respective risk factors are set out in ▶ **Table 2**. Using the paired t-test, or the Wilcoxon signed-rank test, we investigated the differences between mean or median scores for men and women within the couples with regard to the various risk factors. Four out of the five risk factors showed a significant discrepancy, with a just on average effect size (depressiveness, anxiety, acceptance, and helplessness).

Men (Md = 115) showed higher self-efficacy expectations than women (Md = 100) (z = 10.44, p < 0.001, r = 0.6). In women there was a slight positive correlation between the length of the intention to conceive and levels of anxiety (ρ = 0.154, p < 0.01) and helplessness (ρ = 0.173, p < 0.01). In men, there was a positive correlation between helplessness and the length of the intention to conceive (ρ = 0.204, p < 0.01). Both men and women showed a weak positive correlation between the length of the fertility treatment and the scores for anxiety and helplessness, and a weak negative correlation between length of fertility treatment and self-efficacy scores. Moreover, women showed a weak positive correlation between the length of fertility treatment and depressiveness. Given the low absolute value of these statistically significant correlations (r range: 0.11–0.23), due to the sample size we tended to regard them as artefacts without great clinical relevance; for this reason, we decided not to perform any deeper analysis.

Analysis of the couples: APIM results

A significant protective effect (p < 0.001, medium to large effect size) from self-efficacy with regard to the participant's own respective risk factor was observed in both men and women for all five risk areas (actor effect, men and women) (▶ **Table 3**).

▶ **Table 2** Differences between women and men (within a couple) with regard to self-efficacy and the risk areas.

	Number of couples	Women	Men	P	Effect size
		Md ± IQR[a] M ± SD[b]	Md ± IQR[a] M ± SD[b]		
Self-efficacy	307	100 ± 30[a]	115 ± 24[a]	< 0.001[a]	r = 0.6
Depressiveness	302	2 ± 4[a]	0 ± 2[a]	< 0.001[a]	r = 0.41
Anxiety	313	20.6 ± 5.33[b]	17.83 ± 4.83[b]	< 0.001[b]	d = 0.45
Acceptance	302	12 ± 7[a]	15.5 ± 6[a]	< 0.001[a]	r = 0.46
Helplessness	306	11 ± 5[a]	9 ± 6[a]	< 0.001[a]	r = 0.47
Social support	305	19 ± 4[a]	19 ± 4[a]	0.878[a]	r = 0.01

Depending on the scale of measurement, the data were reported as either the median value (Md) ± interquartile range (IQR), or as the mean (M) ± standard deviation (SD). Statistical analysis using [a] = Wilcoxon signed-rank test with correlation coefficient r (r) as effect size or [b] = dependent sample t-test with Cohen's d (d) as effect size.

▶ **Table 3** Actor and partner effects of self-efficacy on the risk factors.

Self-efficacy	Depressiveness	Anxiety	Acceptance	Helplessness	Social support
Actor effects					
a$_1$ (r)	**− 0.51*** (− 0.463)	**− 0.59*** (− 0.554)	**0.47*** (0.443)	**− 0.52*** (− 0.470)	**0.33*** (0.285)
a$_2$ (r)	**− 0.49*** (− 0.467)	**− 0.61*** (− 0.574)	**0.57*** (0.537)	**− 0.52*** (− 0.507)	**0.23*** (0.206)
Partner effects					
p$_1$ (r)	− 0.1 (− 0.118)	0.03 (0.031)	**0.12*** (0.113)	− 0.07 (− 0.083)	**0.14*** (0.140)
p$_2$ (r)	**−0.15**** (− 0.164)	− 0.08 (− 0.125)	0.02 (0.036)	**−0.13**** (− 0.141)	0.01 (0.005)

Significant values are displayed in **bold**.
a$_1$ = standardized actor effect (men), a$_2$ = standardized actor effect (women)
p$_1$ = standardized partner effect (woman → man), p$_2$ = standardized partner effect (man → woman)
r = partial correlation as effect size
* p < 0.05, ** p < 0.01, *** p < 0.001

The men's self-efficacy scores showed a significant negative correlation of − 0.15 (p < 0.01, small effect size) with the women's depressiveness scores (partner effect, man → woman) (▶ **Table 3**). With regard to helplessness, a significant negative correlation of −0.13 (p < 0.01, small effect size) was observed between the men's self-efficacy scores and the women's helplessness scores (partner effect, man → woman) (▶ **Table 3**).

The women's self-efficacy scores had a significant positive correlation with acceptance in the men (partner effect, woman → man), with an effect of 0.12 (p < 0.05, small effect size), and with the men's access to social support (partner effect, woman → man), with an effect of 0.14 (p < 0.05, small effect size) (▶ **Table 3**). Overall, all of the partner effects were considerably smaller in size than the actor effects.

Discussion

Our study has confirmed that infertility is associated with a high level of psychological stress, for both women and men. Compared to men, women appeared to be at a higher risk of depressiveness, anxiety, helplessness, and inability to accept the situation. Self-efficacy proved to have a protective effect with regard to the patient's own risk factors, and (to a small extent) the risk factors of their partner. In all cases, the psychological well-being of both the woman and the man were influenced by the partners' self-efficacy expectations.

According to the ESHRE Guideline, it is to be expected that women tend to suffer (or report suffering) more than men from depressiveness, anxiety, stress, and/or psychiatric comorbidities [6]. This is confirmed by our study data in which a comparison of couples showed that women are more at risk than men of suffer-

ing from depressiveness, anxiety, lack of acceptance of the situation, and helplessness. These results confirm that women dealing with infertility often present with a demonstrably high level of psychological stress. A possible approach to explaining why women suffer a higher degree of psychological stress than men lies in the traditional gender roles, in which the association between motherhood and female role models is stronger than the association between fatherhood and masculinity [20]. In parental roles, the woman is generally expected to be the primary caregiver in the domestic setting, while the man tends to be assigned the role of breadwinner. Young men and women are still internalizing these social expectations, and developing beliefs relating to the roles they are supposed to take in society [21]. Also, when comparing the couples, women showed a lower level of self-efficacy than men. It is possible that the men were trying to fulfil social expectations when reporting their perceptions of self-efficacy and psychological risk factors, and may have tended to overestimate themselves: Men often see themselves as the "strong one" in the couple; in this belief, they tend to be following social expectations [22].

According to the results from this study, the self-efficacy of one spouse is related to both their own level of psychological stress and that of their partner. We were able to determine that a high level of self-efficacy in women is associated with men having a high score in the areas of acceptance and social support (partner effect, woman → man). If a high level of self-efficacy was observed in the man, lower scores for depression and helplessness were observed in the woman (partner effect, man → woman). One possible interpretation of these (albeit weak) partner effects is that men are supported cognitively and on the interpersonal level by their partners, while women are conscious of receiving emotional and intrapsychic support from their partners.

The ESHRE Guideline also assumes that the emotional response of each spouse to the infertility problem is associated with the response of their partner [6]. It has been described that in couples, not only the emotional responses but also the depressive symptoms of each spouse are connected not only to their own psychological stress, but also the infertility-specific suffering of their partner.

This study is one of the first to investigate the relationship between self-efficacy expectations and infertility-related stress and psychological risk profile. Based on our results from the actor–partner interdependence model, we were able to determine that for both men and women, self-efficacy had actor effects with a large effect size on the risk areas of depressiveness, anxiety, helplessness, and lack of acceptance. For lack of social support, too, we were able to identify actor effects with moderate effect size in both sexes. This highlights the fact that a higher level of self-efficacy is associated with a more favorable psychological risk profile. Other studies have presented the positive influence of resilience as a protective factor in the psychological risk profile of infertility patients [11, 23]: A study by Zhang et al. from 2021 demonstrated the protective effect of resilience in husbands on both their own infertility-related stress and post-traumatic development and that of their wives, and a 2020 study by Bhamani et al. showed the positive relationship between resilience and quality of life in Pakistani couples.

A major strength of this study is that, unlike other studies, analysis is focused on the couple, not only on the man and woman as separate individuals. Based on the large number of participants, 721 in total (including 320 couples), we can assume that this cohort is a representative sample of men and women undergoing fertility treatment. However, despite the large number of participants, the overall response rate from Heidelberg was only 35.5%; this may have been due to pre-existing psychological problems and/or language barriers. It is also possible that patients suffering a high level of stress were more likely to complete the questionnaire than those suffering a lower level of stress; this would mean the sample is not representative of the population (selection bias). Moreover, 74.9% of the women and 73.2% of the men had an above-average level of secondary school education (selection bias). Due to the very small number of lesbian couples who responded (n = 1), only the heterosexual couples were included in the couples analysis; this means that homosexual couples (and couples with other sexual identities) were not represented at all. It must also be mentioned that the partner effects only had a small effect size, for both women and men. Only infertility patients from the five abovenamed infertility clinics were included in the study. Accordingly, we are not able to make any observations regarding couples with infertility problems who are not (or are no longer) receiving medical treatment. Therefore, the results from this study cannot be generalized to apply to the entire population of infertility patients.

Conclusion

Based on the data presented in this study, we can clearly recommend a couples-oriented counselling strategy for couples dealing with infertility. Moreover, future studies should focus primarily on the couple as the unit of analysis.

Precisely in a situation in which both partners have to deal with a high level of helplessness – especially when waiting for the results of a pregnancy test – perceiving and encouraging helpful self-efficacy expectations is likely to give the couple something to hold on to and provide them with a sense of orientation (creating "road maps") [24]. This represents a new counselling concept which may enable both spouses to come to terms better with the treatment procedure and potential treatment failures (no pregnancy, or the pregnancy miscarries).

Specific screening instruments should be used to identify patients who have risk factors for emotional problems. This enables couples dealing with infertility to obtain information through a direct referral to psychosocial counselling services. The two questionnaires (SCREENIVF-R and ISE) could be used in future prospective studies to investigate the development of psychological stress over time in women and men during their infertility treatment.

Clinical Trial

Acknowledgement

Conflict of Interest

The authors declare that they have no conflict of interest.

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