

# Dyspareunia and depressive symptoms are associated with impaired sexual functioning in women with endometriosis, whereas sexual functioning in their male partners is not affected

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**STUDY QUESTION:** To what extent are endometriosis and its related physical and mental symptoms associated with the perceived level of sexual functioning in women and their male partners?

**SUMMARY ANSWER:** Dyspareunia and depressive symptoms are associated with impaired sexual functioning in women with endometriosis, whereas sexual functioning in their male partners is not affected.

**WHAT IS KNOWN ALREADY:** Women with endometriosis suffer from more dyspareunia, lower sexual functioning, and lower quality of life. In qualitative studies, partners of women with endometriosis report that endometriosis affected their quality of life and produced relational distress.

**STUDY DESIGN SIZE, DURATION:** In this cross-sectional study, sexual functioning in women with endometriosis ( $n = 83$ ) and their partners ( $n = 74$ ) was compared with sexual functioning in a control group of women attending the outpatient department for issues related to contraception ( $n = 40$ ), and their partners ( $n = 26$ ).

**PARTICIPANTS/MATERIALS, SETTING, METHODS:** Women and partners were recruited in the Maastricht University Medical Centre (MUMC) and the VieCuri Medical Centre Venlo between June 2011 and December 2012. All participants were asked to complete a set of online questionnaires.

**MAIN RESULTS AND THE ROLE OF CHANCE:** Response rates were 59.3% (83/140) for women with endometriosis and 52.3% (74/140) for their partners. Response rates in the control group were respectively 43.2% and 27.4% (41/95 and 27/95), of whom 40 women and 26 partners could be included in the study. Women with endometriosis as compared with the control group, reported significantly more frequent pain during intercourse (53% versus 15%,  $P < 0.001$ ); higher levels of chronic pain (median VAS 2.0 cm versus 0.0 cm,  $P < 0.001$ ); more impairment of sexual functioning (median Female Sexual Function Index 25.4 versus 30.6,  $P < 0.001$ ); more impairment of quality of life (median Short Form-12 66.3 versus 87.2,  $P < 0.001$ ); more pain catastrophizing (mean Pain Catastrophizing Scale 17.8 versus 8.5,  $P < 0.001$ ), more depression and anxiety symptoms (median Hospital Anxiety and Depression Scale for depression 7 versus 4,  $P < 0.001$  and for anxiety 4 versus 1,  $P < 0.001$ ). Sexual functioning was comparable between male partners of women with endometriosis and male partners of the control group based on the International Index of Erectile Function. Logistic regression analyses showed that dyspareunia (OR 0.54; 95% CI

0.39–0.75) and depressive symptoms (OR 0.761; 95% CI 0.58–0.99) were independent and significant negative predictors for sexual functioning. Chronic pelvic pain (OR 0.53; 95% CI 0.35–0.81) and depressive symptoms (OR 0.65; 95% CI 0.44–0.96) were independent and significant negative predictors for quality of life.

**LIMITATIONS, REASONS FOR CAUTION:** Patient recruitment was performed in one tertiary care centre and to a lesser extent one general hospital, possibly leading to an over-representation of patients with more severe endometriosis. All participating women had a partner and are therefore ‘survivors’ in relationship terms. This may have led to an underestimation of the impact of endometriosis on sexual functioning.

**WIDER IMPLICATIONS OF THE FINDINGS:** It would be worthwhile to further explore the role of depressive symptoms in women with symptomatic endometriosis and to assess the effect of treatment of depressive symptoms on sexual functioning and quality of life. The fact that the partners did not report impaired sexual functioning could be a reassuring thought to women that might be discussed in the consulting room.

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**Key words:** endometriosis / dyspareunia / sexual functioning / quality of life / FSFI / mental aspects / partner

## Introduction

Women with endometriosis have a nine-fold risk of developing deep dyspareunia (Ballard et al., 2008). In some of these women, dyspareunia can be treated by surgical resection of endometriotic implants (Abbott et al., 2003; Ferrero et al., 2007; Van den Broeck et al., 2013; Vercellini et al., 2013). However, similar to other symptoms of endometriosis, dyspareunia frequently persists even after multiple treatments or recurs over time (Abbott et al., 2003; Vercellini et al., 2013). This is reflected in the 32–70% of women with chronic endometriosis complaining of dyspareunia (Fagervold et al., 2009; Fourquet et al., 2010; De Graaff et al., 2013). Anticipation and fear of pain may provoke decreased sexual arousal, lack of lubrication, and pelvic floor hypertonia, resulting in a disturbed sexual functioning and satisfaction (Ballard et al., 2008; Ferrero et al., 2008; Desrochers et al., 2009). Decreased sexual functioning has indeed been observed in women with endometriosis (Ferrero et al., 2005; Trippoli et al., 2011; Vercellini et al., 2012; Di Donato et al., 2014).

Over the last decades there is a growing amount of evidence on the role of psychosocial factors in the developing or maintaining of impaired sexual functioning (Meana et al., 1997; Nylanderlundqvist and Bergdahl, 2003; Bachmann et al., 2006). Depression and anxiety have been shown to be more prevalent in women with endometriosis (Sepulcri and do Amaral, 2009; Chen et al., 2015). Pain catastrophizing, which is defined as a negative cognitive and emotional coping response to pain, that includes the tendency to amplify and focus on pain symptoms as well as feelings of helplessness and pessimism (Sullivan et al., 2001) has shown to play a role in the development of chronic pain (Vlaeyen and Linton, 2000; Leeuw et al., 2007). Self-consciousness during intercourse could play a role in sexual functioning of women with endometriosis, while it can be hypothesized that full attentional capacity is required for a sexual response. Distraction with non-sexual stimuli, such as pain, could disturb this sexual response and could impair sexual functioning (Barlow, 1986; Janssen et al., 2000; Salemink and van Lankveld, 2006). However, the role of these

psychosocial factors in sexual functioning in women with endometriosis is an almost unexplored area.

Several studies indicate that the presence of dyspareunia plays a significant role in quality of life in endometriosis patients (Jones et al., 2004; Denny et al., 2007; Ferrero et al., 2007; Bernuit et al., 2011; De Graaff et al., 2013), but the relation between sexual functioning itself and the perceived quality of life has not yet been investigated.

Earlier studies showed that endometriosis itself can have a profound impact on the relationship, with relationship break-up as a result in 8–10% of the women (Fagervold et al., 2009; De Graaff et al., 2013). Furthermore, partners of women with endometriosis can experience challenges to their own quality of life (Culley et al., 2013b; Fernandez et al., 2006). The frequently experienced dyspareunia in women with endometriosis could have implications for partner intimacy and could lead to relational distress (Denny and Mann, 2007; Meana and Lykins, 2009). However, the effect of endometriosis on the sexual functioning of their (male) partners has not been investigated yet in a quantitative way.

During the consensus workshop following the 10th World Congress on Endometriosis in 2011, new priorities for endometriosis research were developed (Vercellini et al., 2011). These new priorities included the use of a common validated instruments to measure sexual functioning; to define the psychological profile of patients with regard to anxiety and depression; and the evaluation of psychological influence on partners, and the effects on the stability of relationships.

With the current study we want to provide answers to questions concerning the effects of endometriosis on the sexual wellbeing of these women and their partners. Therefore, the goals of the present study were three-fold:

- (i) To compare pain symptoms; medical history; aspects of mental functioning; sexual functioning and quality of life between women with endometriosis and a control group.
- (ii) To compare sexual functioning of male partners of women with endometriosis with sexual functioning of male partners of the control group.

(iii) To multivariately explore which factors have an independent and significant relation with sexual functioning (having endometriosis or not, medical history, pain symptoms, mental aspects), and the relation between sexual functioning and quality of life.

In order to meet these goals an observational, cross-sectional, questionnaire-based study on women with endometriosis and their male partners and a control group of women and their male partners visiting the hospital for advice on contraception was performed.

## Materials and methods

### Study population and recruitment

The study population included women in whom the diagnosis endometriosis was established by means of laparoscopy or open surgery using the known visual aspects of the disease (Dunselman *et al.*, 2014). When there was a strong suspicion of the diagnosis of endometriosis based on symptoms in combination with positive pelvic examination, ultrasound or MRI, patients could also be included (Eskenazi *et al.*, 2001; Dunselman *et al.*, 2014). The study included both newly diagnosed and previously diagnosed patients. The control group included women who visited the outpatient department for issues related to contraception (oral contraception, intra-uterine devices or a request for sterilization). All male partners of women with endometriosis and the control group were asked to participate in the study. Women were allowed to participate in the study even if the partner did not participate.

All eligible patients who visited the Maastricht University Medical Centre (MUMC) or the VieCuri Medical Centre Venlo (VMC) between June 2011 and December 2012 were invited to participate in the study. The MUMC is a tertiary care centre for endometriosis and the VMC is a general hospital.

### Eligibility criteria

Inclusion criteria were: age between 18 and 42 years and living in a sexual relationship of at least three months duration. Exclusion criteria were: hysterectomy, being pregnant, breastfeeding or having given birth in the last three months, severe comorbidity such as Morbus Crohn, type I diabetes or malignancies, and not endometriosis-related medication with influence on sexual functioning such as anxiolytic and antipsychotic medication. Women who underwent surgery in the inclusion period were enrolled at least three months after surgery.

### Ethical approval

Ethical approval was obtained from the ethical committee of the MUMC and the VMC. During their visit to the outpatient department, women were asked if they accepted to be approached for the study, and if they agreed, they received an information letter and informed consent form. Women and partners were asked to sign the informed consent form before participating in the study.

### Questionnaires

Participants were asked to complete a set of questionnaires. The questionnaires could be completed at home via a website and they were stored in a database. Participants were advised to answer the questions without the presence of the partner, as this could influence their answers. Women who indicated not to have internet access, were given the opportunity to complete the questionnaires on a computer in the hospital. However, none of the participants used this opportunity.

The female participants were asked to complete the Dutch version of the Female Sexual Function Index (FSFI), the Short Form-12 (SF12), the

Pain Catastrophizing Scale (PCS), the Sexual Self-Consciousness Scale (SSCS), the Hospital Anxiety and Depression Scale (HADS) and an additional questionnaire. The male participants were asked to complete the Dutch version of the International Index of Erectile Function (IIEF) and an additional questionnaire.

The FSFI questionnaire is a 19-item, validated, multidimensional self-report instrument for assessing the major aspects of female sexual dysfunction and sexual satisfaction (Rosen *et al.*, 2000). The FSFI contains six domains: desire, arousal, lubrication, orgasm, satisfaction and pain (scores 0–6), and a summary score (0–36). Women with a FSFI total score below 26 are categorized as being sexual dysfunctional, whereas those scoring at or above this cut-off score are categorized as sexually functional (Wiegel *et al.*, 2005).

The SF-12 is a validated short version of the Short Form-36 that comprises 12 questions, which measure functional health and wellbeing from the patient's point of view (Gandek *et al.*, 1998; Razavi and Gandek 1998). There are two summary measures: physical health and mental health. All raw scale scores are linearly converted to a 0–100 scale, with higher scores indicating higher levels of health-related quality of life.

The PCS is a 13-item, validated, self-report measure of catastrophic thoughts about pain (Sullivan *et al.*, 1995). This measure has a 5-point Likert-style response scale and the scoring range is 0–52, with higher scores indicating higher levels of catastrophic thoughts.

The SSCS questionnaire is a 12-item, validated, self-report instrument for assessing the private and public aspects of self-consciousness proneness in sexual situations and of sexual anxiety and discomfort (Van Lankveld *et al.*, 2008). This instrument has a 5-point Likert-style response scale and the scoring range is 0–48, with higher scores indicating higher levels of self-consciousness. There are two subscales: embarrassment and self-focus.

The HADS questionnaire is a self-assessment mood scale specifically designed and validated for use in non-psychiatric hospital outpatients to determine level of anxiety and depression (Zigmond and Snaith, 1983; Bjelland *et al.*, 2002). The HADS has two subscales (anxiety and depression), each ranging from 0 to 21. Higher scores on the HADS indicate higher degrees of anxiety and depression.

The IIEF is a 15-item validated instrument for the assessment of five domains of male sexual function (desire, erectile function, intercourse satisfaction, orgasmic function and overall satisfaction) (Rosen *et al.*, 1997). Higher scores on the IIEF correlate with better sexual functioning. The Dutch version of the IIEF that was used in the study has not yet been validated.

The additional questionnaire included questions regarding marital state, education level, employment, medical history including having given birth, having a fertility treatment (in the past or present), medication use, duration of relationship, menstrual cycle, avoidance and interruption of intercourse. The pain symptoms dysmenorrhoea, dyspareunia and chronic pelvic pain were measured using a 10 cm visual analogue scale (VAS), where 0 indicated the absence of pain and 10 indicated worst possible pain. Patients were asked to report their average pain over the last three months. Regarding dyspareunia, women were asked if they had pain during intercourse (yes/no). In case they reported pain they were asked to fill in the VAS score. Women who reported to have symptoms due to the IUD, were asked to complete the questionnaires with reference to the period before the IUD was placed.

### Sample size

For the sample size calculation, the expected difference in FSFI total score between women with endometriosis and a control population was chosen to be the primary outcome. We regarded a difference of 0.5 standard deviation as clinically relevant. Under the assumption of normality, it was calculated that with an alpha of 0.05 and a beta of 0.20, a sample size of 64 women was needed in each group.

## Statistical analysis

All data were analysed using SPSS 21. For categorical data, characteristics are reported as numbers and relative frequencies. Continuous data were tested for normality using the Kolmogorov–Smirnov test. In case of a normal distribution data were presented as mean and standard deviation (SD). In case of a non-normal distribution the data were presented as median and inter quartile range (IQR). Between-groups analyses of categorical data were performed by means of the Chi-square analysis with a linear by linear analysis in case of ordinal variables. Continuous data were analysed using Student's *t*-test or Mann–Whitney *U* test, depending on the normality of the distribution of the data.

Logistic regression was performed in order to identify independent and significant predictors for sexual functioning (total FSFI) and quality of life (SF-12 total score). This approach was chosen because the assumptions for a linear regression analysis could not be met. The median was used as a cut point for both sexual functioning and quality of life (for FSFI 27.8 and for SF-12: 73.1). All variables that showed a significant crude association with endometriosis/control status were included in the model. The included variables were: having endometriosis, having given birth, having had fertility treatment, current symptoms of dyspareunia and chronic pelvic pain, PCS scores, HADS scores for anxiety and depression. For the analysis of quality of life, the total FSFI score was also included in the model. Dysmenorrhoea was not included in the model, because 28.5% of the women did not have a menstrual cycle and therefore could not report on dysmenorrhoea.

For the FSFI, PCS, SSCS and IIEF, completing all questions was not mandatory because some questions could be experienced as too stressful. Missing values in these questionnaires were imputed with mean of the participants' answers to the other questions in that subscale, if a maximum of one-third of the scores was missing. Percentages of missing values were 0–10.6% before imputation and 0–3% after imputation. For patients who did not report to have pain during intercourse, a VAS score of 0 was imputed before the logistic regression analysis. The remaining missing variables were replaced by the mean or the median of that particular variable, depending on the normality of its distribution of that variable.

## Results

Of the 140 women with endometriosis invited to participate in the study, 92 women (65.7%) and 84 partners (60.0%) provided informed consent and received the codes for the online questionnaires. Of these, 83 women (59.3%) and 74 partners (52.3%) completed the questionnaires. Of the 95 women who visited the outpatient department for contraception and who were invited to participate in the study, 50 women (52.6%) and 40 partners (42.1%) provided informed consent and received the codes for the online questionnaires. Of these, 41 (43.2%) women and 27 (28.4%) partners completed the questionnaires. One couple was excluded after a profound inconsistency between their answers on the questionnaires was detected. Of the women with endometriosis 78 participants (94%), were recruited in the MUMC and five (6%) in the VMC. For the control population 28 participants (70%) were recruited in the MUMC and 12 (30%) in the VMC. There was no difference in age between responders and non-responders.

Mean age was 34.3 years (endometriosis group) and 32.4 years (control group). The control group had given birth more often than the endometriosis patients (67.5% versus 34.9%,  $P = 0.001$ ), while the endometriosis patients more often had undergone fertility treatments than the control group (44.5% versus 2.5%,  $P = 0.001$ ). Women with

endometriosis had visited more different types of medical specialists ( $P = 0.005$ ), but did not undergo more surgery for other diseases than endometriosis ( $P = 0.173$ ). The percentage of women who had visited a psychologist or psychiatrist was comparable between the groups (control group 20%, endometriosis group 31%,  $P = 0.188$ ). Further basic and medical characteristics are presented in [Supplementary Table SI](#) and [Table SII](#).

Table I shows that women with endometriosis reported higher pain levels for all pain symptoms: dysmenorrhoea (mean VAS 6.36 cm versus 2.34 cm,  $P < 0.001$ ), chronic pelvic pain (median VAS 2.0 cm versus 0.0 cm,  $P < 0.001$ ). Women with endometriosis reported significantly more often to have pain during intercourse (53% versus 15%,  $P < 0.001$ ). Of the women who reported pain during intercourse, the women with endometriosis reported significantly more severe pain (mean VAS 3.92 versus 1.38,  $P = 0.021$ ). The number of (attempts to have) intercourse in the last 4 weeks was significantly higher in the control group than in the women with endometriosis ( $>7$  times in 4 weeks 40.0% versus 22.9%,  $P = 0.022$  for linear by linear analysis). Furthermore, women with endometriosis reported that they more frequently avoided intercourse because of pain (22.9% versus 2.5%,  $P = 0.004$ ) and more frequently interrupted intercourse because of pain (13.2%, 0.0%,  $P = 0.016$ ).

No differences were found with regard to age at first intercourse, number of sexual relationships, and duration of the current relationship between endometriosis and control group. Of the women with endometriosis 52% reported to be afraid to lose their partner because of the consequences of endometriosis for their sexual functioning. This question was not asked to women in the control group. Of the partners of women with endometriosis 64% reported to have less intercourse than wanted because of taking into account partners wishes/pain compared with 50% of the partners in the control group ( $P = 0.036$ ).

Women with endometriosis scored significantly lower on the sexual functioning (FSFI) domains as well as on the FSFI total scale (median total FSFI score 25.4 versus 30.6,  $P < 0.001$ ) (Table II). Furthermore, the proportion of women with sexual dysfunction (total FSFI score  $< 26$ ) was significantly higher in the group of women with endometriosis than in the control group (51.8% versus 17.5%,  $P < 0.001$ ). Women with endometriosis scored significantly lower on the physical health (median 68.8 versus 90.6,  $P < 0.001$ ) and mental health (median 65.8 versus 83.1,  $P < 0.001$ ) subscales of the SF-12 compared with the control group. Women with endometriosis were found to have higher pain catastrophizing scores (mean PCS 17.8 versus 8.5,  $P < 0.001$ ), and significantly higher anxiety (median HADS for anxiety 7 versus 1,  $P < 0.001$ ) and depression scores (median HADS for depression 4 versus 1;  $P < 0.001$ ) as compared with the control group. No statistically significant differences were found with regard to the sexual self-consciousness (SSCS) subscales (mean embarrassment subscale for women with endometrioses 7.3 and for control women 7.7,  $P = 0.713$ ; mean self-focus respectively 7.3 and 7.7,  $P = 0.829$ ).

Partners of women with endometriosis compared with partners of control group participants scored comparable on all five domains of the IIEF (median for erectile function 30 versus 30, median for orgasmic function 10 versus 10, median for sexual desire 8 versus 8, median for intercourse satisfaction 12 versus 12, median for overall satisfaction 8 versus 8) (Table III).

**Table 1** Pain symptoms: dysmenorrhoea, chronic pelvic pain and dyspareunia.

Dysmenorrhoea and chronic pain	Endometriosis group N = 83	Control group N = 40	P-value
	Mean ± SD Median [IQR]	Mean ± SD Median [IQR]	
Women with cycle (N = 57 and 31)			
Dysmenorrhoea (VAS)	6.36 ± 2.87	2.34 ± 2.31	<0.001
Chronic pain (pain at other times) (VAS)	2.3 [0.8–4.9]	0 [0.0–2.0]	<0.001
Women without cycle (N = 26 and 9)			
Chronic pain (VAS)	3.02 ± 3.11	1.02 ± 1.34	0.013
Chronic pain all women (with and without cycle)	2.0 [0.6–5.0]	0.0 [0.0–3.0]	<0.001
Intercourse	N (%)	N (%)	P-value
Intercourse in the last four weeks	69 (83)	38 (95)	} 0.186
No intercourse due to pain	7 (8)	1 (3)	
No intercourse due to other reasons*	7 (8)	1 (3)	
Women with pain during intercourse	44 (53)	6 (15)	<0.001
Dyspareunia	Mean ± SD Median [IQR]	Mean ± SD Median [IQR]	P-value
Dyspareunia, women reporting pain during intercourse and having intercourse (N = 69 and 38), (VAS)	3.92 ± 2.31	1.38 ± 1.10	0.021
Dyspareunia, not active because of pain** (N = 7 and 1), (VAS)	6.26 ± 2.97	8.40	0.525
Dyspareunia, all women having intercourse (N = 76 and 39), (VAS)	1.5 [0.0–4.8]	0 [0.00–0.00]	<0.001
Number of intercourse last 4 weeks	N (%)	N (%)	P-value
0–2	31 (37)	8 (20)	} 0.022***
3–6	32 (39)	16 (40)	
>7 times 3–4 times	19 (23)	16 (40)	
Do not want to answer	1 (1)	0 (0)	
Avoid intercourse last 4 weeks	N (%)	N (%)	P-value
Almost never or sometimes	25 (30)	5 (13)	
Regular, always or not active last four weeks because of pain	19 (23)	1 (23)	0.004
Interrupt intercourse last 4 weeks	N (%)	N (%)	P-value
Never stop for pain	26 (31)	5 (12)	
1–4 times	11 (13)	0 (0)	0.016

\*Tired, IVF treatment, did not want to answer.

\*\*Women without intercourse due to pain were asked to give a VAS score for the last times they had intercourse.

\*\*\*Linear by linear association.

VAS, visual analogue scale (0 = none to 10 = worst possible).

The logistic regression analyses, showed that dyspareunia (OR 0.54; 95% CI 0.39–0.75;  $P < 0.001$ ) and depression (HADS depression; OR 0.761; 95% CI 0.58–0.99;  $P = 0.044$ ) were independent significant predictors for sexual functioning (FSFI) (Table IV). Chronic pelvic pain (OR 0.53; 95% CI 0.35–0.81;  $P = 0.030$ ) and depression (HADS depression; OR 0.65; 95% CI 0.44–0.96;  $P = 0.030$ ) were found to be independent and significant predictors for quality of life (SF-12 total score) (Table V).

## Discussion

### Women with endometriosis in comparison with the control group

In this observational, cross-sectional questionnaire-based study, women with endometriosis reported as expected significantly more pain symptoms compared with the control group. Pain during

**Table II Female Sexual Functioning Index (FSFI), quality of life and psychometric parameters.**

	Endometriosis group N = 83	Control group N = 40	P-value
	Median [IQR]	Median [IQR]	
<b>Total FSFI (2-36)</b>	<b>25.4 19.3–30.9</b>	<b>30.6 [27.1–33.1]</b>	<b>0.001</b>
Desire (1.2–6)	3.0 [2.4–3.6]	3.6 [3.0–4.2]	0.010
Arousal (0–6)	4.5 [3.0–5.4]	5.3 [5.4–0.5.7]	0.016
Lubrication (0–6)	5.1 [3.6–6.0]	5.7 [5.4–6.0]	0.002
Orgasm (0–6)	4.8 [3.2–6.0]	5.2 [4.8–6.0]	0.092
Satisfaction (0.8–6)	4.8 [3.2–5.6]	5.2 [4.8–6.0]	0.012
Pain (0–6)	4.0 [2.0–6.0]	6.0 [5.2–6.0]	<0.001
	N (%)	N (%)	P-value
Sexual dysfunction (FSFI <26)	43 (52)	7 (18)	<0.001
	Mean ± SD	Mean ± SD	
	Median [IQR]	Median [IQR]	
	N (%)	N (%)	P-value
<b>SF-12 total score (0–100)</b>	<b>66.3 [47.5–78.1]</b>	<b>87.2 [82.5–91.9]</b>	<b>&lt;0.001</b>
SF-12 physical health(0–100)	68.8 [43.8–87.5]	90.6 [87.5–93.8]	<0.001
SF-12 mental health (0–100)	65.0 [37.5–80.0]	83.1 [77.8–90.0]	<0.001
<b>PCS (0–52)</b>	<b>17.8 ± 10.9</b>	<b>8.5 ± 7.6</b>	<b>&lt;0.001</b>
<b>SSCS total score (0–48)</b>	<b>17.4 ± 9.7</b>	<b>17.6 ± 8.7</b>	<b>0.911</b>
SSCS Embarrassment	7.3 ± 5.9	7.7 ± 5.4	0.713
SSCS Self-focus	10.0 ± 5.0	9.8 ± 4.8	0.829
<b>HADS anxiety (0–21)</b>	<b>7 [4–11]</b>	<b>4 [3–6]</b>	<b>&lt;0.001</b>
Normal (0–7)	46 (55)	33 (83)	
Mild (8–10)	16 (19)	5 (13)	
Moderate (11–14)	17 (21)	2 (5)	
Severe (15–21)	4 (5)	0 (0)	
<b>HADS depression (0–21)</b>	<b>4 [2–6]</b>	<b>1 [0–2]</b>	<b>&lt;0.001</b>
Normal (0–7)	68 (82)	37 (93)	
Mild (8–10)	8 (10)	3(8)	
Moderate (11–14)	5 (6)	0 (0)	
Severe (15–21)	2 (2)	0 (0)	

IQR, inter quartile range; HADS, Hospital Anxiety and Depression Scale; SSCS, Sexual Self-Consciousness Scale; SF-12, short form 12; PCS, Pain Catastrophizing Scale.

**Table III International Index of Erectile Function.**

	Male partners endometriosis group N = 74	Male partners control group N = 26	P-value
	Median [IQR]	Median [IQR]	
Erectile function (1–30)	30 [27–30]	30 [29–30]	0.410
Orgasmic function (0–10)	10 [9.5–10]	10 [10–10]	0.118
Sexual desire (2–10)	8.0 [7.0–9.0]	8.0 [8.0–9.0]	0.061
Intercourse satisfaction (0–15)	12 [9.0–13]	12 [10.8–14.2]	0.174
Overall satisfaction (2–10)	8.0 [6.0–10]	8.0 [7.7–10]	0.466

IQR, inter quartile range.

intercourse was reported thrice as frequent in women with endometriosis, with significantly higher VAS pain scores during intercourse as compared to women in the control group. This resulted subsequently

in significantly more avoidance and interruption of sexual intercourse by women with endometriosis. Furthermore, women with endometriosis reported more impairment in all domains of sexual functioning, as

**Table IV** Logistic regression for sexual functioning (total Female Sexual Function Index [FSFI]).

Variable	OR	95% CI	P-value
Having endometriosis	2.02	0.57–7.21	0.279
Giving birth	1.17	0.44–3.07	0.753
Fertility treatment	0.39	0.12–1.21	0.103
<b>Dyspareunia</b>	<b>0.54</b>	<b>0.39–0.75</b>	<b>&lt;0.001</b>
Chronic pelvic pain	1.09	0.85–1.40	0.496
PCS	1.01	0.95–1.06	0.856
HADS anxiety	0.93	0.76–1.15	0.504
<b>HADS depression</b>	<b>0.76</b>	<b>0.58–0.99</b>	<b>0.044</b>

HADS, Hospital Anxiety and Depression Scale; OR, odds ratio; CI, confidence intervals; PCS, Pain Catastrophizing Scale.

**Table V** Logistic regression for quality of life (short form-12 total score).

Variable	OR	95% CI	P-value
Having endometriosis	0.48	0.09–2.58	0.392
Giving birth	2.46	0.70–8.57	0.159
Fertility treatment	0.84	0.21–3.33	0.803
Dyspareunia	0.99	0.73–1.35	0.971
<b>Chronic pelvic pain</b>	<b>0.53</b>	<b>0.35–0.81</b>	<b>0.004</b>
PCS	0.96	0.90–1.02	0.158
HADS anxiety	1.07	0.84–1.38	0.576
<b>HADS depression</b>	<b>0.65</b>	<b>0.44–0.96</b>	<b>0.030</b>
FSFI	1.10	0.99–1.22	0.075

HADS, Hospital Anxiety and Depression Scale; OR, odds ratio; CI, confidence intervals; PCS, Pain Catastrophizing Scale; FSFI, female sexual function index.

assessed with the FSFI, which corresponds with the findings in comparable studies (Di Donato *et al.*, 2014; Ferrero *et al.*, 2005; Vercellini *et al.*, 2012; Trippoli *et al.*, 2011). In the current study half of the women with endometriosis could be classified with sexual dysfunction, based on a FSFI total score below 26, which is in accordance prevalences of 32–73% earlier studies (Fritzer *et al.*, 2013; Jia *et al.*, 2013; Vercellini *et al.*, 2013). The impairment in quality of life as expressed by the lower mental and the physical summary measures of the SF-12 are comparable with the known literature (Culley *et al.*, 2013a, De Graaff *et al.*, 2013). Women with endometriosis reported significantly more pain catastrophizing than the control group. As far as we know, this has not been investigated before in women with endometriosis but similar results were found in a smaller study of chronic pelvic pain patients (including endometriosis) and controls (Alappattu *et al.*, 2015). Women with endometriosis showed significantly more depression and anxiety symptoms than the control group, based on the HADS. The few other studies that compared the occurrence of depression and depression symptoms between women with endometriosis and a control group found similar results (Sepulcri and do Amaral, 2009; Chen *et al.*, 2015; ). Women with endometriosis scored comparable with the control group on sexual embarrassment and

sexual self-focus, the two subscales of the SSCS. These results suggest that attentional capacity, required for the processing of erotic stimulation, is not disturbed by having endometriosis or endometriosis-related symptoms.

For this study a control group of women who visited the outpatient department for contraception was included. The advantage of this control group is that these women are of fertile age; sexually active with a male partner; their medical history is known and they can be recruited personally which makes self-selection bias on the basis of disturbed sexual history less likely. A possible disadvantage is that these women are (presumably) fertile and desiring to avoid conception, which could lead to a different sexual behaviour. In the control group the percentage of women classified with sexual dysfunction was 18%, which is comparable with other studies among Dutch women in the fertile age period (17–27%, based on the DSM-IV criteria) (Kedde and de Haas, 2006; Kedde, 2012) and indicates the adequacy of our control group as a reference group. Including a control group that did not undergo a laparoscopy to exclude endometriosis, it has to be acknowledged that in this control group 1%–7% of the women presumably had undiagnosed endometriosis (Eskenazi and Warner, 1997). However, these women do not belong to the target population (women with symptomatic endometriosis), and therefore do not constitute a threat to internal or external validity. In addition, differences found between women with endometriosis and a comparison group potentially including undiagnosed asymptomatic endometriosis are supposed to be smaller than differences between women with endometriosis and a comparison group without undiagnosed asymptomatic endometriosis, making this a defensible, conservative approach.

### Sexual functioning compared between male partners of women with endometriosis and male partners of the control group

The current study revealed that male partners of women with endometriosis reported comparable sexual functioning as the male partners of the control group for all domains of the IIEF. The domains of the IIEF cover both the personal contribution of the male to their sexual functioning and the interaction aspects in the sexual relationship. This could be an important message and a reassuring thought to women with endometriosis, especially because half of the women with endometriosis reported to be afraid to lose their partner because of the disturbed sexual functioning due to endometriosis. However, the conclusion that endometriosis does not affect the sexual experience of the male partner should be drawn with caution, because our study also revealed that partners of women with endometriosis reported more often to adjust the frequency of sexual intercourse than the control group partners. Furthermore, qualitative studies indicated that partners also suffer from the burden of endometriosis (Fernandez *et al.*, 2006; Culley *et al.*, 2013b). An explanation could be found in the argument that the negative consequences of endometriosis may have more subtle effects than are caught by the IIEF. In addition, it has to be recognized that a relationship is not based on sexual functioning alone. Endometriosis can affect a relationship in more ways than merely through the resulting dyspareunia and other aspects of sexual functioning (Denny and Mann, 2007; Culley *et al.*, 2013b).

## Predictors for sexual functioning and quality of life

Based on the logistic regression analysis, the impaired sexual functioning in women with endometriosis was not explained by having endometriosis itself, but by two endometriosis-related symptoms: dyspareunia and depression. The association between dyspareunia and impaired sexual functioning was to be expected because this was also demonstrated earlier (Fourquet et al., 2010; Fritzer et al., 2013). The co-occurrence of increased depression symptoms and lower sexual functioning was described by Van den Broeck and co-workers and Vercellini and co-workers but how these factors relate to each other has not been investigated in earlier studies on endometriosis patients (Van den Broeck et al., 2013; Vercellini et al., 2013). Studies in other patient populations (patients with cervical cancer and patients with diminished interstitial cystitis/painful bladder) did not always show an association between depression and sexual functioning (Bae and Park, 2015; Tripp et al., 2009).

The regression analysis performed to identify predictors for quality of life showed that having endometriosis as such was not a predictor for quality of life, but chronic pelvic pain and depression were the significant and independent predictors. The association between chronic pelvic pain and quality of life was also shown in a cohort of 931 women with endometriosis (de Graaff et al., 2013). The association between depression and quality of life was not described earlier in women with endometriosis. In earlier research the mere co-occurrence of depression and low quality of life was demonstrated in women with endometriosis (Sepulcri and do Amaral, 2009; Vercellini et al., 2013). In patients with other uro-gynaecologic diseases, however, no association was found between depression and quality of life outcomes (Tripp et al., 2009; Bae and Park, 2015).

Sexual functioning was, with a *P*-value of 0.075, not found to be an independent significant risk factor for quality of life. However, the conclusion that sexual functioning has no relevance for quality of life would be an overstatement against the background of earlier studies that showed otherwise. In a survey among 2753 women with symptomatic endometriosis, 50% of the respondents reported that the single largest impact on their quality of life was impaired sexual functioning (Bernuit et al., 2011). In another study of women with cervical cancer a strong association between sexual functioning and quality of life was found (Bae and Park, 2015).

In the current study, no association was found between pain catastrophizing and sexual functioning or quality of life. This is comparable with the results of another study in a small group of pelvic pain patients (Alappattu et al., 2015). However, the role of catastrophizing thoughts in the experience of pain symptoms and its consequences on sexual functioning and quality of life is complex. There is an ongoing debate on whether pain catastrophizing is a cause or an effect of chronic pain. Earlier studies showed a strong association between pain catastrophizing and reported pain levels in a group of 115 women with endometriosis (Martin et al., 2011) and an association between pain catastrophizing and the emotional experience of pain in 79 endometriosis patients (Carey et al., 2014). Furthermore, the role of pain symptoms in the development of depressive symptoms remain unclear, while studies performed in endometriosis patients with and without pain showed contradicting results (Lorençatto et al., 2006; Eriksen et al., 2008; Carey et al., 2014).

## Limitations

Some limitations of the present study should be taken into account. A cross-sectional design was used, which does not permit analysis of any causal inference. Longitudinal studies would allow the confirmation of some causal assumptions derived from the described associations.

Studies investigating quality of life outcomes should preferably recruit participants who are living in a specific geographic area rather than women that visit a specific hospital in order to create the most representative sample (de Graaff et al., 2015). In this study, the majority of the participants were enrolled in a tertiary care centre. This has led to an over-presentation of women needing tertiary care, and therefore this could also have led to an over-presentation of their symptoms. Furthermore, it has to be acknowledged that the participating women all had a partner, which means that they are in fact 'survivors' in relationship terms. This could lead to underestimation of the impact of endometriosis on sexual functioning, because in earlier studies relationship break-up due to endometriosis was reported by 8–10% of the women (Fagervold et al., 2009; De Graaff et al., 2013). Women in the control group also had a partner. However reasons for relationship break-up in general are presumably not strongly related to physical health.

The required sample size was not met. However, the effect of not meeting the sample size is expected to be small because differences on the outcomes were mostly either considerably large or very small.

## Clinical implications and future directions

Our results indicate that in women with endometriosis, dyspareunia and depression are significantly correlated with sexual functioning, while pain catastrophizing and sexual self-consciousness are not. Translating this knowledge to clinical care indicates that reducing pain symptoms, especially dyspareunia, with hormonal or surgical treatment remains one of the cornerstones in the management of endometriosis. Moreover, Van den Broeck and co-workers and Vercellini and co-workers showed that when endometriosis patients were treated (hormonal treatment or surgery), the patients reported positive effects on sexual functioning, depression symptoms and quality of life simultaneously (Van den Broeck et al., 2013; Vercellini et al., 2013).

In addition to the symptom-focused treatment, it is important to investigate what the effect is of depression-focused therapy on sexual functioning and quality of life, especially because depression was found to be associated with both sexual functioning and quality of life. In other studies regarding dyspareunia (vulvar vestibulitis) it has been demonstrated that reduction of pain does often solve only part of the sexual problem (Bergeron et al., 2001; Goldfinger et al., 2009).

Pain catastrophizing was not a significant factor influencing sexual functioning or quality of life. Therefore, based on the findings in this study, focusing on the reduction of catastrophizing of pain seems not to be the first step in psychological management. However, given the fact that catastrophizing of pain is believed to play a role in the development of chronic pain syndromes, it would be worthwhile to further investigate its role in women with endometriosis.

In earlier qualitative studies women with endometriosis reported to conceal their own feelings regarding general distress and dyspareunia (Culley et al., 2013b). Furthermore, lower sexual functioning was



associated with greater feelings of guilt towards the partner (Fritzer *et al.*, 2013). The fear of the woman with endometriosis that she might lose her partner because of the effects of endometriosis on their sexual functioning as a couple should be addressed in the consulting room. The finding in the current study that partners did not report impaired sexual functioning could be reassuring and could strengthen their faith in preserving the relationship. However, more research is needed to further explore partners experience of the effect of endometriosis on their overall and sexual relationship.

## Supplementary data

Supplementary data are available at <http://humrep.oxfordjournals.org/>.

## Authors' roles

Concept and design: AG, JL, LS, GD. Acquisition of data: AG, JB, GD. Analysis and interpretation of data: AG, JL, LS, GD. Manuscript drafting: AG, JL, LS, GD. Critical discussion: AG, JL, LS, JB, GD. Final approval: AG, JL, LS, JB, GD.

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## Conflict of interest

None declared.

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