UNIVERSITY OF BERGAMO

School of Doctoral Studies

Doctoral Degree in “Human Capital Formation and Labour Relations”
Curriculum: Clinical Psychology
SSD: M-PSI/08; 11/E4 - Psicologia clinica e dinamica
XXXI Cycle

Behind common symptoms and psychosocial implications of endometriosis: the role of cognitive and personality factors

Advisor:
Chiar.mo Prof. Angelo Compare

Doctoral Thesis
Cristina ZARBO
Student ID: 1002259

ACADEMIC YEAR 2017 / 2018

Index

Abstract

Endometriosis is known to be associated with severe painful symptomatology, infertility, low quality of life and high psychological distress. The aim of this doctoral thesis was to explore the role of cognitive and personality factors (e.g. coping strategies, metacognitive beliefs, worry and perfectionistic traits) on pain perception, quality of life and mental health in women with a diagnosis of endometriosis. Three scientific studies about these topics were introduced after an initial general introduction.

In general, studies included in this dissertation found that: a) Pain plays an important role in affecting different domains of quality of life and mental health in women with endometriosis; b) Negative metacognitive beliefs have a negative impact on sexual distress, over and above dyspareunia or general chronic pain, both cross-sectionally and longitudinally (i.e. after three months); c) Women with high-pain endometriosis show higher levels of worry personality traits than women with low-pain endometriosis, and higher catastrophization as coping strategy than healthy women without endometriosis; d) High perfectionistic personality traits and importance given to parenthood are associated with low quality of life specifically related to infertility problems.

Findings of these studies suggested that cognitive and personality factors play a key role in the understanding of pain-symptomatology, quality of life and mental health of women with endometriosis. These results may provide important clinical suggestions for multidisciplinary management of this population.

Preface

Endometriosis has been widely investigated in recent years from both medical and psychological point of views. Literature is full of studies about the adverse impact of the disorder on quality of life and mental health. However, it emerges the need to explore psychological/cognitive mechanisms which underlie common symptoms of endometriosis and their impact on women's lives. In this context, it might be central to study individual differences in facing with the disorder. Indeed, the negative impact of endometriosis and its symptomatology could be significantly related to cognitive and personality factors (e.g. coping strategies, metacognitive beliefs, worry or perfectionistic traits).

Basing on this premise, research projects discussed in this dissertation have been developed. Studies included grew from the collaboration between University of Bergamo (research group of Prof. Compare) and both the Department of Psychiatry (Dott. Rabboni) and Gynecology and Obstetrics (Dott. Frigerio) of Hospital Papa Giovanni XXIII of Bergamo.

The research lasted about two years, from December 2016 to June 2018. Ethic commitment of the Hospital approved the protocol. During these years, I dealt with the development of study protocol, data collection, data analysis and writing scientific articles.

This doctoral thesis included three scientific studies: (1) the first one is a cross-sectional study *(*under review in a peer-reviewed journal) regarding how negative metacognitive beliefs impact on sexual distress, over and above pain during sexual intercourse (i.e. dyspareunia) and general chronic pain in women with endometriosis; (2) the second one is a case-control longitudinal study (under review in a peer-reviewed journal) focused on the role of pain in impacting on quality of life and mental health as well as on the role of worry personality traits, coping strategies and metacognitive beliefs in differentiating perceived pain severity, quality of life and mental health in endometriosis population; (3) the third and last study has been recently published in "*Sexual and Reproductive Healthcare*". It focuses on the relationship between perfectionistic personality traits and beliefs about the importance given to parenthood with the quality of life specifically related to infertility problems in a sample of women with and without endometriosis.

Introduction

1. Endometriosis: a general medical introduction to the disorder

Worldwide, 176 million women suffer from endometriosis (Zondervan et al., 2018; in press). Endometriosis is a gynecological chronic condition, defined as the presence of endometrial-like tissue outside the uterus, which induces an inflammatory reaction and frequently leads to painful symptoms and/or infertility (Dunselman et al., 2014; Kennedy et al., 2005)

Socioeconomic impact of the disorder is high (Dunselman et al., 2014). In Europe, it has been estimated an annual expenditure of about €30 billion for work leave linked to endometriosis. Moreover, the individual economic costs for the patient and for the National Health Service for diagnostic tests, chronic pharmacological therapies, hospital admissions, surgical treatments, treatment of complications/recurrences, are significantly high. In Italy, hospital admissions for endometriosis cost about €54 billion (Senato della Repubblica, 2006). These costs should be added to those related to medically assisted procreation treatments that have endometriosis as indication.

Due to these reasons, there is a significant need to optimize the management of women with endometriosis to improve diagnosis, care and reduce both the personal and societal costs. Recently, in Italy, endometriosis has been recognized as a disabling disease that needs particular attention and cure. Indeed, endometriosis has been included in the list of chronic and disabling diseases of the essential levels of assistance (known with the abbreviation of "LEA"). Indeed, women with advanced clinical stages ("moderate or III degrees" and "severe or IV degree") have the right to take advantage of certain specialized control services.

Due to severe symptomatology and high negative impact on women’s lives, the disorder has deserved the attention of a range of medical and psychological researchers and political focus in the last years. In the following paragraphs, medical aspects of endometriosis will be discussed.

1.1. Epidemiology, etiology and risk factors

Endometriosis affects almost 2 to 10% of the general female population and up to 50% of infertile women (Dunselman et al., 2014; Vigano, Parazzini, Somigliana, & Vercellini, 2004). In Europe, one woman every ten has a diagnosis of endometriosis (Senato della Repubblica, 2006). Its incidence is rare before the menarche and tends to decrease after the menopause (Vigano et al., 2004). Etiology of the disorder and risk factors are still unclear.

In recent years, researchers have advanced a wide range of hypothesis about the etiology of endometriosis. Among them, the menstrual reflux hypothesis (or retrograde menstruation) is predominant. According to this theory, endometriosis could be caused by menstrual blood containing endometrial cells that flow back through the fallopian tubes and into the pelvic cavity, instead of out of the body (Vigano et al., 2004).

Furthermore, different researches have been conducted in order to establish risk factors at the bottom of the development of this disorder. According to the European Society of Human Reproduction and Embryology (ESHRE) guidelines (2014), main risk factors for the development of endometriosis are abdominopelvic pain, dysmenorrhea, heavy menstrual bleeding, infertility, dyspareunia, post-coital bleeding, previous diagnosis of ovarian cyst, irritable bowel syndrome, and pelvic inflammatory disease. In addition, the probability of developing endometriosis increases if the woman reports multiple symptoms (Dunselman et al., 2014).

Furthermore, previous studies suggested that other risk factors may include high social class, familiarity for endometriosis, being nulliparous, having had early menarche with short and heavy menstrual cycles, alcohol use and cigarette smoking (Missmer et al., 2004; Vigano et al., 2004). However, it should be highlighted that the relationship between unhealthy lifestyle (e.g. coffee assumption, smoking, alcohol abuse, rich diet) and endometriosis onset is controversial and needs further investigation (Vigano et al., 2004). A recent review has concluded that epidemiological data concerning the association between diet and endometriosis are growing but they are still limited and inconsistent (Soave et al., 2018).

1.2. Diagnosis

Given an established diagnosis of endometriosis is difficult. In 88% of cases, endometriosis affects ovaries, while less frequently it might damage the peritoneal surface, uterine ligaments, fallopian tubes, rectum, tissues around the uterus and ovaries, vagina, cervix, vulva, bowel, and bladder. Rarely, it affects other parts of the body, such as lungs, brain, and skin.

Endometriosis can be histologically categorized into three main classes which represent its main clinical manifestations: peritoneal, ovarian cysts and deeply infiltrating endometriosis (DIE). Peritoneal Endometriosis, also known as “superficial endometriosis”, includes small lesions that usually regress with medical treatment, but frequently reappears after its cessation and the reoccurrence of the menstrual cycle (Brosens, Puttemans, Campo, & Gordts, 2004). Ovarian Endometriosis leads to lesions on the ovaries, which if damaged can cause acute abdominal emergency requiring surgery. DIE is considered the most aggressive form of endometriosis, characterized by an infiltration of more than 5 mm and lesions in rectovaginal septum, uterosacral and utero-ovarian ligaments, and muscular wall of pelvic organs.

Due to both individual and medical issues, women with endometriosis frequently complain of significant delays from the onset of symptoms to diagnosis (Culley, Law, et al., 2013). In particular, a diagnostic delay of 10.4 years has been estimated in Germany and Austria, 8 years in Spain and the United Kingdom (UK), 7-10 in Italy and 4-5 in Ireland and Belgium (Dunselman et al., 2014). Individual issues related to the delay of diagnosis of endometriosis refers to the time spent from the onset of symptoms and seeking medical help. The gap seems to be due to: a) the difficulty in distinguishing from normal and pathological symptoms; b) the individual and medical/society normalization of menstrual irregularities and pain; c) the use of contraceptives, which causes hormonal suppression of symptoms and leads to delay in the onset of symptomatology (Culley, Law, et al., 2013; Dunselman et al., 2014). At medical level, misdiagnosis of endometriosis is common. Indeed, there is still a lack of knowledge about the pathology and its manifestations also among medical specialists and general medical practitioners (Culley, Law, et al., 2013). Indeed, frequently, women with endometriosis are referred to inappropriate secondary care or the disease is mistaken for other medical conditions, such as pelvic inflammatory disease (PID), ovarian cysts, or irritable bowel syndrome (IBS) (Culley, Law, et al., 2013). As consequence, women have to “battle” for an accurate diagnosis and have limited faith in health professionals (Grogan, Turley, & Cole, 2018; in press).

According to the ESHRE guidelines (2014), gynecologists should reduce misdiagnosis basing on the history, symptoms, and signs reported by women as well as on physical examination and imaging techniques. However, the diagnosis is proven only by histology of a directly biopsied vaginal lesion, from a scar, or of tissue collected during laparoscopy.

a. Symptoms and signs

According to The National Institute for Health and Care Excellence (NICE) guidelines (2017), suspicion of endometriosis should be advanced when the woman complains about one or more of the following symptoms and signs:

- Chronic pelvic pain
- Dysmenorrhoea affecting daily activities and quality of life
- Deep pain during or after sexual intercourse
- Period-related or cyclical gastrointestinal symptoms (e.g. painful bowel movements)
- Period-related or cyclical urinary symptoms (e.g. blood in the urine or pain passing urine)
- Infertility

Reporting multiple symptoms increases the chance of a diagnosis of endometriosis. However, evidence about symptoms that would indicate a specific diagnosis of endometriosis is still weak and incomplete (Dunselman et al., 2014).

b. Clinical examination and imaging techniques

According to ESHRE guidelines (2014), the choice of recurring at clinical examination for the diagnosis of endometriosis should be carried out in relation to the weight of benefits versus the burden for the woman. Clinical examination includes inspection of the vagina using a speculum, a bimanual and rectovaginal palpation, and the inspection and palpation of the abdomen. It is a useful and inexpensive technique for a faster diagnosis, but sometimes it could be related to burden for patients (e.g. cases of painful examination, history of sexual abuse, age-related issues). In case of burden for the woman, the gynecologist should recur to other medical technologies.

In some cases, the clinical examination could join to the use of transvaginal sonography (TVS), rectal endoscopic sonography (RES), magnetic resonance imaging (MRI), and serum CA-125 (Dunselman et al., 2014). However, it should be highlighted that some of them are expensive and others (i.e. serum CA-125 measurement) have limited potential for the diagnosis of endometriosis. Currently, there are no immunological biomarkers that can diagnose endometriosis in a non-invasive way.

c. Diagnostic laparoscopy

The diagnosis of endometriosis is proven only by histology during a laparoscopy, which is a surgical exam that, through the introduction of an optical probe in a small incision near the navel, allows the vision of the abdominal cavity without opening the abdomen. Diagnostic laparoscopy usually lasts half an hour, under general anaesthesia, and is performed in day-hospital.

According to the Revised American Society for Reproductive Medicine (ASRM) classification system (1997), during laparoscopy, surgeons might stage the disease on the basis of points assigned to the different locations of the disease. Endometriosis could be classified depending on the number, size and superficial and/or deep location of endometrial implants, plaques, endometriomas and/or adhesions, into the following stages: stage I (minimal, 1- 5 points), stage II (mild, 6 - 15 points), stage III (moderate, 16 - 40 points) and stage IV (severe > 40 points).

Despite its accuracy, diagnostic laparoscopy should be considered as a secondary technique for having a diagnosis. ESHRE guidelines (2014) suggest that in women with symptoms and signs of endometriosis, medical treatment before embarking on an invasive procedure like a laparoscopy should be preferred. Indeed, according to them, diagnostic laparoscopy should be considered in the following conditions: woman’s wish to have a definitive diagnosis, infertility, symptoms and signs of advanced disease (i.e. ovarian endometrioma and deep infiltrating disease).

1.3. Symptomatology

Pain is the major concern of women with a diagnosis of endometriosis. Pain could be defined as ‘an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage’ (Loeser & Treede, 2008). Pain is a very complex, subjective experience, difficult to identify.

As regard endometriosis, mechanisms that underlie pain are still poorly understood. A recent study (Coxon, Horne, & Vincent, 2018; in press) has suggested that changes in both peripheral and central nervous system might be involved. In particular, endometriosis-associated pain may include “reduced innervation of the sympathetic nervous system, increased sensory innervation and changes in the inflammatory markers in the peritoneal fluid”. Furthermore, fluctuations in central nervous systems might include “changes in the activity and connectivity of different brain areas, altered brain area volumes” as well as “dysfunction of the Hypothalamic-Pituitary-Adrenal axis (HPA) and altered psychology” (Coxon et al., 2018; in press). Moreover, it should be highlighted that both mood and stress may influence the HPA axis, affecting in turn pain perception. Indeed, complex factors such as emotions, cognition and previous experiences together may contribute to the variation and modulation of the pain experience (Melzack & Katz, 2013).

In addition, the relationship between pain and the extent/location/type of endometriosis is complex (Coxon et al., 2018; in press). Due to different localizations of the endometriotic lesions, patients may suffer from visceral and somatic pain or both at the same time (Chiantera, Abesadze, & Mechsner, 2017; Dunselman et al., 2014). However, the severity of the pain seems to be not related to the severity of the disorder (Olive & Pritts, 2001).

The leading symptoms of endometriosis (i.e. chronic pelvic pain, dysmenorrhea, dyspareunia, intestinal complaints, fatigue/weariness, and infertility) will be discussed in the following sections.

a. Chronic pelvic pain

Pelvic pain in women with endometriosis usually begins one or two days before expected menstruation, may be unilateral or bilateral, and lasts until the end of menstruation. Nevertheless, in some cases, pelvic pain could be constant, become chronic and interfere with daily life. Chronic pelvic pain (CPP) refers to not-menstrual pain localized in the pelvic region lasting six or more months (Butrick, 2007). CPP is complained by 1/3 of women who underwent laparoscopy for endometriosis (Butrick, 2007). In a large international cross-sectional survey, CPP has been reported by 60% of women with endometriosis (De Graaff et al., 2013).

b. Dysmenorrhea

Dysmenorrhea is complained by 59% of women with endometriosis (De Graaff et al., 2013). It refers to painful symptoms associated with menstruation, such as abdominal pain which usually interfere with daily activities, and commonly related to nausea, vomiting, lumbago, diarrhea, and headache (Harada, 2013). Primary dysmenorrhea refers to menstrual pain without underlying pathology, whereas secondary dysmenorrhea denotes menstrual pain associated with underlying pathology (e.g. endometriosis).

c. Dyspareunia

Dyspareunia refers to pain during/after intercourse. It is a frequent and serious symptom reported by women with a diagnosis of endometriosis and frequently the main reason for surgery. It might be classified into two types: superficial (pain in and around the vaginal introitus) and deep (pain with deep penetration) dyspareunia (Fritzer et al., 2013). Different studies have reported different occurrences of the symptomatology. Fritzer et al. (2014) have found a prevalence between 53-90%, while De Graaff et al. (2013) found that dyspareunia is complained by 56% of women with endometriosis.

Dyspareunia is a heterogeneous symptom, usually caused by pelvic adhesions, pelvic inflammatory disease or interstitial cystitis. In case of endometriosis, pain during/after intercourse is most severe before menstruation, and intensity corresponds with the depth of infiltration (Fritzer et al., 2014). The frequency of dyspareunia increases when endometriotic implants are located on the uterosacral ligaments (Dubernard et al., 2006). However, the prevalence of dyspareunia varies between studies because of differences in the definition of the symptom and heterogeneity of population with endometriosis (Ferrero et al., 2005; Ferrero, Ragni, & Remorgida, 2008; Fritzer et al., 2014).

d. Infertility

About 50% of women with fertility problems have received a diagnosis of endometriosis (Practice Committee of the American Society for Reproductive, 2012). Mechanisms through which the disorder affects fertility are still not fully understood (Macer & Taylor, 2012).

Endometriosis can affect fertility at different stages (from the conception to the childbirth). Patients with severe endometriosis are at significant risk for ovarian tissue damage, which may lead to infertility, reduced response to ovarian stimulation, and rarely, premature ovarian failure. Moreover, repeated surgical interventions and the presence of bilateral endometriomas are risk factors for compromised ovarian reserve in young patients (Carrillo, Seidman, Cittadini, & Meirow, 2016).

Furthermore, endometriosis can affect gametes and embryos, the fallopian tubes and embryo transport (Macer & Taylor, 2012). Indeed, women with endometriosis have higher incidences of preterm delivery, pre-eclampsia, antepartum bleeding/placental complications, and cesarean section when compared to women without endometriosis (Practice Committee of the American Society for Reproductive, 2012). In this regard, a recent systematic review and meta-analysis have found that women with endometriosis or adenomyosis have a higher odds of preterm delivery and to have a child small for gestational age compared to women without endometriosis or adenomyosis (Bruun, Arendt, Forman, & Ramlau-Hansen, 2018).

e. Other symptoms

Basing on the localization of the disorder, women with endometriosis could complain about pain during evacuation (i.e. dyschesia) or urination (dysuria) or fatigue, diarrhea, constipation, bloating or nausea, especially during menstrual periods.

1.4. Comorbidity and risk for medical complications

In some cases, endometriosis is accompanied by other chronic medical conditions or risk of developing them. Indeed, patients with endometriosis are at risk of developing additional medical conditions such as allergies, fibromyalgia, asthma, eczema, autoimmune inflammatory disease, chronic fatigue syndrome and hypothyroidism (Murphy, 2002; Sinaii, Cleary, Ballweg, Nieman, & Stratton, 2002). In particular, women with endometriosis are likely to receive a diagnosis of irritable bowel syndrome (Ballard, Seaman, De Vries, & Wright, 2008).

Moreover, the diagnosis of endometriosis could be related to a higher risk for developing a gynecological or breast cancer. A systematic review of Zafrakas, Grimbizis, Timologou, and Tarlatzis (2014) concluded that the association of endometriosis with clear-cell and endometrioid ovarian cancer is a consistent finding in most studies. Moreover, the systematic review of Sayasneh, Tsivos, and Crawford (2011) found that the majority of studies included have shown an increased risk of ovarian cancer in patients with endometriosis. However, the effect size was modest (ranging between 1.32 and 1.9) and a cause-effect connection between the two occurrences cannot be confirmed. Finally, women with endometriosis could be at risk of developing also a breast cancer, in particular in patients after age 40, because of their increased exposure to elevated endogenous estrogen (Bertelsen et al., 2007).

2. Living with endometriosis: psychological and cognitive implications

Due to severe symptomatology and complexity of the disorder, the lives of these patients are often drastically impaired. Living with endometriosis is particularly heavy and is frequently accompanied by overall low quality of life and reduced mental health (in particular, high prevalence of depressive and anxious symptomatology). In particular, chronic pelvic pain and infertility frequently cause psychosocial burden in these population (Gao et al., 2006).

Endometriosis can be both physically and emotionally debilitating. It affects a range of fields of women's lives, from everyday activities to future perspective and opportunities (Chaman-Ara, Bahrami, Moosazadeh, & Bahrami, 2017). Physically, pain symptomatology can lead to an impairment of work-related and daily activities, social and sexual relationships and education (Dunselman et al., 2014). Psychologically, endometriosis can lead to depression, anxiety, psychosocial stress, and feelings of uncertainty, which in turn can interfere with a woman's perceived sense of control, handling of adverse situations, and resourcefulness (Gao et al., 2006; Pope, Sharma, Sharma, & Mazmanian, 2015). Most women experience feeling upset, angry, depressed, uncertain, weak, powerless, helpless, hopeless, defeated, disappointed, frustrated, exhausted, and feel like a burden to others (Moradi, Parker, Sneddon, Lopez, & Ellwood, 2014). In addition, endometriosis histories are characterized by strong experiences of disruption that involved ruptures in multiple domains of lives, including also the sense of identity (Facchin, Saita, Barbara, Dridi, & Vercellini, 2018).

Pain is one of the major stressors for a woman with endometriosis. However, the relationship between pain and quality of life/psychological distress is still poorly understood. Some studies (e.g. Giuliani et al., 2016) did not found correlations between pain intensity and quality of life domains, while other authors (e.g. Souza et al., 2011) have suggested that it's the pain itself (and not the presence of endometriosis) that has a negative effect on quality of life. Indeed, according to Souza et al. (2011), having endometriosis in addition to chronic pelvic pain does not lead to an additional impact on quality of life. Furthermore, interestingly, psychosocial/cognitive factors and pain symptomatology seem to be related by a bidirectional relationship. Indeed, pain experience, pain-related distress, and treatment outcome may be modulated by psychological and cognitive aspects (Aerts et al., 2018) and high levels of emotional distress may intensify the severity of pain perceived (Lagana et al., 2017). For example, impaired mental health or cognitive maladaptive coping strategies (e.g. catastrophization) can increase the perception of the severity of pain (Lagana et al., 2017; Zarbo et al., 2017).

In this context, individual differences in mental health, quality of life and pain perception severity may be related to specific personality traits, beliefs, and coping strategies. In the following sections, these matters will be discussed in detail.

2.1. Quality of life and life functioning

Living with endometriosis may be characterized by physical limitations that can affect a range of women's life domains (Bernuit et al., 2011; Chaman-Ara et al., 2017; Di Donato et al., 2013; Jia, Leng, Shi, Sun, & Lang, 2012). Impairment in quality of life includes burden in physical, psychological and social relationships domains (Giuliani et al., 2016; Sepulcri & Do Amaral, 2009). Evidence emerged from a large international study (De Graaff et al., 2013) evidenced that effect of endometriosis on quality of life seems to be large for general health, social functioning and mental role limitation; moderate for physical role limitation and pain; and small for physical functioning, vitality, and mental health. The burden on quality of life is so severe that some women declare that they are experiencing a state of health 'worse than death' (Simoens et al., 2012).

Literature about this issue has shown that women with endometriosis when compared to control group (i.e. norms, healthy women, general population) have lower quality of life (De Graaff et al., 2013; Giuliani et al., 2016; Lagana et al., 2015; Sepulcri & Do Amaral, 2009; Verket et al., 2018; in press). However, one should underline that quality of life in this population seems to be strictly related to education, surgery, number of co-morbidities, chronic pain and intensity of pain, dyspareunia, and duration of treatment (De Graaff et al., 2013; Di Donato et al., 2013; Jia et al., 2012; Sepulcri & Do Amaral, 2009; Stull et al., 2014). For example, better quality of life seems to be significantly associated with postsecondary education, while worse quality of life is related to a history of previous surgery (Di Donato et al., 2013).

a. Everyday life

Women with endometriosis usually report that the disease and symptomatology have a significant impact on everyday life (Moradi et al., 2014). Limitations in everyday activities – usually due to pain, fatigue and limited energy - include walking, exercise, childcare, sleeping, cooking, shopping, cleaning, and gardening (Bernuit et al., 2011; Culley, Law, et al., 2013; Fourquet et al., 2010; Jones, Jenkinson, & Kennedy, 2004; Moradi et al., 2014). In particular, between 23% to 71% of women with endometriosis usually complain about household and housekeeping activities impairment (Bernuit et al., 2011; Fourquet et al., 2010).

Fatigue seems to be one of the main complaints of women with endometriosis. A recent study of Ramin-Wright et al. (2018) on a large sample, found that recurrent fatigue is experienced by a majority of women diagnosed with endometriosis and that it was associated with a range of psychological and medical disturbances (i.e. insomnia, depression, pain, and occupational stress). From the study emerged that fatigue is independent of age, time since first diagnosis and stage of the disease (Ramin-Wright et al., 2018).

b. Social and relational life

Social and relational functioning is often highly impaired by endometriosis (Culley, Law, et al., 2013; De Graaff et al., 2013; Moradi et al., 2014; Young, Fisher, & Kirkman, 2015). Indeed, negative impact on social lives has been found in 19-48% of women with endometriosis (Bernuit et al., 2011; Fagervold, Jenssen, Hummelshoj, & Moen, 2009; Fourquet et al., 2010). Moreover, when compared with a control group, women with endometriosis usually show lower social functioning (Petrelluzzi, Garcia, Petta, Grassi-Kassisse, & Spadari-Bratfisch, 2008).

Different theories have been advanced concerning social functioning impairment in women with endometriosis. The predominant theory about these limitations suggested that reduction of social activities could be due to pain, fatigue, need for toilet access, worry about unexpected onset of pain, and reduced confidence with others (due to worry). These conditions could lead to negative feelings (e.g. depression, anger) and reduce social participation and relational life (Gilmour, Huntington, & Wilson, 2008; Jones et al., 2004; Young et al., 2015).

Evidence has shown that women with endometriosis frequently report feelings of isolation and misunderstanding (Ferrero et al., 2005; Grogan et al., 2018; in press) and, due to severe symptoms, the need to stay home and miss social events (Moradi et al., 2014). Some women believe that pain, stress, anger and mood swings caused by endometriosis can seriously affect relationships with others. Indeed, they are prone to distance themselves from any social or familiar contact because they feel different or jealous. Moreover, some of them reported that they have negative relationships in the workplace because of impacts of the disorder on their mood (Ferrero et al., 2005). Furthermore, social isolation and feelings of loneliness are usually increased by the fact that they are usually reluctant to discuss their experiences with others as they feel their complaints are not always believed (Aerts et al., 2018; Cox, Henderson, Wood, & Cagliarini, 2003; Whelan, 2007).

Moreover, many of them declare that endometriosis affects their actual or potential intimate relationships (De Graaff et al., 2013; Facchin et al., 2018). Indeed, a range of intimate relationships has been interrupted due to endometriosis and/or negative feelings toward partners, such as anger, sense of guilt, and shame (Facchin et al., 2018). The relational burden is so high that some of them consider the disorder as the cause of their divorce (De Graaff et al., 2013).

c. Employment and education

Impact of endometriosis on work and education domains is severe and has been documented in a range of studies (Culley, Law, et al., 2013; De Graaff et al., 2013; Fourquet et al., 2010; Moradi et al., 2014; Young et al., 2015).

Concerning work, women with endometriosis report reduction in quality of work, fewer life opportunities and employment, frequent sick days and inability to fulfill job requirements (Fourquet et al., 2010; Moradi et al., 2014; Young et al., 2015). Living with endometriosis obligate them to take time off work, choose part-time work, made them less productive, and lost the chance of promotion (Moradi et al., 2014). Indeed, studies have found an average of 13% loss of work time and 19.3 days of work missed per year due to endometriosis (Fourquet et al., 2010). Similarly, a multicentre study across ten countries found that women with endometriosis loss an average of 10.8 hour weekly due to a reduction in effectiveness at work (Nnoaham et al., 2011). In Italy, loss of work productivity leads to a spending of US$456 per woman/week (Nnoaham et al., 2011). However, it should be highlighted that poor performance at work is strictly related (i.e. predicted) to pain and depression (Fourquet et al., 2010).

Similar findings have been reported about education. Indeed, women with endometriosis declare that the disorder affected study activity and grades, forcing sometimes them to leave education before conclusion (Gilmour et al., 2008; Huntington & Gilmour, 2005). In the qualitative study of Moradi et al. (2014), a large part of women described that the disorder and related-symptomatology caused taking time off school, difficulty in focusing, and loss of productivity in schoolwork. Moreover, some women were forced to schedule their surgery during school holidays and some of them have chosen to study by correspondence.

d. Financial impact

Endometriosis is frequently related to a severe financial impact (Moradi et al., 2014). This impact is directly due to the cost of treatment such as medications, surgery, infertility treatment, complementary therapy (e.g. naturopathy, psychological counseling or sex therapy), and sanitary pads (Moradi et al., 2014). Moreover, the financial impact is indirectly related to loss of, or decrease in income due to working part-time, no paid sick leave and taking time off, or losing the chance of working during school holidays because of scheduled surgery (Moradi et al., 2014).

e. Future perspective and opportunities

Suffering from painful endometriosis may lead to missed opportunities in several important areas of life (Hållstam, Stålnacke, Svensén, & Löfgren, 2016). Living with endometriosis is often accompanied to feelings of hope, loss of positive perspective and opportunities and worry for the future. When thinking to future, some women hope to be pain-free, have a family and an intimate relationship, reduced disease recurrence, and an effective treatment (Moradi et al., 2014; Young et al., 2015). Major concerns are usually symptoms returning or worsening, future fertility problems, and worry about daughters which are at risk of experience the disorder (Young et al., 2015). Moreover, another negative impact on life opportunities refers to employment (e.g. giving up or not being able to be employed in the desired job, losing the chance for promotion, choosing a less stressful job) and relationships (e.g. broken relationships or engagement) (Moradi et al., 2014).

2.2. Mental Health

Endometriosis is known to severely affect the psychological health of women, leading to a series of mental issues like anxiety, stress, depression, somatization as well as impairments in wellbeing and body image/identity. In particular, depression and anxiety are the most common disorders associated with endometriosis. Nevertheless, personality seems to be implicated in the relationship between the disorder and psychological distress. Evidence about these issues will be discussed in the next sections.

a. Wellbeing

Wellbeing can be defined as “the balance point between an individual’s resource pool and the challenges faced” (Dodge, Daly, Huyton, & Sanders, 2012). Several women with a diagnosis of endometriosis show an impairment in wellbeing status (De Graaff et al., 2013; Young et al., 2015). Indeed, as consequence of endometriosis, women feel a decrease in their wellbeing, feeling “weary”, “miserable”, “angry” and “depressed” (Young et al., 2015). However, this condition is not only due to symptomatology of the disorder itself, but is strictly related to the way others (i.e. medical team, family members, partners, colleagues, and friend) related to them (i.e. labelling them “crazy” or “depressed”) (Young et al., 2015).

b. Anxiety

Anxiety, coupled with depression, is one of the main issues and one of the most reported mental disturbance in women with endometriosis (Lagana et al., 2017; Pope et al., 2015). An Italian study by Sepulcri et al. (2009) found that 87.5% of women with endometriosis presented anxiety symptomatology. Anxiety (in term of phobic anxiety, or general anxiety) -or the risk of developing it - seems to be higher in women with endometriosis than in general population (Cavaggioni et al., 2014; Chen et al., 2016; Culley, Law, et al., 2013; Lagana et al., 2015; Low, Edelmann, & Sutton, 1993). More specifically, qualitative investigations have found that main topics of worry for women with endometriosis were: heavy bleeding or unpredictable spotting, judgment of others for carrying large numbers of drugs or painkillers in bag, caring for child (or losing their child custody after a divorce), and future fertility (Moradi et al., 2014).

However, the relationship between the disorder and anxiety seems to be related to sociodemographic and clinical factors (e.g. pain and age). Indeed, women with endometriosis aged more than 40 years old have a higher risk of developing anxiety disorders (Chen et al., 2016). Moreover, pain-intensity positively correlates with anxiety levels (Sepulcri & Do Amaral, 2009). Patients with endometriosis-associated pain show greater prevalence of psychiatric disorders compared to pain-free patients, even if that difference is not statistically significant (Cavaggioni et al., 2014).

c. Depression

One of the major diagnosed mental disorder in women with a diagnosis of endometriosis is depression (Chen et al., 2016; Culley, Hudson, et al., 2013; Culley, Law, et al., 2013; Lagana et al., 2017; Low et al., 1993; Pope et al., 2015). In Italy, the prevalence of depressive symptomatology among women with endometriosis is 86.5% (in particular, mild in 22.1%, moderate in 31.7%, and severe in 32.7%) (Sepulcri & Do Amaral, 2009). Furthermore, depressive symptomatology seems to be higher in women with endometriosis than in general population (Cavaggioni et al., 2014; Lagana et al., 2015).

Endometriosis has been frequently related to emotional distress, hopelessness, isolation, worthlessness, depression and feeling suicidal (Culley, Law, et al., 2013). Most women usually report that living with chronic pain, fatigue and other physical symptoms significantly lead them to feel low, depressed, tearful and/or irritable and angry. Frustration is usually due to the fact that the disorder prevents them from having the life they wanted. Furthermore, they report feelings of guilt because of the impact on couple and sexual relationship or infertility (anticipated or actual) (Culley, Hudson, et al., 2013).

However, the prevalence of depression among this population seems to be different based on CPP and age. Indeed, a study of Lorencatto, Petta, José Navarro, Bahamondes, and Matos (2006) evidenced that depressive symptomatology is higher in women with CPP-related endometriosis (i.e.86%) than in women without CPP-related endometriosis (i.e. 38%). Indeed, it has been suggested that the responsible for depression in this population could be the experience of chronic pelvic pain, and not the disorder itself (Pope et al., 2015). Moreover, women with endometriosis aged more than 40 years seem to be more prone for developing major depression or any depressive disorder than younger (Chen et al., 2016).

d. Personality, identity and body image

Few studies have investigated personality factors related to endometriosis and the impact of the chronic disease on self-efficacy, female identity and body image.

Studies on personality traits of women with endometriosis suggested that personal disposition may affect the experience of pain (Bylinka & Oniszczenko, 2016; Facchin et al., 2016; Gomibuchi et al., 1993). For example, the study of Bylinka and Oniszczenko (2016) found a high negative correlation between the temperament trait of endurance (i.e. the ability to respond adequately, even in conditions of extreme distress) and pain intensity ratings, and a predictive role of both endurance trait and internal beliefs about control for pain intensity. Furthermore, literature found that women without dysmenorrhea seem to be less assertive compared with women who complained of dysmenorrhea and women without endometriosis (Gomibuchi et al., 1993). Similarly, women with painful endometriosis seem to have lower novelty seeking compared with the control group and higher harm avoidance and lower exploratory excitability and responsibility as personality traits compared with women with pain-free endometriosis (Facchin et al., 2016).

In addition, studies have found that endometriosis negatively affect women’s female identity, self-esteem, self-efficacy and body image (Facchin et al., 2018; Leanza,

Leanza, Nestori, & Leanza, 2015; Melis et al., 2015; Moradi et al., 2014). In particular, women with advanced endometriosis have lower level of self-efficacy than women with mild endometriosis (Leanza et al., 2015). “I am only half a woman”, “it is not me” and “I am not a woman” are expressions which denote the loss of identity common in women affected by this pathology. Furthermore, these patients usually express a negative sense of female identity and low perception of own value (Facchin et al., 2018). Some of them reports that endometriosis has interfered with their identity for several reasons such as: not being able to have sex, being infertile, not being a good mother or the mother that they wanted to be, not being able to do daily activities, and not feeling happy (Moradi et al., 2014).

In addition, a part of them usually declares of being unsatisfied with body appearance (Moradi et al., 2014). Indeed, different studies found that women with endometriosis have a negative body image because they had gained weight, have scars due to surgery, or are pale because of heavy bleeding and anemia (Facchin et al., 2018; Melis et al., 2015; Moradi et al., 2014).

e. Alexithymia

Alexithymia is the concept used to delineate the state of “no words for mood”, a condition characterized by difficulties in verbal expression of emotions and limited ability to use fantasy (Lesser, 1981). Despite its importance in the medical field and in relation to the body-mind relationship, few studies have investigated alexithymia in women with endometriosis. The study of Cavaggioni et al. (2014) found higher levels of alexithymia in women with endometriosis than in the control population. Moreover, a relationship between alexithymia and pain has been found in this population (Cavaggioni et al., 2014). These findings led researchers to suggest that the presence of high level of alexithymia may make difficult to identify other psychiatric disturbances, due to a severe difficulty in identifying and describing emotions which may be representative of this population (Lagana et al., 2017).

f. Other mental conditions

Few studies have investigated the presence of other mental conditions (e.g. personality disorders, somatization, psychoticism) in endometriosis population. From literature emerges that women with endometriosis, especially if pain-related, when compared to other groups (i.e. general population, women with other gynaecological disorders) show higher level of somatization (Lagana et al., 2015), psychoticism and introversion (Low et al., 1993), obsessive-compulsive disorder (Cavaggioni et al., 2014), and bipolar disorder (Kumar, Khan, Vilos, & Sharma, 2011). However, the study of Lagana et al. (2015) found no significant differences concerning obsessive-compulsive symptoms, hostility, paranoid ideation, psychoticism, and anger between women with endometriosis and a control group. Studies on this topic are still mixed, and conclusions cannot be reached.

2.3. Psychological and cognitive implications of pain

a. Pain experience

A large part of women with endometriosis commonly report pain symptomatology (in particular pelvic pain, dysmenorrhea, and dyspareunia) which negatively affects quality of life and mental health (Cavaggioni et al., 2014; De Graaff et al., 2013; Lagana et al., 2015; Lorencatto et al., 2006; Pope et al., 2015; Sepulcri & Do Amaral, 2009; Souza et al., 2011). Patients usually describe pain as ‘sharp’, ‘stabbing’, ‘horrendous’, ‘tearing’, ‘debilitating’ and ‘breath-catching’ (Moradi et al., 2014). Furthermore, severe pain is frequently accompanied by vomiting, nausea and heavy and/or irregular bleeding. Pain is usually as awful that is considered a way to become crazy (Facchin et al., 2018).

Nevertheless, most women commonly tend to normalize pain periods (Facchin et al., 2018). Normalization is enforced by others (i.e. doctors, and patients’ significant others) who are often unable to understand women’s complaints. Due to normalization attempts, most patients ignore pain or try to relieve it with analgesics for a long time. They usually seek help only when their sufferance is extreme and endometriosis has already caused physical damages (Facchin et al., 2018)

Moreover, it should be highlighted that the impact of pain is dynamic, and its experience differs between women. It could be reported every day, one at months or rarely, and it changes individually over time and across life stages (Culley, Hudson, et al., 2013). A retrospective study of Fagervold et al. (2009) of women diagnosed fifteen years before, investigated how pain changed over the life course. The study showed that the majority of women who had been pain-free at diagnosis experienced pain after diagnosis. Pain in the premenopausal period was experienced by about 80% of women, while in the post-menopause period only about 3% of patients reported pain (Fagervold et al., 2009).

Finally, it is important to underline that pain seems to be independent to the stage of endometriosis. Indeed, women with mild endometriosis may have intense pelvic pain, while women with more severe endometriosis may suffer less from acute/chronic pain (Lagana et al., 2017). These findings suggest that psychological or cognitive factors may be involved, influencing pain experience in this population.

b. Does pain make the difference?

The impact of pain is so severe that several authors have suggested that it could be the main cause of low quality of life and psychological distress in this population, independently to the presence of the pathology (Culley, Law, et al., 2013; Lagana et al., 2017; Pope et al., 2015; Souza et al., 2011). The study of Facchin et al. (2015) found that patients with CPP-related endometriosis, when compared to asymptomatic patients and healthy controls, had poorer quality of life and mental health. Interestingly, no significant differences in quality of life and mental health were found between pain-free women with endometriosis and control group. Similarly, Cavaggioni et al. (2014) and Lorencatto et al. (2006) found high prevalence of mental disturbances in women with CPP-related endometriosis. In particular, Cavaggioni et al. (2014) found that women with endometriosis have higher rates of mood and anxiety disorders and that the prevalence was greater in women who also experienced endometriosis-related pain, compared to pain-free women. In addition, Lorençatto et al. (2006) found correlations between pain intensity and depression, somatic awareness, and catastrophization of pain in women with CPP-related endometriosis.

c. The influence of cognitive and personality factors on pain experience

Recently, it has been advanced the hypothesis that personality, cognition, and beliefs could influence pain experience in women with endometriosis. However, the role of these factors has been few investigated and are still poorly understood.

As regards personality traits, few studies have found a role of assertiveness, harm avoidance, and novelty seeking in influencing pain experience in this population. The study of Gomibuchi et al. (1993) found that women with endometriosis and without dysmenorrhea are less assertive than women with endometriosis who complain about dysmenorrhea and women without endometriosis. In addition, Facchin et al. (2016) found that women with endometriosis and pelvic pain have lower novelty seeking as compared with healthy controls and higher harm avoidance than the pain-free endometriosis group. Therefore, women with painful endometriosis may be more prone to avoid new potentially risky situations (low novelty seeking), as well as to experience pessimistic worries, fear, and inhibition (high harm avoidance) (Facchin et al., 2016).

Furthermore, some studies found a significant role of cognitive coping strategies in affecting pain experience in women with this chronic condition. On this regard, a recent review of my research group (Zarbo et al., 2017) concluded that women with CPP-related endometriosis seem to be more likely to repress emotions that control group (i.e. healthy women). Moreover, the review highlighted that suppression of emotions, pain catastrophizing and passive coping style are related to higher self-reported pain in endometriosis population. Findings of Martin et al. (2011), Carey et al. (2014) and McPeak et al. (2018) on this topic are relevant. In particular, Martin et al. (2011) suggested that catastrophization accounted for 21% of the variance of pain at baseline and significantly predicted pain at follow-up (after 1 year). Moreover, at entry and at follow-up, pain severity was more related to catastrophizing than to conventional demographic and clinical variables (Martin et al., 2011). In addition, pain catastrophizing in women with endometriosis was related to subsequent post-surgical pain outcomes (Carey et al., 2014) and concurrent reduced health-related quality of life, independently of pain severity and other potential confounders (McPeak et al., 2018).

2.4. Sexual dysfunctions and distress

Sexuality is a complex concept influenced by both physiological and psychosocial factors, which affects not only physical health but also psychological well-being, feelings of feminity and intimate relationships. Sexual health is not the absence of sexual disease or dysfunctions but is a concept that more holistically includes physical, psychological and social well-being. Sexual health is not just about disease, but also about identity and relationships (Rohleder & Flowers, 2018).

Different studies have found a severe negative impact of endometriosis on quality of sex life (Bernuit et al., 2011; Culley, Hudson, et al., 2013; Di Donato et al., 2013; Fourquet et al., 2010; Melis et al., 2015; Moradi et al., 2014; Pluchino et al., 2016; Young et al., 2015). Indeed, women with endometriosis experience a range of dysfunctions related to sex, affecting all phases of sexual response: desire, sexual arousal, genital-pelvic pain/penetration and orgasm/sexual satisfaction (Fairbanks, Abdo, Baracat, & Podgaec, 2017). In particular, the impact on sex lives has been observed between 33.5% (Bernuit et al., 2011) and 71% (Fourquet et al., 2010) of women with a diagnosis of endometriosis. Moreover, sexual problems and concerns are higher in women with endometriosis than in other populations (e.g. healthy women) (Giuliani et al., 2016). It has been estimated that patients with endometriosis have more than twice sexual dysfunctions than women without the chronic condition (Fairbanks et al., 2017).

Furthermore, the majority of studies have found a correlation between pain (general pain or dyspareunia) and sexual dysfunctions (De Graaff, Van Lankveld, Smits, Van Beek, & Dunselman, 2016; Fourquet et al., 2010; Fritzer et al., 2013; Young et al., 2015), while few studies have found any significant relation between them (Giuliani et al., 2016).

Furthermore, it should be highlighted that a recent systematic review suggested that around two-thirds of women with endometriosis have some form of sexual dysfunctions not limited to dyspareunia (Barbara, Facchin, Buggio, et al., 2017). Indeed, despite dyspareunia is common and debilitating, other factors seem to be significant in this context. Dyspareunia is not the only determinant of sexual health in this population (Pluchino et al., 2016). Intimacy seems to be impacted by bleeding during and/or after sex, general fatigue and feeling unwell, reduced sexual desire as a result of medication, having a low mood, the stress of trying to get pregnant, feeling unattractive and unfeminine (Culley, Hudson, et al., 2013; Facchin et al., 2018). Furthermore, literature suggested that educational level, body mass index, previous surgery, depressive symptoms, personality traits, CPP, and mental and physical comorbidities may influence sexual function of women with endometriosis (De Graaff et al., 2016; Di Donato et al., 2013; Pluchino et al., 2016).

This condition usually results in a decrease in frequency of intercourse, avoidance of having sex for fear of painful intercourse or bleeding, frustration due to failure in having an orgasm, and problems with partners (Fagervold et al., 2009; Moradi et al., 2014). In particular, it has been found that about half of women with endometriosis feel that endometriosis had a negative effect on their relationship, leading sometimes to relationship’s breakdown (Fagervold et al., 2009).

Furthermore, despite several studies have focused on sexual dysfunctions of women with endometriosis, few researches have investigated the impact of the disorder on sexual distress (i.e. negative emotions and beliefs associated with the experience of low quality of sex). Female sexual distress has been observed in the majority of patients affected by endometriosis (Fritzer et al., 2014). Indeed, women with endometriosis usually report feelings of guilt or inadequacy for being unable to meet the expectation of the other (i.e. partner or society) for sexual activity (Young et al., 2015). In addition, women with endometriosis have lower levels of arousal/desire and negative attitudes towards sexuality, including feelings of anxiety and avoidance of intercourse (Fritzer et al., 2014). Investigating these issues is noteworthy as negative feelings can lead to physical tension and, in turn, cause sexual dysfunctions (Fritzer et al., 2013).

2.5. Infertility

Infertility refers to the inability or failure to conceive after regular unprotected sexual intercourses for at least twelve months (World Health Organization, 2002). Due to its severe impact on quality of life and mental health of both members of the couple, infertility has attracted the attention of several clinicians and researchers over the years.

Experiencing infertility has been related to a range of psychological disturbances, such as depression, anxiety, sexual distress, couple's relational problems, and loss of control (Chen, Chang, Tsai, & Juang, 2004; Cousineau & Domar, 2007; Maroufizadeh, Karimi, Vesali, & Omani Samani, 2015; Peterson, Newton, & Feingold, 2007).

The adverse psychological and clinical impact of infertility could be exacerbated when is combined with a chronic and painful medical disease, such as endometriosis. Endometriosis treatments often act as a contraceptive or may create risks to fertility. Therefore, some couples face a difficult choice. Indeed, treatments for endometriosis usually give them relief from pain but suspend the possibility to conceive. However, rejecting treatment for having a child means living with pain and the possibility of expanding of the disorder.

Even if the combination of two negative conditions (i.e. endometriosis and infertility) could be adverse for women's mental health and quality of life, few studies have focused on this specific topic. Indeed, a recent systematic review of qualitative studies of endometriosis concluded that there was an inadequate investigation of women's experiences of endometriosis-associated infertility (Young et al., 2015).

The experience of infertility in this population is often related to feelings of loss, grief, distress, anxiety, depression and loss of female identity (Culley, Hudson, et al., 2013; Facchin et al., 2018). A qualitative research found that some women feel worried and/or depressed about such diagnosis or the possibility of future fertility problems (Jones et al., 2004). In that study, one woman described herself as not feeling like "a complete woman" because of her inability to conceive (Jones et al., 2004). Furthermore, fertility issues usually cause distress also in younger women because they were not currently willing to have a child but feel pressured by doctors who strongly advise them to conceive as soon as they could to avoid future problems (Facchin et al., 2018).

Former studies on this topic found that: a) infertile women with endometriosis (especially those in advanced stages of the disorder), when compared to infertile ones without endometriosis, show higher depression, stress perception and anxiety, as well as decreased quality of life (Siedentopf, Tariverdian, Rücke, Kentenich, & Arck, 2008); b) infertile women with endometriosis and infertile ones without endometriosis showed the same perceived social support (Siedentopf et al., 2008); c) women with severe endometriosis who searched for a child and failed had worse quality of life, vitality and higher limitations due to emotional problems when compared to those who gave birth to a child (Betto et al., 2017); d) during Assisted Reproductive Technology (ART) stimulation, infertile women with and without endometriosis have the same level of quality of life, but those with endometriosis have a decrease of dysmenorrhea and dyspareunia (Santulli et al., 2016); e) Invasiveness of ART does not affect satisfaction of infertile women with endometriosis; satisfaction is related to number of attempts, treatment accomplishment and pregnancy test outcomes (van der Houwen et al., 2014).

2.6. Coping strategies

Lazarus and Folkman (1986; 1984) defined coping strategies as “the constantly changing cognitive and behavioral efforts to manage the specific external or internal demands that are appraised as taxing or exceeding the resources of the person”. Therefore, coping strategies refer to the specific behavioral, emotional or cognitive efforts that people use to master, tolerate, reduce or minimize stressful events (Taylor & Stanton, 2007). The way an individual cope with a stressor can mitigate or exacerbate the levels of stress experienced, leading to a series of positive or negative mental and physical outcomes. The importance of coping strategies in different medical and psychological settings has been evidenced by a wide range of studies and review (Collins, Bradley, O'Sullivan, & Perry, 2009; Compare, Zarbo, Shonin, Van Gordon, & Marconi, 2014; Folkman, 1997; Jensen, Turner, Romano, & Karoly, 1991; Li & Shun, 2016; Mehrabi, Hajian, Simbar, Hoshyari, & Zayeri, 2015; Petticrew, Bell, & Hunter, 2002; Ruiz-Aranda, Salguero, & Fernandez-Berrocal, 2010; Strobel, Hunt, Sullivan, Sun, & Sah, 2014). Among coping strategies, pain catastrophization is one of the most studied in the medical field. It can be described as a cognitive negative amplification of pain-related thoughts that includes rumination (i.e. thinking repetitively to pain), magnification (i.e. concerning exaggeratedly to negative consequences of pain), and helplessness (believing the pain will not change) (Sullivan, 2009).

Regarding the connection between coping strategies and endometriosis, a recent critical narrative review published by my research group (Zarbo et al., 2017) found nine quantitative and qualitative papers focused on this theme. From the review emerged that these patients, in order to cope with pain, engage in the following coping strategies: schedule everyday activities around menstrual cycle, engage in self-management (e.g. alleviating pain and discomfort through taking analgesics, relaxation or controlling diet), seek for social support, try to think to the disorder in different way, evoke spirituality, adopt a positive attitude towards the condition, or manage nutrition (Huntington & Gilmour, 2005; Roomaney & Kagee, 2016).

In addition, the review found mixed results about differences in coping strategies between women with and without endometriosis. Women with endometriosis seem to recur to the same problem-focused and emotional-focused coping strategies of healthy women, while ones with related CPP were more likely to repress emotions (Zarbo et al., 2017). Indeed, Quinones et al. (2015) suggested that women with endometriosis and healthy women cope with stressful events using the same problem-focused and emotional-focused types of coping strategies. On the contrary, the study of Thomas, Moss-Morris, and Faquhar (2006) suggested that women with endometriosis-related CPP, if compared to healthy control, were more likely to repress emotions. Similarly, both women with endometriosis-related CPP and women with CPP without endometriosis showed a higher tendency to suppress thoughts and emotions if compared to healthy women. These results could be related to the occurrence of a high level of pain, and not to the diagnosis of the pathology itself.

Furthermore, the majority of studies included in the review focused on the influence of coping strategies on self-reported pain and mental health in this population. As regards this relationship, the review concluded that a) the experience of pain is strictly related to both suppression of emotions, passive coping, and catastrophization; b) some coping strategies seem to be related to better or worse mental health (Zarbo et al., 2017). In particular, studies on endometriosis population found that passive coping strategies and suppression can lead to higher levels of self-reported pain and to its overestimation (Nunnink & Meana, 2007; Thomas et al., 2006). Likewise, catastrophizing accounted for 21% of the variance of pain at baseline and significantly predicted pain at follow-up (Martin et al., 2011) and is longitudinally and significantly related to persistent post-surgical pain outcomes (Carey et al., 2014).

Furthermore, significant is the relationship between coping strategies, pain and psychosocial outcomes in this population. To this regard, Eriksen et al. (2008) found that detached and rational coping styles seem to be related to better mental health, while both emotional and avoidance coping styles to a poor mental status. Moreover, patients without pain had a higher tendency to suppress emotions when compared to patients with pain. In addition, the study of Donatti, Ramos, Andres, Passman, and Podgaec (2017) found that more stressed and depressed women were those who used more than one dysfunctional coping strategy focused on emotions, while less stressed women utilized more positive strategies focused on the problem (Donatti et al., 2017).

Concluding, even if scientific interest on this topic has been expanding in recent years, it should be highlighted the lack in literature of studies focusing on a wider range of behavioral, cognitive and emotional coping strategies (such as acceptance, positive appraisal, refocusing on planning, self-blame, rumination, etc.) in this population and their role on affecting pain experience and mental health.

2.7. Metacognitive beliefs

It is known that thoughts have a great impact on emotional and psychological wellbeing. However, thoughts are only thoughts, and many of them are usually unnecessary and are quickly forgotten. The process of selection and control of thoughts is due to metacognition, which refers to thought applied to thought: it monitors, controls and evaluates the process and the product of consciousness (Wells, 2009).

During life path, everyone develops specific beliefs and theories with respect to the content of one's thoughts. These beliefs on thoughts are called “metacognitive beliefs”. Metacognitive beliefs are defined as “stable knowledge or beliefs about one’s own cognitive system, and knowledge about factors that affect the functioning of the system” (Wells, 1995). Examples of metacognitions include beliefs concerning the significance attributed to some thoughts (e.g. “It is bad to think X”) or beliefs about coping strategies and their impact on cognition (e.g. “Ruminating will help me find solutions to problems”).

According to the model of Wells and Simons (2009), onset and maintenance of distress are not caused by the negative content of thoughts about stressors but are related to how the individual copes to those thoughts (i.e. his metacognitive beliefs about his own worries). The presence of a psychological disorder is the signal that thoughts are extending into our minds without being disposed of. Indeed, psychological disorders are usually characterized by patterns of thoughts that are repetitive, self-perpetuating and brooding, difficult to keep under control. This pattern of thoughts is called “Cognitive Attentional Syndrome” (CAS; Wells, 2009; Wells & Matthews, 1996). CAS is characterized by perseverative thinking, unnecessary conceptual processing, attentional hypervigilance to threat, and dysfunctional self-regulation and coping strategies. According to the theory of self-regulatory executive function (Wells & Matthews, 1996), metacognitions have a central role in the persistence of maladaptive forms of coping, which in turn contribute to the onset and maintenance of psychological disorders or distress.

An example of the impact of the CAS on psychological health can be provide by the case of the panic disorder. Panic attacks are common and are claimed by several individuals during life path. However, worrying about possible subsequent attacks lead to prolonged anxiety, and monitoring of bodily sensations increases the possibility that a subsequent attack will occur. Therefore, the person who is prone to activate the cognitive-attentional response pattern is more likely to show a persistence of anxious arousal and to develop repeated panic attack (Wells, 2009).

Literature about metacognitive beliefs is widely spreading in recent years. Metacognitive beliefs have been investigated in relation to several mental disorders (i.e. obsessive symptoms, post-traumatic stress disorder, anxiety, depression, substance use), fear and coping styles in different settings (Bailey & Wells, 2016; Butow et al., 2015; Cook et al., 2015; Papageorgiou & Wells, 2001; Sica, Steketee, Ghisi, Chiri, & Franceschini, 2007; Thewes, Bell, & Butow, 2013; Toneatto, 1999). Moreover, metacognitive beliefs about worry have been associated to self-reported pain behavior, pain catastrophizing, and pain control beliefs (Spada, Gay, Nikčevic, Fernie, & Caselli, 2016; Yoshida et al., 2012). Therefore, metacognition may play a significant role in the development or maintenance of pain-related thoughts.

Concluding, a recent review of our research group (Zarbo et al., 2017) has highlighted the lack in the literature of studies about metacognitive beliefs in women with endometriosis. In this setting, the metacognitive model could provide an efficient framework by which better understand the impact of endometriosis and his symptoms on women's lives. According to the model, own cognitions and beliefs about own worries about the disorder or about the pain symptomatology (i.e. metacognitive beliefs) could affect the way the woman cope with the stressor and influence, indirectly, quality of life and mental health.

3. Treatments for endometriosis

Endometriosis is a complex disorder and treatments should be personalized according to the age of the patient, pregnancy desire, symptomatology, localization of lesions, and disorder stage (Lagana et al., 2017). Treatments for endometriosis aim at improving quality of life, preventing disease recurrence, reducing pain symptomatology and preserving fertility (Donnez et al., 2002). They could be mainly medical or surgical, while psychological and other complementary treatments could be adjuvants of typical therapies.

The majority of patients are treated with oral contraceptives or progestins (Vercellini et al., 2003), which frequently reduce endometriosis-associated pain within a brief period (Kennedy et al., 2005). Nevertheless, in some cases, medical treatments are not effective, and surgery is required. The least invasive and the best alternative for women seeking conception is the conservative surgery. Unfortunately, conservative surgery is not a durable treatment for severe endometriosis as the risk of recurrence and re-operation after this treatment is quite high (Shakiba, Bena, McGill, Minger, & Falcone, 2008; Vercellini et al., 2009). If a woman has not responded to drug treatments and conservative surgery and is not seeking for a child, a radical surgery should be considered. The removal of the uterus (hysterectomy) and/or ovaries (oophorectomy) are the most common possibilities.

Studies have shown that both pharmacologic and surgical treatments improve physical and mental quality of life (Chaichian et al., 2017; Gao et al., 2006; Vercellini et al., 2013). It has been showed that both options achieve similar benefits at 12-month follow-up but have different temporal trends (Vercellini et al., 2013). Indeed, after surgery, women experiment a significant improvement of the quality of life and mental health in the brief period, which worsens with time. On the contrary, hormonal treatment leads to a gradual increase of quality of life and mental health. Despite that, after 12 months the benefits of both treatments are similar (Vercellini et al., 2013). However, qualitative studies have found that women feel more positive about surgical than drug treatment (Denny, 2004; Young et al., 2015). Furthermore, women worry about various aspects of treatment including short- and long-term side effects of various treatments and hospital stays and report frustration and anger for the lack of effective treatments (Denny, 2004; Young et al., 2015).

As regards fertility improvement, current treatment options of endometriosis-associated infertility include surgery and recurring to Assisted Reproductive Treatments (i.e. superovulation with intrauterine insemination, and in vitro fertilization; Macer & Taylor, 2012). In particular, surgery for stage III or IV endometriosis can be useful to treat pelvic adhesions that may impact reproductive function (Practice Committee of the American Society for Reproductive, 2012). However, to date there is insufficient evidence about the efficacy of resection of endometriomas prior to in vitro fertilization (IVF) for subsequent improvement of pregnancy outcomes (Practice Committee of the American Society for Reproductive, 2012). IVF seems to maximizes cycle fecundity for women with endometriosis (Practice Committee of the American Society for Reproductive, 2012). Indeed, IVF should be reserved as the secondary treatment for women who fail to conceive spontaneously after surgery within 6–12 months, since it is able to increase significantly delivery rates (Šalamun, Verdenik, Laganà, & Vrtačnik-Bokal, 2018).

Finally, despite increasing knowledge in the medical field, still now endometriosis is a disease which is impossible to prevent or to definitely treat. Indeed, current therapies target only symptomatic relief, do not prevent disease recurrence and have associated adverse effects.

3.1. Medical treatments

The majority of patients with endometriosis receives medical treatments, assuming hormonal treatment (hormonal contraceptives, progestogens, antiprogestogens or GnRH agonists). Hormonal treatments aim at downregulation of the ovaries and reducing the estrogenic stimulation of endometriotic growth. The choice of the most appropriate hormonal therapy depends on several factors such as therapeutic effectiveness, tolerability, drug cost, physician’s experience and expected patient compliance (Lagana et al., 2017).

These treatments are safe, inexpensive and well-tolerated options (Vercellini et al., 2003). They usually reduce endometriosis-associated pain and sexual dysfunctions and improve quality of life in a brief period (Caruso et al., 2015; Dunselman et al., 2014; Kennedy et al., 2005). Conversely, suppression of ovarian function to improve fertility in minimal and mild endometriosis is not effective and should not be offered as an option for this objective (Dunselman et al., 2014).

Even if hormonal treatments (like GnRH agonists) are effective in reducing endometriosis symptoms, they are often associated with anxiety and depression during treatment. For this reason, psychiatric drugs may be considered as adjunctive treatment during medical therapy (Lagana et al., 2017).

3.2. Surgical treatments

In some cases, medical treatments are not effective and surgery, less or more invasive, is required. Furthermore, surgery is the primary treatment for more severe forms of endometriosis, such as DIE (Lagana et al., 2017).

The least invasive and the best alternative in women seeking conception is the conservative surgery, aimed at removing or destroying the deposits of endometriosis, even preserving the uterus and ovaries as much as possible. After this surgery, the pregnancy rate is about 50% (Donnez et al., 2002), even if the percentage usually depends on pre-existing tubal adhesions (Osuga et al., 2002). Unfortunately, conservative surgery is not a long-lasting treatment for severe endometriosis as the risk of recurrence and re-operation is quite high (Shakiba et al., 2008; Vercellini et al., 2009). Indeed, pain recurrence and re-operation rates after conservative surgery for symptomatic endometriosis are high and probably underestimated (Vercellini et al., 2009). In a study of Vercellini et al. (2009), medium-term recurrence of lesions has been observed in 20% of the cases.

If a woman has not responded to drug treatments and conservative surgery and is not seeking for a child, a radical surgery should be considered. Laparotomy and laparoscopy are equally effective in the treatment of endometriosis-associated pain (Dunselman et al., 2014). Radical treatments have been associated with great pain relief, less likelihood of recurrence of the disorder and better quality of life and quality of sex (Ford, English, Miles, & Giannopoulos, 2004; Fritzer et al., 2014; Namnoum, Hickman, Goodman, Gehlbach, & Rock, 1995; Setala, Harkki, Matomaki, Makinen, & Kossi, 2012; Tan, Maillou, Mathur, & Prentice, 2013). In particular, after 4 months since the radical laparoscopic treatment of endometriosis, a significant improvement of the quality of life, dysmenorrhoea, deep dyspareunia, dyschesia, and the general pain was found in the study of Garry et al. (2000). Moreover, a more recent study of Abbott et al. (2003) found a significant improvement of the quality of life and sexual functioning as well as a decrease of discomfort and pain symptoms after five years since the radical surgery. Complete excision of endometriosis with vaginal resection in patients with deeply infiltrating endometriotic nodules in the posterior fornix of the vagina has been associated with better quality of life and sexual functioning as well as a decrease in pain symptoms (Setala et al., 2012). Finally, laparoscopic rectal and sigmoid resection for endometriosis significantly reduce endometriosis-related symptoms and improve quality of life and sexual well-being (Kossi, Setala, Makinen, Harkki, & Luostarinen, 2013).

Even if hysterectomy and bilateral salpingo-oophorectomy are acceptable treatments for endometriosis, they must be reserved to women with debilitating symptoms and failure of previous therapies who have completed their family (Mehrdad Moghimi & Bahram Moazzami, 2017). Apart from some of the advantages of surgical methods (such as definite diagnosis, long-term cure), they have several disadvantages, including risks associated with surgeries, higher expenses, recurrence of endometriosis (in 30% of cases that had laparoscopy), and decrease in ovarian reservoir and infertility (Mehrdad Moghimi & Bahram Moazzami, 2017). Furthermore, the NICE (2017) suggests that, after laparoscopic excision or ablation of endometriosis, the medical team should consider hormonal treatment, to prolong the benefits of surgery and manage symptoms.

3.3. Complementary treatments

Multidisciplinary and/or interdisciplinary approaches are essential to the care of patients suffering from endometriosis (Wattier, 2018). Psychological and other treatments could be adjuvants of typical therapies. Complementary therapy includes nutrition balanced, yoga stress reduction relaxation, acupuncture, stress reduction techniques, and physical therapy (Kaatz, Solari-Twadell, Cameron, & Schultz, 2010)

Despite the impact on quality of life and mental health of endometriosis is severe, few studies have studied the efficacy of psychological treatments in this population. Mindfulness-based psychological treatment has been found to be effective, also in long-term, in helping women to deal with endometriosis-related pelvic pain and improving well-being (Hansen, Kesmodel, Kold, & Forman, 2017; Kold, Hansen, Vedsted-Hansen, & Forman, 2012). Indeed, it has been found that 10-sessions treatment had a positive effect on pain, control and powerlessness, wellbeing, social support, and self-image in this population. Overall the effect was maintained after one-year follow-up for the majority of the scales (Kold et al., 2012). Follow-up study on long-term found that positive effects of the treatment lasted on quality of life outcomes also after six years (Hansen et al., 2017).

Negative metacognitive beliefs predict sexual distress in women with endometriosis[1]

Abstract

Objective: To assess the predictive value of dyspareunia, general chronic pain and metacognitive beliefs to sexual distress in a sample of women with endometriosis.

Methods: Ninety-six women (mean age=34.60 ± 6.44 years) with a diagnosis of endometriosis took part to this cross-sectional study. Sociodemographic and clinical data were collected by means of a structured ad hoc questionnaire. Metacognitive beliefs and sexual distress were assessed by means of the Meta-Cognitions Questionnaire (MCQ30) and the Female Sexual Distress Scale-R (FSDS-r). General chronic pain intensity was collected by means of a Numeric Rating Scale. Data were subjected to Hierarchical logistic regression.

Results: We found high percentages of dyspareunia and sexual distress (i.e. 66% and 76%). Findings suggested that dyspareunia and chronic pain did not predict sexual distress, while negative beliefs about worries predicted sexual distress over and above them (*p*=.040, odd ratio 1.159).

Conclusions: In target population, metacognitive beliefs may have more influence on sexual distress than pain symptomatology.

Keywords

Metacognition, chronic disease, sexuality, pain, dyspareunia

---

[1] Article submitted to a peer-reviewed journal. Current status: Under review, after first revisions.
Authors: Zarbo Cristina, Brugnera Agostino, Compare Angelo, Secomandi Rita, Candeloro Ilario, Malandrino Chiara, Betto Enrico, Trezzi Gaetano, Rabboni Massimo, Emi Bondi, Frigerio Luigi

1. Introduction

Endometriosis is a chronic disabling condition, characterized by endometrial-like tissue setting down outside the uterus, affecting about 5% to 10% of the female population in reproductive age (Vigano et al., 2004). Pain is the most common symptom of the disorder, claimed in almost half of patients, manifesting itself as chronic pelvic pain, dysmenorrhea, dyspareunia, pelvic or abdominal, dyschesia, and/or dysuria. Pain is considered the major stressor in the lives of women with endometriosis (Zarbo et al., 2017), severely affecting the quality of life and mental health (Facchin et al., 2015; Moradi et al., 2014). The influence of pain is so high that several authors have suggested that is the pain symptomatology (and not the endometriosis itself) to negatively impact on women's life and cause distress (Cavaggioni et al., 2014; Culley, Law, et al., 2013; Facchin et al., 2015; Lorencatto et al., 2006).

Due to the adhesions and localization of nodules in regions subjected to traction during sexual intercourse (e.g. the uterosacral ligaments), women with endometriosis have a nine-fold increased risk of recurrent or persistent genital pain during sexual intercourse (i.e. dyspareunia) than the general female population (Ballard et al., 2008). Both dyspareunia and chronic pelvic pain seem to have significant negative implications for sexual activity, quality of life and distress in this population (Basson et al., 2000; Montanari et al., 2013; Pluchino et al., 2016; Tripoli et al., 2011). Dyspareunia negatively affects women's lives to the point that some of them avoid sexual activity, with decreasing in self-esteem and quality of couple relationships (Denny & Mann, 2007).

Moreover, dyspareunia has been related to several forms of sexual dysfunctions, such as less sexual desire and/or lubrication, arousal difficulties, and orgasm disorders (Fritzer et al., 2013). Evidence has shown that women with endometriosis have more than twice sexual dysfunctions compared to women without the disorder (Fairbanks et al., 2017). Sexual difficulties can affect women with endometriosis in all phases of sexual response, such as desire, sexual arousal, and orgasm/sexual satisfaction (Fairbanks et al., 2017; Montanari et al., 2013), with a negative impact on quality of life (Montanari et al., 2013).

However, it should be highlighted that the presence of dyspareunia is not the only cause of sexual dysfunctions in this population (Pluchino et al., 2016). More than half of patients with endometriosis have sexual dysfunctions not limited to dyspareunia (Barbara, Facchin, Buggio, et al., 2017). Indeed, chronic pelvic pain, advanced stages of disease, the presence of physical and mental comorbidities, personality traits, women's expectations, educational level, Body Mass Index, and previous surgery can affect sexual functioning (Di Donato et al., 2013; Pluchino et al., 2016).

Furthermore, despite the well-known link between sexual functioning and quality of life/wellbeing, and even if sexuality is known to be a complex phenomenon influenced also by psychosocial factors, few studies have focused on the concept of "sexual distress" in this population. Sexual distress refers to the personal distress related to a specific sexual difficulty (Hendrickx, Gijs, & Enzlin, 2016). The concept includes negative feelings about own sexual life, such as unhappiness, worry, anger, guilt, frustration, and dissatisfaction (Stephenson & Meston, 2010a). The negative condition is particularly important as it is known to be associated with low sexual/relationship satisfaction and emotional wellbeing (Bancroft, Loftus, & Long, 2003; Rosen et al., 2009; Stephenson & Meston, 2010b). Indeed, women with sexual distress usually declare to be unhappier with their relationship compared with women without sexual distress (Rosen et al., 2009).

However, according to Burri, Rahman, and Spector (2011), several women who experience sexual distress are not necessarily sexually dysfunctional. Indeed, sexual distress seems to be more related to general anxiety than to sexual dysfunctions (Burri et al., 2011).

Even if the importance of sexuality has been widely recognized for women's quality of life and a large part of studies has focused on sexuality-related to endometriosis, very few studies focused on sexual distress in this population. The study of Fritzer et al. (2013) found a prevalence of 78% of sexual distress and 32% of sexual dysfunction in a sample of one hundred and twenty-five patients with endometriosis and dyspareunia. Moreover, the study found statistically significant correlations between sexual dysfunctions and pain intensity during/after sexual intercourse, low number of episodes of sexual intercourse per month, high feelings of guilt towards the partner, and few feelings of feminity (Fritzer et al., 2013). These results evidenced that sexual distress in women with endometriosis is more common than sexual dysfunction (i.e. 40% higher), leading to the conclusion that it should be specifically explored to have a wider and complete picture of the sexual health of these patients.

In this context, psychological and cognitive factors may play an important role in influencing sexual distress. The metacognitive model of Wells & Simons (2009) could provide an efficient framework by which better understand the onset and maintenance of sexual distress. Metacognition refers to the “psychological structures, knowledge, events and processes that are involved in the control, modification, and interpretation of thinking itself” (Wells & Cartwright-Hatton, 2004). Metacognitive beliefs are defined as “stable knowledge or beliefs about one’s own cognitive system, and knowledge about factors that affect the functioning of the system” (Wells, 1995).

According to the model of Wells and Simons (2009), onset and maintenance of distress are not caused by the negative content of thoughts about stressors (e.g. “I cannot stop think about my problems”), but are related to how the individual copes with those thoughts (i.e. his metacognitive beliefs about his own worries; e.g. “it is bad to continuously think about my problems, I’m getting mad”). Examples of metacognitions include beliefs concerning the significance attributed to some thoughts (e.g. “It is bad to think X”) or beliefs about coping strategies that impact on cognition (e.g. “Ruminating will help me find solutions to problems”).

The theory of self-regulatory executive function (Wells & Matthews, 1996) suggests that metacognitions have a central role in the persistence of maladaptive forms of coping, which in turn contribute to the onset and maintenance of psychological disorders or distress. A core principle of this model is that psychological disorders are linked to the activation of a particular toxic style of thinking called Cognitive-Attentional Syndrome (CAS; Wells, 2009; Wells & Matthews, 1996), which is characterized by perseverative thinking, unnecessary conceptual processing, and attentional hypervigilance to threats. In other words, metacognitions lead the individual to engage into unhelpful coping strategy and, in particular, to focus attention on information congruent with his own disorder, use inappropriate goals and internal criteria for judgment, and engage unhelpful coping strategies of worry/rumination (Wells & Cartwright-Hatton, 2004). Maladaptive coping strategies contribute, in turn, to psychological disorders/difficulties or distress (Wells, 2000, 2009). Indeed, maladaptive metacognitive beliefs have been found to correlate positively with psychopathology (Sun, Zhu, & So, 2017).

Metacognitive model is part of the “third wave” cognitive-behavioral approaches, known to include functionalist models in their perspective. These models attribute importance to top-down mental functions such as voluntary attention and executive control, or bottom-up experiential and interpersonal processes (Ruggiero, Spada, Caselli, & Sassaroli, 2018). Nevertheless, these models have the limitations to focus on current problems and specific issues, as well as to minimize the importance of personality, unconscious processes, the characteristic of environment and individual’s childhood and familiar system.

To date, metacognitive beliefs have been investigated in a wide range of populations (e.g. patients with cancer, gastrointestinal disorders, or pain) while, to the best of our knowledge, no studies have focused on endometriosis population. Previous studies on patients with cancer, have found that both positive and negative beliefs about worry are related to greater fear of recurrence of the pathology (Butow et al., 2015) as well as to symptoms of anxiety, depression, distress and Post-Traumatic Stress Disorder (PTSD; Cook et al., 2015; Quattropani, Lenzo, Mucciardi, & Toffle, 2016). Furthermore, metacognitive beliefs about worry have been associated with both self-reported pain behavior and pain catastrophizing (Spada et al., 2016).

In the field of sexuality, the model may contribute to explain the onset and maintenance of sexual distress, leading to important clinical implications. Indeed, beliefs about own worries about sexual difficulties (i.e. metacognitive beliefs) could affect the way the woman cope with the stressor (i.e. the pain and sexual problems) and impact on distress related to sexuality.

In summary, evidence has suggested that endometriosis and pain-related symptomatology may negatively affect sexuality and cause both sexual dysfunctions and sexual distress. However, pain, sexual dysfunctions, and sexual distress seem to be independent factors in this population. Indeed, it has been suggested that sexual distress could not depend only on pain and sexual dysfunctions. In this context, sexual distress could be related to psychological and cognitive factors, such as the way the woman cope with her own thoughts about stressors (i.e. pain and sexual difficulties).

Due to the fundamental role of sexuality in human life and its significant impact on quality of life, emerges the need for further research studies. In order to overcome existing limitations of literature, the main aim of this cross-sectional study was to explore the predictive value of dyspareunia, general chronic pain and metacognitive beliefs to sexual distress in a sample of women with endometriosis. Investigating the role of psychological and cognitive factors in influencing sexual distress in this population would provide important clinical implications for the multidimensional treatment of these women and the role of the psychologist in a medical setting.

2. Material and methods

2.1. Participants and procedure

In April 2017, women with a diagnosis of endometriosis were contacted in virtual mutual support groups, medical forums, and web associations. A public announcement has been published, containing a link to a web-survey on which to complete questionnaires and provide informed consent.

Inclusion criteria were: being in fertility age (from 18 to 55 years old), clinical or surgical diagnosis of endometriosis, and ability to write and read in the Italian language. We excluded women with past or concurrent neurological and psychiatric disorders or severe medical conditions.

Firstly, a total of 118 women were enrolled in the study and completed the battery. Then, sixteen of them were excluded for past psychiatric and neurological disorders, while six were excluded because they did not have any sexual intercourse in the last three months. Finally, ninety-six women took part to the study. Sociodemographic and clinical information of participants are shown in Table 1.

All questionnaires were self-administered and completed by means of a web-survey tool. The web-based survey method was chosen for its advantages over other formats (Evans & Mathur, 2005) and to ensure honest answers on a very intimate topic. Indeed, the self-administered nature of web open-ended questions allows the generation of richer responses (Schaefer & Dillman, 1998) and the avoidance of interviewer effects (Duffy, Smith, Terhanian, & Bremer, 2005).

The study was conducted in accordance with APA (1992) ethical standards for the treatment of human experimental volunteers; each participant provided consent in compliance with the Declaration of Helsinki (2013). The study was approved by the ethical committee of the local institution.

Sociodemographic Information	
Age: mean (*SD*)	34.60 (6.44)
range	22 – 51
Education: *n* (%)	
Middle Schools	9 (9.4)
High Schools	48 (50)
Bachelor's Degree	10 (10.4)
Master's Degree	18 (18.8)
Postgraduate/ Ph.D. Degree	9 (9.4)
Other	2 (2.1)
Marital Status: *n* (%)	
Engaged	15 (15.6)
Married	44 (45.8)
Common Law	26 (27.1)
Single	7 (7.3)
Separated	3 (3.1)
Divorced	1 (1)
Profession: *n* (%)	
Student	9 (9.4)
Volunteer	1 (1)
Employed full-time	33 (34.4)
Employed part-time	19 (19.8)

Self-employed	18 (18.8)
Unemployed	16 (16.7)
Clinical information	
Endometriosis localization: *n* (%)	
Ovary	79 (82.3)
Intestine	42 (43.8)
Urinary tract	26 (27.2)
Rectovaginal septum	55 (57.8)
Uterus	16 (16.7)
Tube	2 (2.1)
Ureter	2 (2.1)
Other sides	13 (13.5)
Stage: *n* (%)	
Stage I	1 (1)
Stage II	8 (8.3)
Stage III	8 (8.3)
Stage IV	52 (54.2)
Not known	27 (28.1)
Pelvic pain*: *n* (%)	
No	18 (18.8)
Dysmenorrhea*: *n* (%)	
No	27 (28.1)
Not having menstruation	10 (10.4)
Dyspareunia*: *n* (%)	
No	33 (34.4)
Evacuation pain*: *n* (%)	
No	42 (43.8)
Urination pain*: *n* (%)	
No	65 (67.7)
Backache*: *n* (%)	
No	17 (17.7)
Time spent since diagnosis^: mean (*SD*)	79.58 (148.24)
Time spent since symptoms onset^: mean (*SD*)	146.40 (102.62)

Past Treatment for Endometriosis: *n* (%)	
Medical Treatments	13 (13.5)
Surgical Treatments	10 (10.4)
Both Medical and Surgical Treatments	67 (69.8)
None	6 (6.3)
Contraceptive pills°: *n* (%)	
No	13 (13.5)
Contraceptive pills*: *n* (%)	
No	49 (51)

Table 1. Sociodemographic and clinical characteristics of the sample (N=96)
** in the last 3 months*
° over the last 3 months
^ in months

2.2. Instruments

Sociodemographic and clinical information were collected by means of a structured ad hoc questionnaire. We collected information about age, civil status, nationality, occupational status, education, family status, BMI, lifestyle (i.e. smoking). Moreover, we assessed the presence of past and present chronic medical condition in comorbidity to endometriosis, as well as clinical data about endometriosis (e.g. previous and current treatments, localization, stage, symptomatology history).

General chronic pain intensity over the last three months was assessed by means of a Likert scale from 0 (no pain) to 10 (the most terrible pain). Dyspareunia was assessed by means of a specific question referring to the last three months and coded as 0 (no dyspareunia) and 1 (yes dyspareunia). Metacognitive beliefs and sexual distress were assessed by means of the Italian version of two specific questionnaires, which will be presented below.

Female Sexual Distress Scale-R (FSDS-r) (Derogatis, Clayton, Lewis-D'Agostino, Wunderlich, & Fu, 2008) is a 13-items scale that assesses distress related to sexuality. The FSDS requests the participant to indicate how often each of the sexual related problems (e.g. absence of desire, feeling of guilty) has caused distress in the previous seven days. Sexual distress can be diagnosed when the FSDS-R total score is higher than 11. The scale demonstrated good discriminant validity, high test-retest reliability, a high degree of internal consistency, as well as good discriminant validity and test-retest reliability (Derogatis et al., 2008). The Italian translated version provided by the authors (copyright: American Foundation for Urological Disease Inc.) has been used in this research study.

Meta-Cognitions Questionnaire (MCQ-30; Cartwright-Hatton & Wells, 1997; Quattropani, Lenzo, Mucciardi, & Toffle, 2014). This is a 30-items scale, validated in Italy, which allows the assessment of metacognitive beliefs (i.e. beliefs about own cognitions) through five subscales, which are: (1) “positive beliefs” about worry, which assesses the thoughts about the beneficial effect of worrying (e.g. for avoiding problems, or remaining organised); (2) “negative beliefs” about uncontrollability of thoughts and corresponding danger, which includes items about the importance of controlling one's thoughts in order to prevent dangers related to the uncontrol; (3) “cognitive confidence”, which refers to lack of self-confidence in one's memory and attention; (4) “Need to control thoughts”, which concerns ideas of superstition and punishment related to some thoughts; (5) “cognitive self-consciousness”, which refers to items reflecting the tendency to be aware of and monitor thinking. Higher scores on each subscale indicate the higher presence of that belief. Cut-off scores are not available for the total score and subscales of the questionnaire. The Italian validation of Quattropani et al. (2014) on healthy women (N=169) has found the following mean scores: Total score= 60.35 (11.73); Negative beliefs = 11.97 (4.17); Positive beliefs= 10.34 (3.62); Cognitive confidence= 10.25 (3.37); Need to control thoughts= 11.24 (3.17); Cognitive self–consciousness= 16.54 (3.01).

The Italian version of the MCQ-30 has demonstrated good psychometric properties, satisfactory internal consistency, and convergent validity, as well as a good test-retest reliability (Quattropani et al., 2014).

2.3. Statistical Analyses

Preliminary analyses were performed to ensure no violation of the assumption of normality, linearity, multicollinearity, singularity, homoscedasticity, and independence of residuals. Standardized scores and box plots were used to identify univariate outliers. Variables with values +/- 3.29 *SD* from the mean were considered outliers (Tabachnick & Fidell, 2007). Outlier values were brought into range (Tabachnick & Fidell, 2007). Normality was assessed for each variable by examining box-plots, stem and leaf plots, histograms, and skewness and kurtosis values.

First of all, we calculated *chi-square* and *t-test* for independent samples in order to investigate relationships between variables. Sexual distress (FSDS; coded as no/yes) was inserted as dependent variable and the other measures as independent ones (i.e. age, education, marital status, profession, stage of endometriosis, pain, time spent since diagnosis and the onset of symptoms, past and current treatments, MCQ total score and subscales).

Then, we checked significative results and inserted them into Hierarchical logistic regression analyses. FSDS category (no/yes) was inserted as the dependent variable, while MCQ-NEG was inserted at block 2 as a predictor. General chronic pain over the last 3 months (NRS scale from 0 to 10) and dyspareunia (no/yes) were inserted at block 1 to be controlled.

All statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS) version 23.0. All statistical tests were two-sided; a p-value ≤.05 was considered significant.

3. Results

From preliminary analyses emerged that catastrophization subscale was slightly positively skewed and square root (sqrt) corrected the skew. However, the findings were the same for the original and transformed data. Then, for ease of interpretation, we reported results using the original scores (Tabachnick & Fidell, 2007). Results revealed no issues with normality, linearity, homoscedasticity, and independence of residuals. Missing data were not imputed and were treated as missing.

Differences between groups (no sexual distress; sexual distress;) for sociodemographic and clinical data as well as for metacognitive beliefs were assessed by means of *Chi-Square* analyses for categorical variables and independent sample *t-test* for continuous ones. From these analyses, we found that the two groups differed only for dyspareunia (*p*= .039), general chronic pain intensity over the last three months (*p*= .008), and MCQ-NEG (*p*= .028).

Results from the hierarchical logistic regressions (odds ratios, 95% confidence intervals, and significance levels) are summarized in Table 2. From hierarchical logistic regressions, we found that negative metacognitive beliefs were able to predict the presence of sexual distress, over and above chronic pain and pain during sexual intercourse in the sample of women with endometriosis. Our findings showed that dyspareunia and chronic pain have no impact on sexual distress in this population. This means that women who reported sexual distress did not differ from women who did not report sexual distress as regard dyspareunia and chronic pain. Conversely, women with sexual distress had a significantly higher level of negative metacognitive beliefs about own worries than women without sexual distress. These results were maintained even controlling for chronic pain and dyspareunia.

As shown in Table 2, the full model (at block 2) was statistically significant, χ^2 (3, N=96) = 12.49, $p < 0.05$, indicating that the model was able to distinguish between respondents who reported and did not report sexual distress. The model as a whole (at block 2) explained 18.3% (Nagelkerke R squared) of the variance in sexual distress status. At block 1 only NRS over the last 3 months approximated the statistical significance (*p*= .057). At block 2, our findings showed that MCQ-NEG predicted significantly sexual distress over and above dyspareunia and general chronic pain intensity (*p*= .040, odds ratio 1.159). These results suggested that participants who had higher negative metacognitive beliefs were over 1 time more likely to report sexual distress than those who had less negative metacognitive beliefs, even controlling for dyspareunia and general chronic pain intensity.

Variables	B	SE	Wald	*p*	β
Block 1 (R^2 = .118)					
Dyspareunia[a]	-.601	.543	1.226	.268	.548
NRS-pain[a]	.194	.102	3.620	.057	1.21
(Constant)	.234	.748	.098	.754	1.264
Block 2 (R^2 = .183)					
Dyspareunia[a]	-.782	.571	1.877	.171	.458
NRS-pain[a]	.163	.106	2.369	.124	1.177
MCQ-NEG	.148	.072	4.205	.040*	1.159
(Constant)	-1.757	1.232	2.032	.154	.173

Table 2. Logistic regression analysis for sexual distress

[a] *Over the last 3 months*

NRS: Numeric Rating Scale; MCQ-NEG: Metacognitive beliefs questionnaire – negative beliefs about worries subscale.

4. Discussion

The present study found high percentages of dyspareunia and sexual distress among endometriosis population (i.e. respectively 66% and 76%). Moreover, we found that negative metacognitive beliefs predict sexual distress, over and above dyspareunia and general chronic pain intensity. According to our findings, dyspareunia and pain intensity did not predict sexual distress in these patients. Findings suggested that sexual life is different between persons and that this difference may be explained by psychological and cognitive factors.

The percentage of sexual distress found by our study (i.e. 76%) was quite similar to that found by Fritzer et al. (2013). A high percentage of women with endometriosis in our study declared to feel (a) distressed, unhappy, worried, dissatisfied, and angry about sexual life; (b) guilty, frustrated, inferior, inadequate, and embarrassed for sexual problems.

Moreover, our results highlighted how sexual distress is not even associated with dyspareunia or chronic pain intensity. These results are innovative and could be associated with those about sexual dysfunctions. Literature about sexual functioning in patients with endometriosis has shown that: (a) dyspareunia is not the unique cause of sexual dysfunctions (Barbara, Facchin, Buggio, et al., 2017; Di Donato et al., 2013; Pluchino et al., 2016); (b) sexual distress is not necessarily related to a sexual dysfunction (Burri et al., 2011; Fritzer et al., 2013).

Furthermore, the main contribution of this paper to current literature is related to the role of cognition in the prediction of sexual distress. As concluded recently Barbara, Facchin, Meschia, et al. (2017), sexual functioning is a complex and multidimensional phenomenon, in which psychological and relational dimensions play a significant role. Our results showed that cognitions about own worries play the most important role in the prediction of sexual distress, over and above general chronic pain intensity or pain during sexual intercourse. Therefore, according to the model of Wells & Simons (2009), we can suggest that negative metacognitive beliefs about own worries about sexual health (e.g. thinking that worry will make her mad) affect sexual distress passing through the influence on coping strategies. In other words, beliefs about worries lead to a dysfunctional way to cope with stressors (i.e. catastrophizing or avoiding sexual difficulties, overestimating pain, enhancing guilt feeling towards the partner, ruminating about own problems). This means that sexual distress is not due to the presence or absence of a pain during sexual intercourse or sexual dysfunctions, but to the way, the woman copes with his own thoughts about stressors (i.e. his maladaptive coping strategies).

The link between coping strategies and psychological distress in females with endometriosis have been claimed by previous studies and literature review (Donatti et al., 2017; Zarbo et al., 2017). Former studies have found positive correlations between suppression of emotions/specific negative coping styles or strategies (i.e. passive coping, and catastrophization) and the experience of pain (Zarbo et al., 2017). Moreover, some positive coping styles (e.g. detached, rational, focused to the problem) have been related to better mental health and adaptation to stress (Donatti et al., 2017; Zarbo et al., 2017).

In addition, significant clinical implications emerged from this study. Sexuality has an important role in a person's life and should be considered from different views, not only the medical one. In our sample, 76% of women complained about sexual-related distress, in some cases even in absence of pain during sexual intercourse. Sexual issues need to be addressed and discussed in health services. Psychologists and therapists play a significant role in a medical setting to engage in this objective.

Furthermore, the person with a diagnosis of endometriosis could benefit from metacognitive therapy, beyond that medication for the enhancement of sexual health. Sexual distress, indeed, seems to be not related to the presence of chronic pain and pain during sexual intercourse but to cognitive factors, like negative metacognitive about own worries. In this context, the therapist may support women in developing more flexible styles of cope with negative emotions and thoughts as well as alter the process of paying attention. Indeed, metacognitive therapy (Wells, 2009) could help them to deal with negative emotions related to sexual problems, enhancing the acceptance of stressors and negative thoughts about them. In addition, the therapist may support them in replacing maladaptive coping strategies (e.g. rumination, avoidance) with more adaptive ones.

Despite the interesting findings and clinical implications emerging from the study, limitations due to small sample size, cross-sectional design, and the web-based recruitment should be noticed.

Further research needs to overcome the limitations of this study and investigate the role of metacognitive beliefs longitudinally to subsequent sexual distress. Moreover, further studies need to investigate which factors contribute to sexually-related distress. They should investigate relationships between sexual distress and personality, psychological factors (e.g. quality of life, depression, etc.) and sexual dysfunctions. For example, recently, some studies have found significant relationships between personality traits and quality of life/experience of pain in this population (Bylinka & Oniszczenko, 2016; Facchin et al., 2016; Gomibuchi et al., 1993; Zarbo et al., 2018).

Concluding, to the best of our knowledge, this is the first study assessing metacognitive beliefs in women with endometriosis and in relation to sexual distress. We can conclude that sexual health is not merely the absence of pain during sexual intercourse. Women with sexual distress, even if not reporting dyspareunia or chronic pain, should be kept into account for sexual health enhancement. Treatments should not be limited to the improvement of sexual functioning but include psychological and cognitive focus. Metacognitive therapy may be beneficial for women with sexual distress related to endometriosis.

5. Compliance with ethical standards

The authors declare that they have no conflicts of interest. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study.

About and beyond pain: mental health, coping strategies and metacognitive beliefs in women with endometriosis[2]

Abstract

Purpose: Main aims of this study were: a) to assess differences in quality of life, mental health, coping strategies and metacognitive beliefs between women with low-pain endometriosis (LP), high-pain endometriosis (HP), and healthy ones (CG) at T0; b) to assess the role of pain on changes over time in quality of life and mental health in women with endometriosis; c) to assess the predictive value of metacognitive beliefs on subsequent quality of life and mental health, controlling for pain.

Methods: Women with a diagnosis of endometriosis were enrolled to take part to this prospective case-control study. Healthy women were enrolled as a control group. Women with endometriosis were evaluated in two times (T0 and T1, three months follow-up). Quality of life, worry trait, depression, sexual distress, pain, coping strategies, and metacognitive beliefs were assessed by means of validated questionnaires.

Results: Our findings suggested that: a) at T0, HP group had significantly higher scores on depression, sexual distress, and catastrophization than CG, as well as higher scores on worry trait than LP; b) changes in depressive symptomatology across time were related to pain group; c) metacognitive beliefs predicted sexual distress after 3 months, over and above pain severity.

Conclusions: Findings suggested that pain plays an important role in affecting different domains of quality of life and mental health in this population. However, the medical team should keep into account beliefs and worry traits, which could influence pain experience and predict subsequent distress.

---

[2] Article submitted to peer-reviewed journal. Current status: Under review.
Authors: Zarbo Cristina, Brugnera Agostino, Compare Angelo, Candeloro Ilario, Malandrino Chiara, Secomandi Rita, Betto Enrico, Rabboni Massimo, Emi Bondi, Trezzi Gaetano, Frigerio Luigi

Keywords

Pain, metacognitive beliefs, coping, endometriosis, mental health

1. Introduction

Worldwide, 176 million women suffer from endometriosis (Zondervan et al., 2018; in press). Endometriosis is a gynecological chronic condition, defined as the presence of endometrial-like tissue outside the uterus, which induces a chronic and inflammatory reaction (Kennedy et al., 2005). The disorder is known to lead to pain symptomatology (i.e. chronic pelvic pain, dyspareunia, dyschesia, low back pain, and dysmenorrhea; Dunselman et al., 2014; Vigano et al., 2004), low quality of life and severe psychological disturbances (Culley, Law, et al., 2013; Pope et al., 2015).

The main clinical manifestations of the disease are peritoneal, ovarian and deeply infiltrating endometriosis (DIE). In particular, peritoneal Endometriosis, also known as "superficial", is related to small lesions that usually relapse with medical treatments, but can reappear after cessation of medical treatment (Brosens et al., 2004). Conversely, DIE is considered the most aggressive form of endometriosis, characterized by an infiltration of more than 5 mm and lesions in rectovaginal septum, uterosacral and utero-ovarian ligaments, and muscular wall of pelvic organs (Cornillie, Oosterlynck, Lauweryns, & Koninckx, 1990). Due to severe symptomatology and high negative impact on women's lives, endometriosis has deserved the attention of a range of medical and psychological researchers as well as a political emphasis in the last years.

Pain is considered the major stressor for this population (Zarbo et al., 2017). Women with such diagnosis usually describe the pain as 'sharp', 'stabbing', 'horrendous', 'tearing', 'debilitating' and 'breath-catching' (Moradi et al., 2014). The impact of pain on women's lives is severe and it is usually accompanied by vomiting, nausea and heavy and/or irregular bleeding (Moradi et al., 2014). Nevertheless, several women tend to normalize pain periods and postpone medical help-seeking (Facchin et al., 2018). Indeed, several women seek medical help only when sufferance is extreme and endometriosis has already caused physical damages (Facchin et al., 2018).

The impact of pain is so high that several authors have suggested that is the pain symptomatology (and not the endometriosis itself) to severely affect women's life and cause distress. Indeed, the critical narrative review of Culley et al. (2013) reported that studies that compared women with chronic pelvic pain (CPP) related to endometriosis and women with chronic pelvic pain with other or unknown causes, suggested that it is the experience of pain that is associated with mental health difficulties and emotional distress. Furthermore, the study of Facchin et al. (2015) found that endometriosis patients with pelvic pain, when compared to asymptomatic endometriosis patients and healthy controls, showed poorer quality of life and mental health. Interestingly, no significant differences in quality of life and mental health were found between pain-free women with endometriosis and control group. Similarly, Cavaggioni et al. (2014) and Lorencatto et al. (2006) found a high prevalence of mental disturbances in women with CPP-related endometriosis.

Despite consensus about the role of pain on concurrent mental health outcomes seem to have been reached, to the best of our knowledge, no studies have focused on the impact of pain symptomatology to subsequent mental health outcomes in women with endometriosis. This issue represents a severe limitation of literature.

Furthermore, it should be emphasized that reported pain seems to be independent to the stage of endometriosis. Indeed, women with mild endometriosis may have intense pelvic pain while women with more severe endometriosis may show less pain (Lagana et al., 2017). These findings suggest that other factors, such as psychological and cognitive ones, may influence pain experience in women with endometriosis. For these reasons, some authors have advanced the idea that coping strategies, cognition, and beliefs could influence pain experience in women with endometriosis. Coping has been defined by Folkman and Lazarus (1984) as "the constantly changing cognitive and behavioral efforts to manage the specific external or internal demands that are appraised as taxing or exceeding the resources of the person". Therefore, coping strategies refer to the specific efforts (i.e. behavioral and cognitive) that individuals use to master, tolerate, reduce or minimize the impact of stressful events. One of the more studied coping strategy in relation to pain is catastrophization - a cognitive negative amplification of pain-related thoughts that includes rumination (i.e. thinking repetitively to pain), magnification (i.e.

concerning exaggeratedly to negative consequences of pain), and helplessness (believing that pain will not change) (Quartana, Campbell, & Edwards, 2009).

The role of coping strategies in affecting pain experience has been documented in several studies on a wide range of settings and population (see for example Keefe, Brown, Wallston, & Caldwell, 1989; Meints, Stout, Abplanalp, & Hirsh, 2016). Nevertheless, few studies have focused on coping strategies and their relationship with pain experience in women with endometriosis. Moreover, the largest part of studies has focused on catastrophization related to pain, omitting the role that other coping strategies (e.g. rumination, acceptance, refocus planning) could have in the experience of pain in this population.

On this regard, a recent review of Zarbo et al. (2017) concluded that women with CPP-related endometriosis seem to be more likely to repress emotions that control group (i.e. healthy women). Moreover, the review highlighted that suppression of emotions, pain catastrophizing and passive coping style are related to higher self-reported pain in endometriosis population. Findings of Martin et al. (2011), Carey et al. (2014) and McPeak et al. (2018) on this topic are relevant. In particular, Martin et al. (2011) suggested that catastrophization accounted for 21% of the variance of pain at baseline and significantly predicted pain at follow-up (after 1 year). Moreover, at entry and at follow-up, pain severity was more related to catastrophizing than to conventional demographic and clinical variables (Martin et al., 2011). In addition, pain catastrophizing in women with endometriosis was related to subsequent post-surgical pain outcomes (Carey et al., 2014) and concurrent reduced pain health-related quality of life, independently of pain severity and other potential confounders (McPeak et al., 2018). Furthermore, focusing on coping strategies employed by this population is relevant as it has been shown that they are related to outcomes in mental health. Indeed, coping strategies focusing on emotions, detached and rational coping styles seem to be related to better mental health, while emotional and avoidance coping styles to a poor mental status (Donatti et al., 2017; Zarbo et al., 2017).

Furthermore, the review (Zarbo et al., 2017) highlighted a lack in the literature of studies about metacognitive beliefs in women with endometriosis. In this context, the metacognitive model of Wells & Simons (2009) could provide an efficient framework by which better understand the impact of pain on women's lives and mental disturbances in this population. Indeed, own cognitions and beliefs about own worries about pain (i.e. metacognitive beliefs) could affect the way the woman cope with the stressor (i.e. the pain) and affect, indirectly, quality of life and mental health. Metacognitive beliefs are defined as "stable knowledge or beliefs about one's own cognitive system, and knowledge about factors that affect the functioning of the system" (Wells, 1995). According to the model (Wells & Simons, 2009), onset and maintenance of distress are not caused by the negative content of thoughts about stressors but are related to how the individual copes to those thoughts (i.e. his metacognitive beliefs about his own worries). Examples of metacognitions include beliefs concerning the significance attributed to some thoughts (e.g. "It is bad to think X") or beliefs about coping strategies and their impact on cognition (e.g. "Ruminating will help me find solutions to problems"). According to the theory of self-regulatory executive function (Wells & Matthews, 1996), metacognitions have a central role in the persistence of maladaptive forms of coping, which in turn contribute to the onset and maintenance of psychological disorders or distress. Indeed, the dysfunctional metacognitive system leads to the development of a Cognitive-Attentional Syndrome (CAS; Wells, 2009; Wells & Matthews, 1996), which is characterized by perseverative thinking, unnecessary conceptual processing, and attentional hypervigilance to threat. These factors lead to unhelpful coping strategies and, in turn, to psychological disorders/difficulties or distress (Wells, 2000, 2009).

To date, metacognitive beliefs have been assessed in a wide range of populations (e.g. patients with cancer, gastrointestinal disorders, or pain). Previous studies on patients with cancer, have found that both positive and negative beliefs about worry are related to greater fear of recurrence of the pathology (Butow et al., 2015) as well as to symptoms of anxiety, depression, distress and Post-Traumatic Stress Disorder (PTSD; Cook et al., 2015; Quattropani et al., 2016). Furthermore, meta-cognitive beliefs about worry have been associated with both self-reported pain behavior and pain catastrophizing (Spada et al., 2016).

Concluding, in order to overcome existing limitations of literature, the main aims of this research study were: a) to assess differences in quality of life, mental health (i.e. trait worry, depression, sexual distress), coping strategies and metacognitive beliefs between women with low-pain endometriosis, women with high-pain endometriosis, and healthy women; b) to assess the role of pain (high vs low) on changes across time in quality of life and mental health (i.e. depression and sexual distress) in women with endometriosis; c) to assess the predictive value of metacognitive beliefs on mental quality of life, depression and sexual distress outcomes after 3 months, controlling for previous scores and pain symptomatology.

2. Material and methods

2.1. Participants and procedure

From December 2016 to April 2018, women with a diagnosis of endometriosis were recruited in a hospital of north Italy to take part to this longitudinal case-control study. We included women with a diagnosis of endometriosis, without past or concurrent neurological and psychiatric disorders or severe medical conditions, and able to write and read in the Italian language. Sixty women that met inclusion criteria were enrolled in the department of obstetrics and gynecology or in the outpatient clinic. During the enrolment phase (T0), women with endometriosis completed a series of self-report questionnaires and had a clinical interview with a trained psychologist and a gynecologist. The psychologist did a structural interview in order to collect sociodemographic information and data related to current and past psychiatric or neurological disorders, as well as assist participants in the compilation of questionnaires. The gynaecologist was responsible for the gynecological examination and for collecting information about the disorder (i.e. symptomatology, previous treatments, localization, etc.).

After three months (T1), women with endometriosis were contacted again to complete again some questionnaires. Twenty-five women accepted to participate to the second evaluation. Basing on their clinical history and gynecological examinations, from T0 to T1, women with endometriosis received specific treatments. In particular, 10 (40%) of them received only hormonal treatment, 3 (12%) of them did only a surgical treatment, 10 (40%) of them received both hormonal and surgical treatments, and 2 (8%) of them received no treatment.

At T0, the group of women with endometriosis was compared to a control group of sixty-two healthy women, matched for age, that met the following inclusion criteria: having not a chronic gynaecological disorder, not reporting past or concurrent neurological and psychiatric disorders or severe medical conditions, and being able to write and read in Italian language. Sociodemographic and clinical information of women with endometriosis (N=60) and control group (N=62) at T0 are shown in Table 1.

The study was conducted in accordance with APA (1992) ethical standards for the treatment of human experimental volunteers; each participant provided consent in compliance with the Declaration of Helsinki (2013). The study was accepted by the Ethical Committee of Papa Giovanni XXIII Hospital in Bergamo (Italy).

Sociodemographic Information	**Endometriosis Group**	**Control Group**
Age: mean (*SD*)	36.98 (8.32)	33.92 (9.4)
range	21 – 53	24-54
Education: *n*		
Middle Schools	18	4
High Schools	30	22
Bachelor's Degree	8	10
Master's Degree	2	23
Postgraduate/PhD Degree	1	2
Other	1	1
Marital Status: *n*		
Engaged	7	17
Married	31	17
Common Law	8	11
Single	12	12
Separated	2	1
Divorced	0	3
Widow	0	1
Profession: *n*		

Student	2	11
Employed full-time	27	23
Employed part-time	15	11
Self-employed	5	12
Unemployed	11	5
Child: *n*		
No	36	41
Smoke: *n*		
No	45	43
Clinical information		
Endometriosis type: *n*		
Superficial endometriosis	30	
Deep endometriosis	12	
Both superficial and deep endometriosis	13	
Adenomyosis involvement	5	
Pelvic pain*: *n*		
No	23	
Dysmenorrhea*: *n*		
No	17	
Not having menstruation	8	
Dyspareunia*: *n*		
No	29	
Not having sex intercourse	4	
Evacuation pain*: *n*		
No	42	
Urination pain*: *n*		
No	49	
Backache*: *n*		
No	26	
Time spent since diagnosis^: mean (*SD*)	51.45 (73.46)	
Time spent since symptoms onset^: mean (*SD*)	66.83 (87.39)[a]	
Past Treatment for Endometriosis: *n*		
Medical Treatments	20	

Surgical Treatments	6
Both Medical and Surgical Treatments	24
None	10
Hormonal treatment*: *n*	
No	29 [b]

Table 1. Sociodemographic and clinical characteristics of women with endometriosis (N=60) and control group (N=62) at T0
* in the last 3 months
^ in months
[a] 54 cases
[b] 56 cases

2.2. Instruments

Sociodemographic and clinical information (about endometriosis or other medical conditions) were collected by means of a structured interview by a gynecologist and a psychologist. Quality of life, mental health (i.e. trait worry, depression, sexual distress), coping strategies, metacognitive beliefs, and pain symptomatology were collected by means of validated self-report questionnaires.

SF-12 Health Survey (Gandek et al., 1998; Kodraliu et al., 2001) is a 12 item self-report questionnaire that allows the evaluation of the quality of life in several domains. Physical Component Scale (PCS) and Mental Component Scale (MCS) are the two main scales that assess, respectively, the physical and mental domain of quality of life. Both original and Italian versions of the scale showed good validity. In this study, it was administered at endometriosis group and control group at T0, and at endometriosis group at T1.

Short-Form McGill Pain Questionnaire (SF-MPQ; Melzack, 1987) is a self-report scale for the evaluation of pain severity that includes 15 items and two subscales: Affective subscale and Somatic subscale. Moreover, a total score can be obtained by summing all items. Pain intensity for each adjective related to pain experience is assessed in a scale from 0 (none) to 3 (severe). The scale, in this study, was completed by women with endometriosis at both T0 and T1.

Patient Health Questionnaire 9 items (PHQ9; Mazzotti et al., 2003; Spitzer, Kroenke, & Williams, 1999) is a brief self-report questionnaire for the evaluation of major depressive symptoms basing on DSM-IV criteria. Cut-off points allow discriminating stage of depressive symptomatology (i.e minimal, minor, moderately severe, and severe depression). High sensitivity and specificity (88%) for major depression has been found in the original version of the scale. In this study, women with endometriosis completed PHQ9 at both T0 and T1, while the control group completed it only at T0.

Penn State Worry Questionnaire (PSWQ; Meyer, Miller, Metzger, & Borkovec, 1990; Morani, Pricci, & Sanavio, 1999) is a self-report questionnaire including 16 items that allows the assessment of worry traits. Borkovec, Robinson, Pruzinsky, and DePree (1983) defined "worry" as a chain of thoughts or images, burdened by negative emotions and relatively uncontrollable. The worry process is an attempt to engage in mental problem-solving on a question of uncertain outcomes. The PSWQ is a trait measure, indeed it concerns the habit of worrying in general regardless of moments in time, regardless of the circumstances. The total score of the scale ranges from 16 to 80. Both the original version and the Italian validation showed good internal consistency (Meyer et al., 1990; Morani et al., 1999). In this study, both women with endometriosis and healthy ones completed PSWQ at T0.

Female Sexual Distress Scale-R (FSDS-r; Derogatis et al., 2008) is a 13-item self-report questionnaire that assesses distress related to sexuality over the previous 7 days. Sexual distress can be diagnosed when the FSDS-R total score is higher than 11. The scale demonstrated a high degree of internal consistency, as well as good discriminant validity and test-retest reliability (Derogatis et al., 2008). In this study, women with endometriosis completed FSDS-r at both T0 and T1, while the control group completed it only at T0.

Cognitive Emotion Regulation Questionnaire – Short Version (CERQ-short; Garnefski & Kraaij, 2006) is a self-report multidimensional scale that includes 18 items aiming at assessing coping strategies in term of individuals' thoughts after having experienced a negative event. Cognitive coping strategies refers to rather stable styles of dealing with negative life events.

The scale includes nine subscales, which are: a) Self-blame refers to thoughts of blaming for what has been experienced; b) Acceptance, referring to thoughts of resigning; c) Rumination, referring to thinking all the time about the feelings and thoughts associated with the negative event; d) Positive Refocusing, which refers to thinking of other, pleasant matters instead of the actual event; e) Refocus on Planning refers to thinking about what steps to take in order to deal with the event; f) Positive Reappraisal refers to attaching a positive meaning to the event in terms of personal growth; g) Putting into Perspective, which refers to thoughts of playing down the seriousness of the event when compared to other events; h) Catastrophizing, referring to explicitly negatively emphasizing the experience; i) Other-blame, referring to thoughts of putting the blame on others. Each scale could obtain a score ranging from 4 to 20. A higher score in each scale suggests the higher presence of that cognitive coping strategy. The scale has demonstrated good reliability and validity (Garnefski & Kraaij, 2006). In this study, both women with endometriosis and healthy ones completed the scale at T0.

Meta-Cognitions Questionnaire (MCQ-30; Cartwright-Hatton & Wells, 1997; Quattropani et al., 2014) is a 30-item self-report scale for the assessment of metacognitive beliefs. The scale is divided into five subscales, which are: (1) “positive beliefs” about worry, which assesses the thoughts about the beneficial effect of worrying (e.g. for avoiding problems, or remaining organized); (2) “negative beliefs” about uncontrollability of thoughts and corresponding danger, which includes items about the importance of controlling one's thoughts in order to prevent dangers related to uncontrol; (3) “cognitive confidence”, which refers to lack of self-confidence in one's memory and attention; (4) “Need to control thoughts”, which concerns ideas of superstition and punishment related to some thoughts; (5) “cognitive self-consciousness”, which refers to items reflecting the tendency to be aware of and monitor thinking. The scale includes also a total score that indicates the stage of metacognitive beliefs. The Italian version of the MCQ-30 (Quattropani et al., 2014) demonstrated good psychometric properties, satisfactory internal consistency, and convergent validity, as well as a good test-retest reliability. In this study, both women with endometriosis and healthy ones completed MCQ30 at T0.

2.3. Statistical Analyses

Preliminary analyses were performed to ensure no violation of the assumption of normality. In order to reach our first aim (i.e. assessing differences in quality of life, mental health, coping strategies and metacognitive beliefs between women with low-pain endometriosis, women with high-pain endometriosis, and healthy women) we performed a one-way between-groups multivariate analysis of variance (MANOVA). Low and high pain groups were shaped based on the median score on MPQ total score. The dependent variable was the group: endometriosis women with low pain (LP), endometriosis women with high pain (HP), control group (CG). Independent variables were psychological and cognitive scores. Effect sizes were evaluated using Partial $\eta 2$ and interpreted according to the guidelines (small > .01; medium > .06; large > .14; Leech, Barret, & Morgan, 2005). Tukey HSD was applied for post-hoc group comparisons.

Then, in order to assess our second aim about the effect of pain group on change in psychological condition across times in women with endometriosis, we performed a Repeated Measures ANOVA (RMANOVA) on each index. Factor was the group of pain at T0 (Low pain; high pain), while dependent variables were T0/T1 quality of life, T0/T1 depression, and T0/T1 sexual distress. Post-Hoc comparisons were performed using Fisher LSD.

Finally, to assess our third aim regarding the predictive value of MCQ30 at T0 to subsequent (after three months) mental quality of life, depression and sexual distress in women with endometriosis, we performed Hierarchical multiple regressions. Therefore, we inserted – respectively- T1_MCS, T1_PHQ9, T1_FSDS as dependent variables. T0_MPQ and - respectively - T0_MCS, T0_PHQ9, T0_FSDS were inserted in Block 1 to be controlled. T0_MCQ30 was inserted at block 2 as a predictor.

All statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS) version 23.0 and STATISTICA. All statistical tests were two-sided; a p-value $\leq .05$ was considered significant.

3. Results

Standardized scores and box plots were used to identify univariate outliers. Variables with values +/- 3.29 *SD* from the mean were considered outliers. Outlier values were brought into range according to Tabachnick and Fidell (2007). Normality of each group was assessed for each variable by examining box-plots, stem and leaf plots, histograms, and skewness and kurtosis values. Results revealed no issues with normality. Missing data were not imputed and were treated as missing.

One-way between-groups multivariate analyses of variance (MANOVAs) was performed to investigate differences in quality of life, mental health, coping strategies and metacognitive beliefs in three groups (i.e. LP; HP; CG). Analyses revealed a significant effect of group for PCS, PHQ9, PSWQ, FSDS-r, Refocus planning, Positive reappraisal, and Catastrophization. Tukey HSD post-hoc comparisons evidenced that HP group had significantly: a) lower scores on PCS than both LP group and CG; b) higher scores on PHQ9, FSDS-r, and Catastrophization than CG. LP group had significantly: a) lower scores on PCS, PSWQ, Positive reappraisal, and Refocus planning than CG; b) lower scores on PSWQ than HP group. No significant differences among groups were found for MCS, Self-blame, Acceptance, Rumination, Positive Refocusing, Putting Perspective, Other blame, MCQ30_POS, MCQ30_NEG, MCQ30_CC, MCQ30_CSC, and MCQ30 total score. All means, standard errors, F values, Partial $\eta^{2,}$ and significance levels are reported in Table 2.

Variables	**Low Pain** (N = 30)	**High Pain** (N = 30)	**Control Group** (N = 62)	**F value**	***p* value**	***Partial* η^2**	
T0_PCS	47.74 (9.85)	41.79 (9.02)	53.84 (4.69)	27.787	< .001*	.32	*a. b. c*
T0_MCS	44.09 (11.08)	40.34 (9.79)	45.51 (9.12)	2.826	.063	.05	
T0_PH9	5.5 (4.45)	7.1 (4.24)	4.27 (3.38)	5.422	.006*	.08	*c*
T0_PSWQ	42.57 (11.83)	48.87 (10.88)	49.13 (7.81)	5.043	.008*	.08	*a. b*
T0_FSDS-r	8.53 (10.85)	14.8 (15.76)	6.71 (7.90)	5.520	.005*	.08	*c*
T0_SelfBlame	4.1 (1.84)	3.83 (2.15)	4.63 (1.75)	2.050	.133	.03	
T0_Acceptance	6.67 (2.07)	7.23 (2.31)	6.5 (1.99)	1.249	.290	.02	
T0_Rumination	5.97 (2.27)	5.9 (2.19)	5.59 (1.80)	.430	.651	.01	
T0_PositiveRefocusing	5.23 (1.98)	5.2 (1.99)	4.68 (1.77)	1.259	.288	.02	
T0_RefocusPlanning	5.8 (1.80)	6.53 (2.34)	6.87 (1.65)	3.079	.050*	.05	*b*
T0_PositiveReappraisal	6.7 (2.38)	7.13 (2.59)	7.85 (1.83)	3.120	.048*	.05	*b*
T0_PuttingPerspective	7.17 (2.11)	7.27 (2.10)	6.31 (2.13)	2.825	.063	.05	

T0_Catastrophizing	4.47 (2.21)	4.87 (2.60)	3.61 (1.09)	5.267	.006*	.08	*c*
T0_Otherblame	3.03 (1.67)	3 (1.55)	3.66 (1.43)	2.727	.070	.04	
T0_MCQ30_POS	9.1 (3.58)	10.23 (4.77)	10.53 (3.69)	1.346	.264	.02	
T0_MCQ30_NEG	13.7 (3.94)	14.9 (3.74)	14.05 (3.24)	.936	.395	.02	
T0_MCQ30_CC	10.2 (3.73)	9.73 (3.79)	9.40 (3.71)	.465	.629	.01	
T0_MCQ30_NC	12.3 (3.37)	11.77 (3.63)	10.92 (3.52)	1.706	.186	.03	
T0_MCQ30_CSC	17.27(3.30)	15.93(4.13)	16.05 (3.06)	1.549	.217	.03	
T0_MCQ30_TOT	62.57(12.28)	62.63(11.98)	61 (10.41)	.307	.736	.01	

Table 2. Means and standard deviations. *F* value and *p* values of univariate tests between patients with Low pain (LP). High Pain (HP). and control group (CG) for all psychological characteristics.

[a] $p < 0.05$ LP vs HP
[b] $p < 0.05$ LP vs CG
[c] $p < 0.05$ HP vs CG

Then, RMANOVAs were conducted to assess the impact of the group (T0 low-pain endometriosis; T0 high-pain endometriosis), on PCS, MCS, PHQ9, and FSDS-r scores, across two times periods (T0 and T1). Analyses revealed no significant interaction between scores across time and group for PCS, MCS, and FSDS-r. Conversely, there was a substantial main effect for PHQ9 * Pain group, Wilks' Lambda = .83, *F* (1, 22) = 4.59, *p* < .05, partial eta squared = .173. The main effect comparing the two groups on the base of pain at T0 was significant, *F* (1,22) = 4.55, *p* = .043, partial eta squared = .171, suggesting a difference in depressive outcomes in the two groups of pain. Fisher LSD post-hoc comparisons suggested that at T0 groups were similar in the PHQ9 score. After three months, women in LP group significantly reduced depressive symptomatology, while the PHQ9 score of women in HP group remained rather similar across time. Furthermore, differences between groups grew at T1. Indeed, after 3 months, depressive scores of women in LP group were significantly lower than those of women in HP group (at both T0 and T1) (see Table 3, Figure 1).

		Low pain T0_PH9	**Low Pain T1_PH9**	**High Pain T0_PH9**	**High Pain T1_PH9**
		(5.0)	**(2.92)**	**(6.83)**	**(7.25)**
Low pain	**T0_PH9**	/	0.020519*	0.253168	0.163164
Low pain	**T1_PH9**	0.020519*	/	0.018719*	0.010014*
High pain	**T0_PH9**	0.253168	0.018719*	/	0.622511
High pain	**T1_PH9**	0.163164	0.010014*	0.622511	/

Table 3. Fisher LSD post-hoc repeated measures ANOVA for depression (T0, T1) and group (Low pain, High pain)

MS = 14.837, df = 29.022

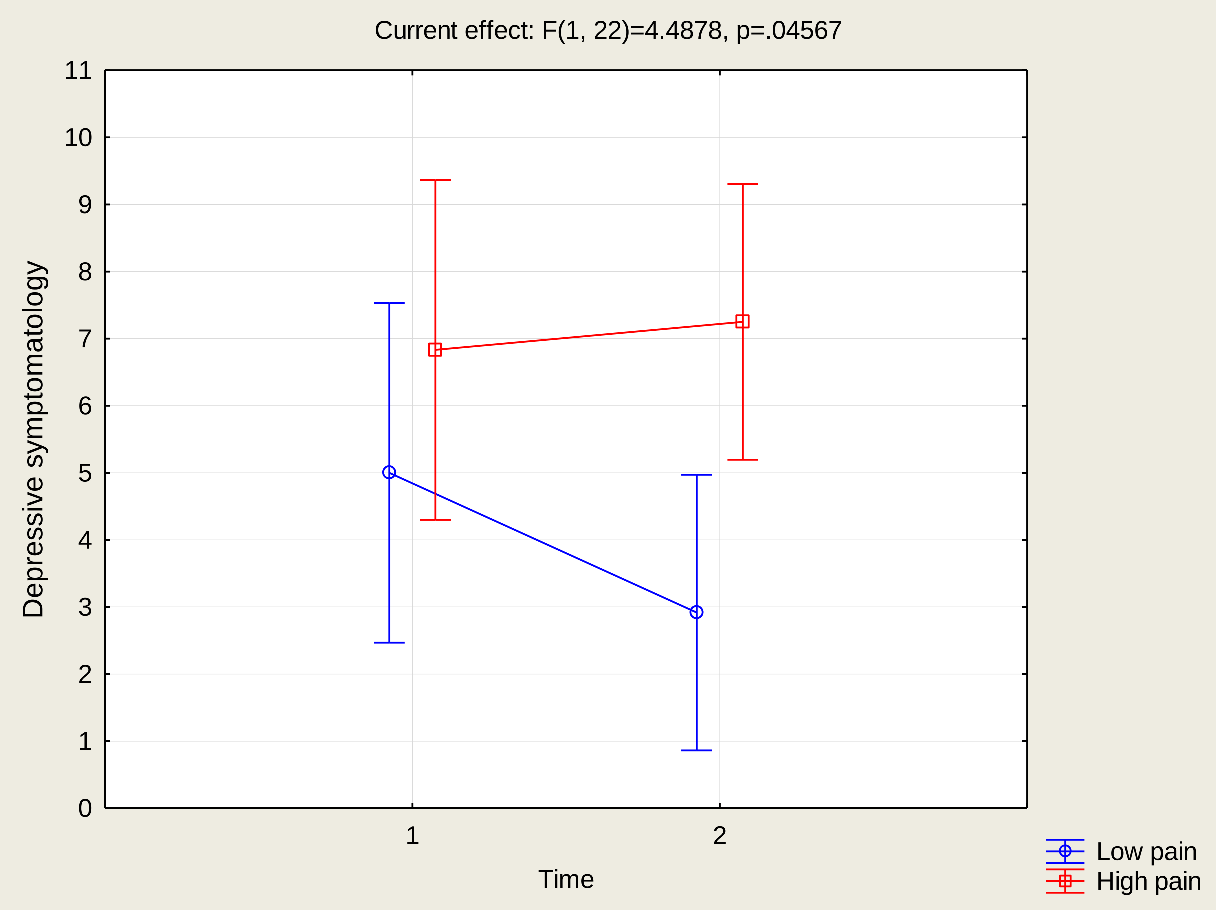

Figure 1. Repeated Measure ANOVA. Changes in depressive symptomatology between pain groups.

Finally, Hierarchical multiple regressions were used to assess the ability of MCQ30 at T0 to predict levels of subsequent PHQ9, FSFS-r, MCS at T1, controlling for T0_MPQ and – respectively - for T0_PHQ9, T0_FSDS-r, T0_MCS (See Table 4). Our results showed no significant effect of MCQ30 in the prediction of PHQ9 and MCS, while a significant effect has been found for FSDS-r. Indeed, results showed that T0_FSDS-r and T0_MPQ inserted at block 1 explained 55% of the variance in T1_FSDS-r. After entry T0_MCQ30 at block 2, the total variance explained by the model as a whole was 64%, *F* (3, 20) = 11.58, *p* < .000. Therefore, T0_MCQ30 explained an additional 8% of the variance in sexual distress, after controlling for FSDS-r and pain severity at T0, R squared change = .088, *F* change (1, 20) = 4.83, *p* = .04. In the whole model, both T0_FSDS (*beta*= .755, *p* < .001) and T0_MCQ30 (*beta*= .380, *p* .040) significantly predicted subsequent sexual distress severity at T1. Conversely, in the full model, pain severity did not predict FSDS at T1.

Variables	**β**	**t**	***p***	**Partial R**
Block 1 (R^2 = .546)				
T0_FSDS-r	.759	4.634	.000*	.711
T0_MPQ	- 0.47	- .286	.778	- .062
(Constant)		1.311	.204	
Block 2 (R^2 = .635)				
T0_FSDS-r	.720	4.754	.000*	.728
T0_MPQ	-.042	-.282	.781	-.063
T0_MCQ30	.299	2.198	.040*	.441
(Constant)		-1.728	.099	

Table 4. Multiple linear regression analyses for Sexual distress at T1

FSDS-r: Female Sexual Distress Scale; MPQ: McGill Pain Questionnaire; MCQ30: Metacognitive Questionnaire

4. Discussion

Our findings suggested that pain plays an important role in affecting different domains of quality of life and mental health in women with endometriosis and that a strict relationship between pain severity and worry trait/catastrophization seem to exist. Furthermore, results showed that, across time (i.e. after 3 months), the relationship between pain severity and quality of life/mental health is maintained only for depressive symptomatology. Indeed, we found that: a) only group of women with low pain endometriosis have a significant reduction of depressive symptomatology after 3 months;

b) after 3 months, women with previous high pain have significantly more depression severity than women with previous low pain. Furthermore, our findings showed that metacognitive beliefs seem to be significant predictors of subsequent sexual distress, over and above previous pain symptomatology and sexual distress score. These findings confirmed in part previous literature, while in part added significant novelty to current research on this population and lead to important clinical implications.

Pain severity matters: the relationship between pain and quality of life, sexual distress and depression

Firstly, we found that women with high-pain endometriosis had lower physical quality of life than both low-pain endometriosis and control group. Similarly, women with low-pain endometriosis showed lower physical quality of life than healthy women. Moreover, sexual distress and depression were higher in women with high-pain endometriosis than in the control group. Differences found between low pain, high pain, and control group confirmed previous studies of Cavaggioni et al. (2014), Lorencatto et al. (2006), Souza et al. (2011) and Facchin et al. (2015). Indeed, in previous studies, pain has been suggested to play an important role in affecting the quality of life and mental health (e.g. depression, anxiety) of women with endometriosis. However, this is the first study that compared three groups (low-pain endometriosis, high-pain endometriosis, healthy women) on quality of life, worry traits, depressive symptomatology, and sexual distress.

Moreover, even if the quality of life and depression have been widely investigated in women with endometriosis, - as well as in relation to pain and compared to healthy population - sexual distress in this population has never been studied in these circumstances. Indeed, few studies have focused on the concept of “sexual distress” (i.e. sexually related personal distress) in this population. The study of Fritzer et al. (2013) found statistically significant correlations between sexual dysfunctions and sexual distress (high feelings of guilt towards the partner, and few feelings of feminity). Our study suggested a role of pain severity in affecting concurrent sexual distress.

We found that women with a high level of pain have higher sexual distress and depressive symptomatology than healthy participants. Interestingly, these differences were not found between women with low-pain and healthy ones, as well as between high-pain and low-pain women with endometriosis. Indeed, healthy women and women with low-pain endometriosis seem to have similar levels of sexual distress and depressive symptomatology. Our findings lead us to hypothesize that is the severity of pain and not the presence of endometriosis itself, that could play a key role in affecting concurrent sexual distress and depressive symptomatology.

Worry trait is related to the perception of pain

Interestingly, we found higher levels of worry traits in endometriosis women with high pain than in those with low pain. Personality traits (and their relationship with painful symptoms) in women with endometriosis have been few investigated previously. The study of Sepulcri and Do Amaral (2009) found a positive correlation between anxious trait and pain-intensity. Moreover, studies on personality factors suggested that personality could affect the expression of pain in women with endometriosis (Facchin et al., 2016; Gomibuchi et al., 1993). Indeed, women without dysmenorrhea tended to be less assertive compared with women who complained of dysmenorrhea and healthy women (Gomibuchi et al., 1993). Similarly, women with painful endometriosis had lower novelty seeking compared with the control group and higher harm avoidance and lower exploratory excitability and responsibility compared with the pain-free endometriosis group, as well as higher fatigability compared with the pain-free endometriosis group and the control group (Facchin et al., 2016).

The relationship between worry/anxiety traits and the experience of pain has been documented in studies in a wide range of populations and settings (Babel, 2017; Dilek et al., 2012; Greszta & Sieminska, 2008; James & Hardardottir, 2002; Moosbrugger & Schermelleh-Engel, 1991). For example, Dilek et al. (2012) found that patients with anxious personality have a higher risk of developing a pain syndrome after two months from the fracture of the distal radius. Moreover, individuals with high trait anxiety seem to be less pain tolerant than individuals with low trait anxiety (James & Hardardottir, 2002).

Interestingly, our findings lead us to suggest a role of worry traits in affecting perceived pain in women with endometriosis. In the last decades, different hypotheses (cognitive and neurophysiological) have been advanced about the link between anxiety and pain experience. According to the biopsychosocial model of chronic pain and disability, the experience of pain is the result of a dynamic interaction between physiological, psychological, and social factors. Personality traits contribute to the process of pain chronification by making people more vulnerable to respond to pain in an anxious and avoidant style (Peters & Vancleef, 2008). Moreover, neurophysiological mechanisms including the role of periaqueductal grey, amygdala, anterior cingulate cortex (ACC) and anterior insula could play a role in mediating this relationship (Wiech & Tracey, 2009).

The relationship between pain experience and coping strategies

Our results suggested interesting differences between groups as regards certain types of coping strategies. In particular, women with high-pain endometriosis showed higher catastrophization than the control group. Moreover, women with low-pain endometriosis showed lower scores on positive reappraisal and refocus planning than the control group.

Previous findings have suggested that suppression of emotions, pain catastrophizing and passive coping style seem to be related to higher self-reported pain in endometriosis population (Zarbo et al., 2017). Martin et al. (2011), Carey et al. (2014) and McPeak et al. (2018) have previously highlighted the role of catastrophization in affecting pain experience in both cross-sectional and longitudinal studies.

Moreover, the link between catastrophization and pain experience has been emphasized in previous studies on different population and settings. On this regard, former studies have suggested that catastrophizing might have a significant impact on pain perception via a specific negative appraisal to stimuli. According to the schema-activation model (Sullivan et al., 2001), individuals who exaggerate the threat value of pain stimuli or pain sensations will likely increase their attentional focus on the pain. Indeed, catastrophizers have the tendency to process preferentially pain-related information and interpret even ambiguous sensation as painful.

Furthermore, this is the first study that assessed a wide range of coping strategies on women with endometriosis on the base of pain severity and compared to healthy women. Interestingly, we found a deficit in positive cognitive coping strategies (i.e. refocus planning and positive reappraisal) in women with low-pain endometriosis than in healthy participants. However, this difference seems to be statistically low. These results are significant if we consider the well-known role of coping strategies in influencing the quality of life and mental health. Promoting these strategies should be one of the aims of the medical team.

Pain severity affects 3-months follow-up depressive symptomatology

Furthermore, this is the first study that focused on the impact of pain symptomatology on subsequent mental health outcomes in women with endometriosis (i.e. after 3 months). In particular, we found that pain symptomatology has an effect on concurrent quality of life and mental health. However, this effect seems to be not maintained across time for each variable. Indeed, change in the mental quality of life, physical quality of life, and sexual distress seem to be not related to previous pain severity. However, change across time in depressive symptomatology seems to be related to previous pain experience. In particular, depressive symptomatology in women with low pain decreased significantly after 3 months. Moreover, after 3 months, women in the low pain group had significantly lower depression than those in the high pain group. Therefore, the previous low pain seems to be related to better remission of depressive symptomatology, while high pain seems to be related to higher both concurrent and subsequent depression. These results are particularly significant because highlighted the importance of pain severity in affecting depression outcomes also longitudinally.

Metacognitive beliefs predict sexual distress after three months over and above the pain

Our findings showed that controlling for pain score at baseline and the previous score in sexual distress, metacognitive beliefs significantly predicted sexual distress severity after 3 months. Therefore, results suggested that cognitions and beliefs about own worries play the most important role in predict subsequent sexual distress, over and above pain severity. According to the model of Wells & Simons (2009), we can suggest that metacognitive beliefs about own worries affect sexual distress passing through the influence of coping strategies. In other words, beliefs about own worries may lead to a dysfunctional way to cope with stressors (i.e. catastrophizing, ruminating about own problems), and, indirectly to the onset and maintenance of distress. This is the first study that assessed metacognitive beliefs in a longitudinal study in women with endometriosis and in relation to sexual distress.

5. Conclusions

Concluding, to the best of our knowledge, this is the first case-control longitudinal study assessing not only the relationship between pain and mental condition but focusing also on metacognitive beliefs and coping strategies. Limitations of this study include small sample size at follow-up, short-term follow-up (i.e. after 3 months) and lack of control for specific medical conditions (i.e. surgery, medication, stage) occurring at T0 and between T0 and T1. These conditions have been assessed and reported but control was not possible due to the high heterogeneity of the sample and the complexity of endometriosis. Endometriosis represents a complex condition, in which control of each of such medical categories would request a bigger sample size and a forced-categorization of a series of variables.

Despite these limitations, findings of this study arise significant conclusions and clinical implications about the role of pain, worry traits, coping strategies and metacognitive beliefs in women with endometriosis. Indeed, despite literature is full of studies about the importance of pain in affecting the quality of life and mental health of women with endometriosis, this study added significant conclusions. We can assert that the role of pain in affecting the quality of life and mental health is surely significant and requests a specific attention from the medical team. However, our results suggested that coping strategies (in particular, catastrophizing) and worry traits could affect the way women experience pain. Therefore, women who usually catastrophize or show worry traits are more likely to experience higher pain. Furthermore, longitudinally, metacognitive beliefs seem to play a significant role in predicting sexual distress over and above pain. These findings have important clinical implications for the medical team. In addition to pain assessment and treatment, the medical team should keep into account personality traits, reinforce positive coping strategies as well as reduce negative coping strategies (i.e. catastrophization) and metacognitive beliefs. Cognitive-Behavioral support treatments based on the treatment of these issues are suggested to improve quality of life and mental health of women with pain-related endometriosis.

6. Compliance with ethical standards

The authors declare that they have no conflicts of interest. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study.

Perfectionistic traits and importance given to parenthood are associated with infertility-related quality of life in a sample of infertile women with and without endometriosis[3]

Abstract

Objective: To assess the quality of life and psychological differences between infertile women with endometriosis and without endometriosis. To investigate the predictive role of perfectionism, mindful awareness and beliefs about parenthood to the quality of life in a sample of women with fertility problems.

Methods: 43 infertile women (22 with endometriosis; 21 without endometriosis) who recurred to Assisted Reproductive Treatments (ARTs) in the last 12 months took part in this cross-sectional study. Sociodemographic and clinical data were collected by means of a structured ad hoc questionnaire. Fertility Quality of Life, Fertility Problem Inventory – Need of parenthood subscale, Obsessive Beliefs Questionnaire – Perfectionism subscale, and Cognitive and Affective Mindfulness Scale-Revised were used to assess target outcomes.

Results: Any difference in the quality of life and psychological condition was found between infertile women with and without endometriosis. Importance given to parenthood (*beta* = - .60, p < .001) and perfectionism (*beta* = - .30, p < .05) predicted quality of life related to fertility issues, independently of group.

Conclusions: Infertility might elicit self-discrepancy between real-self (i.e. being infertile) and ideal-self (being fertile), which in turn has a negative impact on quality of life. Conclusions about the role of the psychologist in ART's team are discussed.

---

[3] Article published in *Sexual & Reproductive Healthcare* (2018).
Cite as: Zarbo, C., Brugnera, A., Compare, A., Candeloro, I., Secomandi, R., Betto, E., Fusi, F, Marabini, R., Malandrino, C., Carnelli, M., Trezzi, G., Bondi, E., Rabboni, M., Frigerio, L. (2018). Perfectionistic traits and importance given to parenthood are associated with infertility-related quality of life in a sample of infertile women with and without endometriosis. Sexual & Reproductive Healthcare, 17, 86-90.

Keywords

Endometriosis, infertility, mindfulness, perfectionism, quality of life, beliefs

1. Introduction

Worldwide, the belief that motherhood is the highest social roles that a woman can reach is fixed in identities, and maternity is still considered the main milestone of female adult development (Ireland, 1993). Infertility refers to the inability or failure to conceive after regular unprotected sexual intercourses for at least 12 months (World Health Organization, 2002).

Among women with infertility, about 50% of them have received a diagnosis of endometriosis (Practice Committee of the American Society for Reproductive, 2012), a gynecological disabling condition characterized by endometrial tissue outside the uterus. Endometriosis is a chronic condition known to lead to pain symptomatology, like chronic pelvic pain, dyspareunia, dyschesia, low back pain, dysmenorrhea (Vigano et al., 2004), low quality of life and high psychological disturbances (Culley, Law, et al., 2013; Pope et al., 2015; Vitale, La Rosa, Rapisarda, & Lagana, 2017). In particular, several studies have found high levels of anxiety, depression, somatization, and other psychiatric disorders as well as sexual dysfunctions in this population (Evangelista et al., 2014; Lagana et al., 2015; Lagana et al., 2017). Moreover, a range of studies have suggested that the chronic pain itself could be one of the major causes of psychological disturbance of women with endometriosis (Facchin et al., 2015; Lagana et al., 2017), and that the experience of pain could be negatively influenced by the presence of anxiety/depression (Lagana et al., 2017) and dysfunctional coping strategies (Zarbo et al., 2017).

Experiencing infertility and undergoing Assisted Reproductive Treatments (ARTs) have been related to several psychological disturbances, such as depression, anxiety, sexual distress, couple's relational problems, and loss of control (Chen et al., 2004; Cousineau & Domar, 2007; Maroufizadeh et al., 2015; Peterson et al., 2007). However, even if psychological burden related to infertility was overstudied in years, very few studies focused on the role of beliefs and personality traits. Previous studies have found that beliefs of parenthood are central in man's lives when the couple undertakes infertility treatments (Donarelli et al., 2015) and that ART path is harder for those couples who attribute higher importance to become parents (Moura-Ramos, Gameiro, Canavarro, Soares, & Almeida-Santos, 2016). Moreover, perfectionism, a personality trait characterized by striving for flawlessness, setting high-performance standards, critical self-evaluations and concerns regarding others' evaluations, was found to lead to more stress in a sample of infertile women (Sharbaf et al., 2014).

Furthermore, despite the well-known association between endometriosis and infertility, few studies have specifically focused on the investigation of the psychological burden due to the combination of the two conditions. Indeed, a recent systematic review concluded that there is an inadequate investigation of women's experiences of endometriosis-associated infertility (Young et al., 2015). Limited literature on this topic suggested that: a) infertile women with endometriosis (especially those in advanced stages) have higher depression, stress, and anxiety, as well as decreased quality of life than infertile ones without endometriosis (Siedentopf et al., 2008); b) women with severe endometriosis who searched for a child and failed seem to have worse quality of life, less vitality and higher limitations due to emotional problems when compared to women with endometriosis who gave birth to a child (Betto et al., 2017). According to limited literature, infertile women with endometriosis require specific medical and psychological attention than those without endometriosis. From the medical point of view, the integrated approach should be the gold standard treatment for patients affected by endometriosis-associated infertility (Šalamun et al., 2018). Moreover, due to the difficulty of management, it is important to provide a multidisciplinary approach that allows reducing the impact on psychological and emotive well-being (Vitale, La Rosa, Rapisarda, & Laganà, 2017).

Concluding, in order to overcome existing limitations of literature, the main aims of this research study were: a) to assess psychological and quality of life differences between infertile women with endometriosis and infertile women without endometriosis; b) to investigate the role of endometriosis, beliefs and attitudes about own identity as mother (i.e. importance given to parenthood), psychological traits (e.g. perfectionism) and cognitive abilities (e.g. mindful awareness) in explaining quality of life related to infertility.

2. Material and methods

2.1. Participants and procedure

From July 2017 to February 2018, infertile women who underwent ARTs in the last 12 months were recruited from a hospital in north Italy and from social networks to take part to this pilot study. We included women with and without a diagnosis of endometriosis, who recurred to ART in the last 12 months, without past or concurrent neurological and psychiatric disorders or severe medical conditions, and able to write and read in the Italian language.

Women affiliated with the hospital were contacted by a researcher by telephone and invited to participate to the study. Only 30% of them accepted to participate to the study. The presence of past or concurrent psychiatric disorders was assessed by a clinical psychologist by means of some open-ended questions. Basing on specific information reported by each participant, the psychologist established his eligibility for the study.

A total of 56 infertile women was firstly enrolled. Then, 13 of them were excluded because were pregnant or just had a child. Finally, 43 women (22 infertile women with endometriosis; 21 infertile women without endometriosis) were included in the study.

Sociodemographic and clinical information of the two groups are shown in Table 1. The study was conducted in accordance with APA (1992) ethical standards for the treatment of human experimental volunteers; each participant provided consent in compliance with the Declaration of Helsinki (2013).

	Infertile women with Endometriosis (N=22)	**Infertile women without Endometriosis (N=21)**	***p***
Sociodemographic Information			
Age: mean (*SD*)	35.73 (4.53)	36.14 (3.45)	.738
Education: *n*			.394
Middle Schools	2	2	
High Schools	9	9	
Bachelor's Degree	5	4	
Master's Degree	3	6	
Postgraduate/PhD Degree	3	0	
Marital Status: *n*			.348
Single	2	0	
Common Law	6	6	
Married	11	15	
Divorced	1	0	
Engaged	1	0	
Separated	1	0	
Occupation: *n*			.510
Employed part-time	1	4	
Employed full-time	17	13	
Self-employed	2	2	
Unemployed	2	2	
Smoking: *n*			.523
No	16	17	
Physical Activity: mean (*SD*)	2.68 (2.05)	2.29 (3.02)	.615
Endometriosis information			
Endometriosis localization: *n*			/

Ovary	20	/		
Intestine	10	/		
Urinary tract	4	/		
Rectovaginal septum	14	/		
Uterus	3	/		
Bladder	2	/		
Diaphragm	1	/		
Other sides	3	/		
Stage: *n*			/	
Stage II	1	/		
Stage III	3	/		
Stage IV	15	/		
Not known	3	/		
Pelvic pain*: *n*			/	
No	3	/		
Dysmenorrhea*: *n*			/	
No	4	/		
Not having menstruation	3	/		
Dyspareunia*: *n*			/	
No	8	/		
Not had sexual intercourse	2	/		
Dyschesia*: *n*			/	
No	11	/		
Dysuria*: *n*			/	
No	16	/		
Backache*: *n*			/	
No	4	/		
Time spent since diagnosis^: mean (*SD*)	6.23 (4.11)	/		/
Time spent since symptoms onset^: mean (*SD*)	11.67 (8.53)	/		/
Past Treatment for Endometriosis: *n*				/
Medical Treatments	1	/		
Surgical Treatments	4	/		

Both Medical and Surgical Treatments	15	/	
None	1	/	
Infertility history			
Partner infertility: *n*			.092
No	21	15	
Yes, but not serious	1	4	
Yes, serious	0	2	
Familiarity for infertility: *n*			.201
No	14	16	
Searching for pregnancy ^: mean (*SD*)	4.00 (2.02)	3.57 (1.33)	.422
ART attempts: mean (*SD*)	2.18 (1.50)	3.04 (2.50)	.174
Hormonal imbalance [a]: *n*			.734
No	15	15	
Cystic Fibrosis: *n*			.323
No	21	21	
Polycystic ovarian syndrome [b]: *n*			.169
No	17	19	
Spontaneous abortions: *n*			.255
No	18	14	
Voluntary abortions: *n*			.578
No	20	20	
Extrauterine pregnancy: *n*			.300
No	22	20	

Table 1. Sociodemographic and clinical characteristics of the two samples.

[a] Calculated on 37 participants

[b] Calculated on 41 participants

** in the last 3 months*

^ in years

2.2. Instruments

Sociodemographic and clinical information (about endometriosis or other medical conditions, and infertility history) were collected by means of a structured ad hoc questionnaire. Quality of life-related to infertility condition, perfectionistic traits, the importance given to parenthood and mindfulness awareness were assessed by means of validated questionnaires.

Fertility Quality of Life (FertiQoL; Boivin, Takefman, & Braverman, 2011) is a 36 items reliable measure that assesses the impact of fertility problems and its treatment on quality of life. It included items that measure core quality of life, treatment-related quality of life, and overall life and physical health. Items were presented on a scale of 0–4. Higher scores refer to better quality of life. In this study, we included only the FertiQoL core module (24 items), which allows the evaluation of the impact of fertility problems on emotional, mind-body, relational and social domains. The validation of scale has demonstrated good reliability and sensitivity (Boivin et al., 2011).

Fertility Problem Inventory (FPI) – Need for parenthood subscale (Donarelli et al., 2015; Newton, Sherrard, & Glavac, 1999). The original version of FPI comprises 46 items and five subscales: Social concern, Sexual concern, Relationship concern, Need for parenthood, and Rejection of childfree lifestyle. Participants reported how much they agreed or disagreed with fertility-related concerns or beliefs, on a Likert scale that ranges from zero (Strongly disagree) to six (Strongly agree). In this study, we included only the subscale “need for parenthood” (10 items) that assesses the close identification with the role of parent, parenthood as an essential life goal. The scale has demonstrated good discriminative and convergent validity.

Obsessive Beliefs Questionnaire 46 (OBQ-46) - Perfectionism subscale (Dorz, Novara, Pastore, Sica, & Sanavio, 2009). The Obsessive Beliefs Questionnaire (OBQ) is a 46 items tool developed to assess cognitive domains that seem to be central in the development and maintenance of the obsessive-compulsive disorder. The scale includes five sub-scales: Perfectionism, Responsibility for Damage, Control of Thoughts, Responsibility for Omission and Importance of Thoughts. In this study, we included only the scale of perfectionism (11 items), which assesses the need to do things perfectly, and the predisposition to perceive failures in personal terms when individual standards are not achieved. The scale has provided valid and reliable psychometric results.

The Mindfulness Attention Awareness Scale (MAAS; Brown & Ryan, 2003; Veneziani & Voci, 2015) is a 15 items scale that assesses the tendency to be mindful of moment-to-moment experience. Participants refer how frequently they experience the state described in each statement, using a 6-point Likert scale ranging from 1 (almost always) to 6 (almost never). High scores reflect better mindfulness ability. The MAAS have good psychometric properties.

2.3. Statistical Analyses

Preliminary analyses were performed to ensure no violation of the assumption of normality, linearity, multicollinearity, singularity, homoscedasticity, and independence of residuals. First, we calculated chi-square and t-test for independent samples to assess differences between groups (infertile with endometriosis; infertile without endometriosis) on target variables (i.e. sociodemographic, clinical and psychological). Pearson and Spearman's correlations were done to assess relationships between sociodemographic/clinical data and quality of life-related to infertility. Furthermore, hierarchical multiple regressions were done to investigate the predictive role of psychological variables (i.e. importance to parenthood, perfectionism, mindful awareness) to the infertility-related quality of life in the two groups. Therefore, we inserted Quality of Life total score as the dependent variable. Group was inserted at block 1 as the dependent variable to be controlled, while MMAS, Perfectionism, and need for parenthood were inserted at block 2 as predictors.

Standardized scores and box plots were used to identify univariate outliers. Variables with values +/- 3.29 *SD* from the mean were considered outliers (Tabachnick & Fidell, 2007). Outlier values were brought into range (Tabachnick & Fidell, 2007). Normality of each group was assessed for each variable by examining box-plots, stem and leaf plots, histograms, and skewness and kurtosis values. Scatterplot of the standardized residuals was used to assess residuals' assumptions. Results revealed no issues with normality, linearity, homoscedasticity, and independence of residuals. Missing data were not imputed and were treated as missing.

All statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS) version 23.0. All statistical tests were two-sided; a p-value ≤.05 was considered significant.

3. Results

Differences between groups (infertile with endometriosis; infertile without endometriosis) for sociodemographic and clinical data as well as for psychological condition were assessed by means of Chi-Square analyses for categorical variables and independent sample t-test for continuous ones. From these analyses, we found no significant differences between groups (see Table 1 and Table 2). Correlation analyses revealed only a positive correlation between quality of life-related to infertility and age.

Hierarchical multiple regressions were used to assess the ability of perfectionism, beliefs about parenthood, and mindful awareness to predict levels of quality of life-related to fertility issues, controlling for the group (endometriosis; no endometriosis) (See Table 3). Group inserted at block 1 explained 0% of the variance in quality of life. After entry psychological conditions at block 2, the total variance explained by the model as a whole was 53.3%, *F* (4, 38) = 10.83, *p* < .001. In the full model, need of parenthood (*beta* = - .60, p < .001) and perfectionism (*beta* = - .30, p < .05) predicted infertility-related quality of life, independently of group. Group and MAAS did not predict the quality of life in the full model. Furthermore, we did correlation analyses between the quality of life score and a wide range of sociodemographic and clinical variables. These analyses revealed that only age correlated with quality of life. Then, in the regression analyses, we tried to control also for age. In this attempt, age-predicted the quality of life in block 1. However, at block 2 it did not predict the quality of life outcomes and the r square was the same as that reported without age control. Then, for the simplicity of the model, we decided to not include age in the final model.

Variables	**Infertile with Endometriosis (N=22) (means; sd)**	**Infertile without Endometriosis (N=21) (means; sd)**	***T (41)***	**95% CI**	***p***	**Hedges' *g***
FertiQoL_Emotional_Score	51.33 (23.02)	51.18 (22.68)	.021	-13.932 - 14.224	.983	.001
FertiQoL_Mindbody_Score	58.33 (23.81)	56.33 (26.59)	.259	-13.537 - 17.524	.797	.079
FertiQoL_Relational_Score	71.97 (23.62)	75.6 (17.14)	-.575	-16.395 - 9.131	.569	.175
FertiQoL_Social_Score	58.32 (21.86)	53.56 (27.06)	.636	-10.356 – 19.877	.528	.194
FertiQoL_Total_CORE_Score	59.58 (17.21)	59.18 (20.64)	.069	-11.285 – 12.087	.945	.021
FPI_Need_parenthood	38.54 (13.13)	43.57 (13.25)	-1.249	-13.156 - 3.104	.219	.381
OBQ_Perfectionism	30.27 (8.90)	36.14 (17.78)	-1.379	-14.466 - 2.726	.175	.421
MAAS	4.73 (1.16)	5.10 (1.15)	-1.050	-1.085 - .343	.300	.320

Table 2. Independent samples t-test between groups (infertile women with endometriosis; infertile women without endometriosis) for psychological and quality of life scales.

FertiQoL: Fertility Quality of life; FPI: Fertility Problem Inventory; OBQ: Obsessive Beliefs Questionnaire; MMAS: Mindfulness Attention Awareness Scale

Variables	**β**	**t**	***p***	**Partial R**
Block 1 (R^2 = .000)				
Group	-.011	-.069	.945	-.011
(Constant)		14.733	.000	
Block 2 (R^2 = .533)				
Group	.139	1.168	.250	.186
FPI_Need Parenthood	-.602	-5.297	.000*	-.652
OBQ_Perfectionism	-.296	-2.488	.017*	-.374
MAAS	.173	1.461	.152	.231
(Constant)		6.675	.000	

Table 3. Multiple linear regression analyses for Quality of Life total core

FPI: Fertility Problem Inventory; MAAS: Mindfulness Attention Awareness Scale; OBQ: Obsessive Beliefs Questionnaire

4. Discussion

Our results did not find any difference in the quality of life, personality traits, beliefs about parenthood and mindfulness abilities between infertile women with and without endometriosis. Interestingly, our findings showed that beliefs about motherhood (i.e. the overvalue given to having a child) and perfectionism as personality trait may predict the quality of life-related to fertility issues, independently of the group.

To the best of our knowledge, this is the first study that assessed personality traits, beliefs about parenthood and mindfulness awareness in a sample of infertile women with and without endometriosis. Results about the lack of differences between women with and without endometriosis in quality of life did not confirm our initial hypothesis and previous literature. Indeed, a similar study of Siedentopf and Tariverdian (Siedentopf et al., 2008) on 69 infertile women (38 with endometriosis; 31 without endometriosis) found that ones with endometriosis had worse quality of life as well as more depressive and anxious symptomatology than the other group. Differences in results between the two studies could be due to the different instruments used to assess the quality of life. Indeed, in our study quality of life was assessed only related to infertility issues (by means of the FertiQoL), while in the study of Siedentopf and Tariverdian (Siedentopf et al., 2008) quality of life was assessed by means of SF36, an instrument that allows the evaluation of the construct of quality of life in different and general domains (overall physical and mental). Therefore, the two studies could be only in part comparable because they assessed two different aspects of quality of life. We suggest that despite general quality of life of infertile women with endometriosis seems to be poorer than that of infertile women without endometriosis (perhaps because of pain symptomatology), quality of life specifically related to infertility seems to be similar in both groups. Moreover, in our study, any differences between groups were found as regard beliefs and importance given to parenthood, personality traits, and ability to mindful awareness.

Furthermore, interestingly, we found that the overvalue given to becoming a mother and perfectionistic personality trait may predict the quality of life-related to infertility, independently of the presence of the chronic disease. Indeed, we found that the more a woman gives importance to becoming mother (i.e. overestimating childbirth, believing that having a child is the main aim in her life, feeling empty due to the lack of a baby, declaring to be ready to do everything for having a child) and the more she shows perfectionistic personality traits (i.e. establishing high self-standard and ideals that everything should be always perfect, having beliefs that own value depends on the way things are done), poorer will be quality of life-related to infertility condition. These findings could be in part comparable with previous studies. Indeed, Moura-Ramos et al. (2016) found that more importance is given to being a parent, harder is the adjustment to ART’s path. Moreover, literature about perfectionism has found a relationship with worse quality of life, health, life satisfaction and more stress in both infertile women and the general population (i.e. university students; Çapan, 2010; Molnar, Sadava, Flett, & Colautti, 2012; Sharbaf et al., 2014).

The predictive role of beliefs about parenthood and perfectionistic traits to the quality of life could be explained in terms of disillusion of expectations about own ideal identity. According to Morris and Kanfer (1995), across life, each person develops her own self-standards (i.e. self-imposed criteria for judging oneself) about possible selves (i.e. imagined future states of the self). Worldwide, female identity is commonly organized among the ideal standard of being able to give birth to a child and raise a family. We can suppose that when motherhood is a self-standard (or ideal-self) and is combined with perfectionistic personality traits, the psychological burden of infertility could be relevant. Indeed, in this case, a contrast between the ideal-standard of the woman (i.e. having a perfect life, being fertile, being able to give birth to a child) and the actual-self (i.e. being unable to have a child) raises. This “self-discrepancy”, which is due to the gap between different selves (i.e. actual vs ideal), leads to a personal crisis (Higgins, 1987; Kikendall, 1994). In this context, personal crisis includes low quality of life, in terms of negative impact on cognitive abilities (i.e. attention, concentration), stress, loss of control, tiredness, relational and sexual difficulties, feelings of jealousy and resentment, social isolation, job issues, depressive symptomatology, and perceived social pressures.

Concluding, despite interesting clinical implications emerged from this study, some limitations should be considered. First, the number of participants is few and could have reduced the possibility to find significant results, as well as the sample study, was mainly representative of north Italy. Furthermore, the lack of longitudinal assessment reduces the relevance of these results. Further studies need to test these findings in a larger sample as well as clarify open questions arisen from our results, and investigate the role of beliefs and personality traits in long-term quality of life and to subsequent childbirth outcomes.

Finally, our findings are innovative and particularly interesting if we consider the role of the psychologist in the ART team and the role of psychological conditions in childbirth outcomes. Indeed, psychological issues, quality of life and coping strategies are particularly significant for pregnancy outcomes and medical advice seek (Herbert, Lucke, & Dobson, 2010; Smeenk et al., 2001; Williams, Marsh, & Rasgon, 2007).

According to current Italian guidelines (Ministero della salute, 2015), ART services should provide the opportunity for counseling or psychological support to the couple who require it. Psychological counseling and support must be made accessible at all stages of the therapeutic diagnostic approach to infertility and even after the treatment process has been completed, regardless of the outcome of the techniques. In this context, psychologists should take into account the presence of dysfunctional beliefs about childbirth and becoming a mother, and perfectionistic personality traits. Working on dysfunctional beliefs and personality traits, acceptance will be promoted, and quality of life-related to infertility would be enhanced.

5. Compliance with ethical standards

The authors declare that they have no conflicts of interest. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study.

General discussion

Studies included in this dissertation suggested a key role of cognitive and personality factors in influencing the experience of general common symptoms of endometriosis (i.e. pain and infertility) and its main psychosocial implications (e.g. quality of life, sexual distress).

The first study has found that negative metacognitive beliefs are associated with higher sexual distress, over and above dyspareunia and general chronic pain intensity. Findings of the study suggested that negative metacognitive beliefs about own worries about sexual health may affect sexual distress passing through the impact on coping strategies. Therefore, sexual distress seems to be not due to the presence or absence of a pain during sexual intercourse or sexual dysfunctions, but to the way the woman copes with her own thoughts about stressors (i.e. the disorder and its symptomatology).

The second case-control longitudinal study has found an important role of pain in affecting different domains of quality of life and mental health in women with endometriosis. Furthermore, across time (i.e. after three months) the relationship between pain severity and depressive symptomatology is maintained. Indeed, the study found that group of women with low-pain endometriosis have a significant reduction of depressive symptomatology after three months, and women with previous high-pain have significantly more depression severity than women with previous low-pain. Furthermore, results suggested a strict relationship between pain severity perception and worry trait/catastrophization. Indeed, we found higher levels of worry traits and catastrophizing in women with high-pain endometriosis than in those with low-pain endometriosis or a control group. In addition, our findings showed that metacognitive beliefs seem to be significant predictors of subsequent sexual distress, over and above previous pain symptomatology and initial score on that scale.

The third and last study did not find any difference in the quality of life, personality traits, beliefs about parenthood and mindfulness abilities between infertile women with and without endometriosis. However, in both groups of women with infertility issues (with and without endometriosis), the study found a key role of perfectionistic traits and importance given to parenthood in influencing the quality of life-related to fertility issues. The power of beliefs about parenthood and perfectionistic traits on the quality of life in infertile population could be explained in terms of disillusion of expectations about own ideal identity. Indeed, infertility may lead to a “self-discrepancy”, which is due to the gap between different selves (i.e. actual vs ideal), and that could be the cause of a personal crisis and burden in quality of life.

This dissertation has shown that low quality of life, poor mental health and pain symptomatology observed in women with endometriosis could be better explained recurring to underlying factors, such as beliefs, cognitive and emotional responses to stressful events, and personality traits. Therefore, cognitive and personality factors, which are behind symptoms of endometriosis and their typical consequences, are chief and can help us to understand individual differences. It could be concluded that it is not the presence of endometriosis itself or of the severe symptomatology to be the cause of low quality of life and psychological distress, but there are individual variabilities due to above-mentioned factors which should be considered when approaching to this disorder.

In order to improve the knowledge on this interesting topic, further research should include a wider sample size, investigate the role of these factors longitudinally, and focus on functional coping strategies and beliefs able to improve quality of life on this population. Moreover, the effectiveness of psychological treatments based on the enhancement of positive coping strategies and the reduction of negative metacognitive beliefs should be investigated.

Concluding, this manuscript arises important clinical implications for the medical team and the role of the clinical psychologist in this context. Cognitive (in terms of coping strategies, metacognitive beliefs, beliefs about own identity) and personality factors should be taken into account by the interdisciplinary medical team during the path of diagnosis and medical treatment of endometriosis or ART. Psychological support should be provided in addition to medical/surgical treatment to those women which have difficulty to cope functionally with the common stressors related to the pathology (e.g. pain, infertility, psychosocial impairments). In particular, the psychologist should provide psychological counseling for those women who show anxious or perfectionistic personality traits as well as dysfunctional coping strategies and metacognitive beliefs. Interdisciplinary collaboration is crucial in the management of women with endometriosis. The main aims of psychologists might be: reduce worry as a typical way to respond to negative events; reduce perfectionistic traits and beliefs of parenthood, improving self-esteem focusing on real-time experiences and learning to accept also a not-perfect life, helping trying to find other objectives in life; improve positive coping strategies as style to cope with daily stressors such as acceptance, or refocus planning; reduce negative metacognitive about own beliefs and dysfunctional coping strategies (i.e. catastrophizing) acquiring and practicing cognitive and emotion-regulation skills and by means of cognitive behavioral techniques such as attentional training, relaxation, detached mindfulness, and visual imagery. Psychological support based on these themes would improve, in turn, quality of life and psychological well-being (in terms of positive mood and attitude, sexual health, and functional ability to cope with the disorder).

References

Abbott, J. A., Hawe, J., Clayton, R. D., & Garry, R. (2003). The effects and effectiveness of laparoscopic excision of endometriosis: a prospective study with 2-5 year follow-up. *Hum Reprod, 18*(9), 1922-1927. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/12923150

Aerts, L., Grangier, L., Streuli, I., Dallenbach, P., Marci, R., Wenger, J. M., & Pluchino, N. (2018). Psychosocial impact of endometriosis: From co-morbidity to intervention. *Best Pract Res Clin Obstet Gynaecol, 50*, 2-10. doi:10.1016/j.bpobgyn.2018.01.008

American Psychological Association. (1992). Ethical principles of psychologists and code of conduct. *American psychologist, 47*, 1597-1411.

Babel, P. (2017). The Influence of State and Trait Anxiety on the Memory of Pain. *Pain Med, 18*(12), 2340-2349. doi:10.1093/pm/pnw354

Bailey, R., & Wells, A. (2016). The contribution of metacognitive beliefs and dysfunctional illness beliefs in predicting health anxiety: An evaluation of the metacognitive versus the cognitive models. *Clinical Psychologist, 20*(3), 129-137.

Ballard, K. D., Seaman, H. E., De Vries, C. S., & Wright, J. T. (2008). Can symptomatology help in the diagnosis of endometriosis? Findings from a national case–control study—Part 1. *BJOG: An International Journal of Obstetrics & Gynaecology, 115*(1), 1382-1391.

Bancroft, J., Loftus, J., & Long, J. S. (2003). Distress about sex: a national survey of women in heterosexual relationships. *Arch Sex Behav, 32*(3), 193-208. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/12807292

Barbara, G., Facchin, F., Buggio, L., Somigliana, E., Berlanda, N., Kustermann, A., & Vercellini, P. (2017). What Is Known and Unknown About the Association Between Endometriosis and Sexual Functioning: A Systematic Review of the Literature. *Reproductive Sciences, 24*(12), 1566-1576.

Barbara, G., Facchin, F., Meschia, M., Berlanda, N., Frattaruolo, M. P., & Vercellin, I. P. (2017). When love hurts. A systematic review on the effects of surgical and pharmacological treatments for endometriosis on female sexual functioning. *Acta Obstet Gynecol Scand, 96*(6), 668-687. doi:10.1111/aogs.13031

Basson, R., Berman, J., Burnett, A., Derogatis, L., Ferguson, D., Fourcroy, J., . . . Whipple, B. (2000). Report of the international consensus development conference on female sexual dysfunction: definitions and classifications. *J Urol, 163*(3), 888-893. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/10688001

Bernuit, D., Ebert, A. D., Halis, G., Strothmann, A., Gerlinger, C., Geppert, K., & Faustmann, T. (2011). Female perspectives on endometriosis: findings from the uterine bleeding and pain women's research study. *Journal of Endometriosis, 3*(2), 73-85.

Bertelsen, L., Mellemkjaer, L., Frederiksen, K., Kjaer, S. K., Brinton, L. A., Sakoda, L. C., . . . Olsen, J. H. (2007). Risk for breast cancer among women with endometriosis. *Int J Cancer, 120*(6), 1372-1375. doi:10.1002/ijc.22490

Betto, E., Zarbo, C., Verrengia, A., Malandrino, C., Secomandi, R., Trezzi, G., . . . Frigerio, L. (2017). Long-Term Mental and Physical Quality of Life after Radical and Conservative Surgeries and in Relation to Childbirth in Patients with Severe Endometriosis. *JOURNAL OF WOMEN'S HEALTH, ISSUES & CARE, 6*(6), 1-5.

Boivin, J., Takefman, J., & Braverman, A. (2011). The fertility quality of life (FertiQoL) tool: development and general psychometric properties. *Hum Reprod, 26*(8), 2084-2091. doi:10.1093/humrep/der171

Borkovec, T. D., Robinson, E., Pruzinsky, T., & DePree, J. A. (1983). Preliminary exploration of worry: some characteristics and processes. *Behav Res Ther, 21*(1), 9-16. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/6830571

Brosens, I., Puttemans, P., Campo, R., & Gordts, S. (2004). Diagnosi di endometriosi: tecniche di endoscopia pelvica e di imaging. *Best Practice e della Ricerca Clinica Ostetricia e Ginecologi, 18*(2), 285-303.

Brown, K. W., & Ryan, R. M. (2003). The benefits of being present: mindfulness and its role in psychological well-being. *J Pers Soc Psychol, 84*(4), 822-848. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/12703651

Bruun, M. R., Arendt, L. H., Forman, A., & Ramlau-Hansen, C. H. (2018). Endometriosis and adenomyosis are associated with increased risk of preterm delivery and a small-for-gestational-age child: a systematic review and meta-analysis. *Acta Obstet Gynecol Scand, 97*(9), 1073-1090. doi:10.1111/aogs.13364

Burri, A., Rahman, Q., & Spector, T. (2011). Genetic and environmental risk factors for sexual distress and its association with female sexual dysfunction. *Psychol Med, 41*(11), 2435-2445. doi:10.1017/S0033291711000493

Butow, P., Kelly, S., Thewes, B., Hruby, G., Sharpe, L., & Beith, J. (2015). Attentional bias and metacognitions in cancer survivors with high fear of cancer recurrence. *Psychooncology, 24*(4), 416-423. doi:10.1002/pon.3659

Butrick, C. W. (2007). Chronic pelvic pain: how many surgeries are enough? *Clin Obstet Gynecol, 50*(2), 412-424. doi:10.1097/GRF.0b013e31804b195f

Bylinka, J., & Oniszczenko, W. (2016). Temperament, Beliefs About Pain Control, and Pain Intensity in Endometriosis Patients. *J Clin Psychol Med Settings, 23*(4), 410-419. doi:10.1007/s10880-016-9473-8

Çapan, B. E. (2010). Relationship among perfectionism, academic procrastination and life satisfaction of university students. *Procedia-Social and Behavioral Sciences, 5*, 1665-1671.

Carey, E. T., Martin, C. E., Siedhoff, M. T., Bair, E. D., & As-Sanie, S. (2014). Biopsychosocial correlates of persistent postsurgical pain in women with endometriosis. *Int J Gynaecol Obstet, 124*(2), 169-173. doi:10.1016/j.ijgo.2013.07.033

Carrillo, L., Seidman, D. S., Cittadini, E., & Meirow, D. (2016). The role of fertility preservation in patients with endometriosis. *J Assist Reprod Genet, 33*(3), 317-323. doi:10.1007/s10815-016-0646-z

Cartwright-Hatton, S., & Wells, A. (1997). Beliefs about worry and intrusions: The Meta-Cognitions Questionnaire and its correlates. *Journal of anxiety disorders, 11*(3), 279-296. doi:10.1016/S0887-6185(97)00011-X

Caruso, S., Iraci, M., Cianci, S., Casella, E., Fava, V., & Cianci, A. (2015). Quality of life and sexual function of women affected by endometriosis-associated pelvic pain when treated with dienogest. *J Endocrinol Invest, 38*(11), 1211-1218. doi:10.1007/s40618-015-0383-7

Cavaggioni, G., Lia, C., Resta, S., Antonielli, T., Benedetti Panici, P., Megiorni, F., & Porpora, M. G. (2014). Are mood and anxiety disorders and alexithymia associated with endometriosis? A preliminary study. *Biomed Res Int, 2014*. doi:10.1155/2014/786830

Chaichian, S., Kabir, A., Mehdizadehkashi, A., Rahmani, K., Moghimi, M., & Moazzami, B. (2017). Comparing the Efficacy of Surgery and Medical Therapy for Pain Management in Endometriosis: A Systematic Review and Meta-analysis. *Pain Physician, 20*(3), 185-195. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/28339429

Chaman-Ara, K., Bahrami, M. A., Moosazadeh, M., & Bahrami, E. (2017). Quality of life in women with endometriosis: a systematic review and meta-analysis. *World Cancer Research Journal, 4*(1).

Chen, L. C., Hsu, J. W., Huang, K. L., Bai, Y. M., Su, T. P., Li, C. T., . . . Chen, M. H. (2016). Risk of developing major depression and anxiety disorders among women with endometriosis: A longitudinal follow-up study. *J Affect Disord, 190*, 282-285. doi:10.1016/j.jad.2015.10.030

Chen, T. H., Chang, S. P., Tsai, C. F., & Juang, K. D. (2004). Prevalence of depressive and anxiety disorders in an assisted reproductive technique clinic. *Hum Reprod, 19*(10), 2313-2318. doi:10.1093/humrep/deh414

Chiantera, V., Abesadze, E., & Mechsner, S. (2017). How to understand the complexity of endometriosis-related pain. *Journal of Endometriosis and Pelvic Pain Disorders, 9*(1), 30-38.

Collins, M. M., Bradley, C. P., O'Sullivan, T., & Perry, I. J. (2009). Self-care coping strategies in people with diabetes: a qualitative exploratory study. *BMC Endocr Disord, 9*, 6. doi:10.1186/1472-6823-9-6

Compare, A., Zarbo, C., Shonin, E., Van Gordon, W., & Marconi, C. (2014). Emotional Regulation and Depression: A Potential Mediator between Heart and Mind. *Cardiovasc Psychiatry Neurol, 2014*. doi:10.1155/2014/324374

Cook, S. A., Salmon, P., Dunn, G., Holcombe, C., Cornford, P., & Fisher, P. (2015). The association of metacognitive beliefs with emotional distress after diagnosis of cancer. *Health Psychology, 34*(3), 207-2015.

Cornillie, F. J., Oosterlynck, D., Lauweryns, J. M., & Koninckx, P. R. (1990). Deeply infiltrating pelvic endometriosis: histology and clinical significance. *Fertil Steril, 53*(6), 978-983. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/2140994

Cousineau, T. M., & Domar, A. D. (2007). Psychological impact of infertility. *Best Pract Res Clin Obstet Gynaecol, 21*(2), 293-308. doi:10.1016/j.bpobgyn.2006.12.003

Cox, H., Henderson, L., Wood, R., & Cagliarini, G. (2003). Learning to take charge: women's experiences of living with endometriosis. *Complement Ther Nurs Midwifery, 9*(2), 62-68. doi:10.1016/S1353-6117(02)00138-5

Coxon, L., Horne, A. W., & Vincent, K. (2018; in press). Pathophysiology of endometriosis-associated pain: A review of pelvic and central nervous system mechanisms. *Best Pract Res Clin Obstet Gynaecol*. doi:10.1016/j.bpobgyn.2018.01.014

Culley, L., Hudson, N., Mitchell, H., Law, C., Denny, E., & Raine-Fenning, N. (2013). Endometriosis: improving the wellbeing of couples. Summary report and recommendations. Retrieved from Retrieved online: http://www.pelvicpain.org.uk/wp-content/uploads/2018/07/Endopart-study-summary-report-and-recommendations.pdf

Culley, L., Law, C., Hudson, N., Denny, E., Mitchell, H., Baumgarten, M., & Raine-Fenning, N. (2013). The social and psychological impact of endometriosis on women's lives: a critical narrative review. *Hum Reprod Update, 19*(6), 625-639. doi:10.1093/humupd/dmt027

De Graaff, A. A., D'Hooghe, T. M., Dunselman, G. A., Dirksen, C. D., Hummelshoj, L., Consortium, W. E., & Simoens, S. (2013). The significant effect of endometriosis on physical, mental and social wellbeing: results from an international cross-sectional survey. *Hum Reprod*, *28*(10), 2677-2685. doi:10.1093/humrep/det284

De Graaff, A. A., Van Lankveld, J., Smits, L. J., Van Beek, J. J., & Dunselman, G. A. (2016). Dyspareunia and depressive symptoms are associated with impaired sexual functioning in women with endometriosis, whereas sexual functioning in their male partners is not affected. *Hum Reprod, 31*(11), 2577-2586. doi:10.1093/humrep/dew215

Denny, E. (2004). Women's experience of endometriosis. *J Adv Nurs, 46*(6), 641-648. doi:10.1111/j.1365-2648.2004.03055.x

Denny, E., & Mann, C. H. (2007). Endometriosis-associated dyspareunia: the impact on women's lives. *J Fam Plann Reprod Health Care, 33*(3), 189-193. doi:10.1783/147118907781004831

Derogatis, L., Clayton, A., Lewis-D'Agostino, D., Wunderlich, G., & Fu, Y. (2008). Validation of the female sexual distress scale-revised for assessing distress in women with hypoactive sexual desire disorder. *J Sex Med, 5*(2), 357-364. doi:10.1111/j.1743-6109.2007.00672.x

Di Donato, N., Montanari, G., Benfenati, A., Leonardi, D., Bertoldo, V., Monti, G., & Seracchioli, R. (2013). The impact of socioeconomic and anamnestic characteristics on quality of life and sexual function in women with endometriosis. *J Endometr Pelvic Pain Disord, 5*(159-165).

Dilek, B., Yemez, B., Kizil, R., Kartal, E., Gulbahar, S., Sari, O., & Akalin, E. (2012). Anxious personality is a risk factor for developing complex regional pain syndrome type I. *Rheumatol Int, 32*(4), 915-920. doi:10.1007/s00296-010-1714-9

Dodge, R., Daly, A. P., Huyton, J., & Sanders, L. D. (2012). The challenge of defining wellbeing. *International journal of wellbeing, 2*(3), 222-235. doi:10.5502/ijw.v2i3.4

Donarelli, Z., Gullo, S., Lo Coco, G., Marino, A., Scaglione, P., Volpes, A., & Allegra, A. (2015). Assessing infertility-related stress: the factor structure of the Fertility Problem Inventory in Italian couples undergoing infertility treatment. *J Psychosom Obstet Gynaecol, 36*(2), 58-65. doi:10.3109/0167482X.2015.1034268

Donatti, L., Ramos, D. G., Andres, M. D. P., Passman, L. J., & Podgaec, S. (2017). Patients with endometriosis using positive coping strategies have less depression, stress and pelvic pain. *Einstein (São Paulo), 15*(1), 65-70. doi:10.1590/S1679-45082017AO3911

Donnez, J., Squifflet, J., Pirard, C., Jadoul, P., Wyns, C., & Smets, M. (2002). The efficacy of medical and surgical treatment of endometriosis-associated infertility and pelvic pain. *Gynecol Obstet Invest, 54,* 2-10. doi:66288

Dorz, S., Novara, C., Pastore, M., Sica, C., & Sanavio, E. (2009). Presentazione della versione italiana dell'obsessive beliefs questionnaire (OBQ): Struttura fattoriale e analisi di attendibilità (parte 1). *Psicoterapia Cognitiva e Comportamentale, 15*(2), 139-170.

Dubernard, G., Piketty, M., Rouzier, R., Houry, S., Bazot, M., & Darai, E. (2006). Quality of life after laparoscopic colorectal resection for endometriosis. *Hum Reprod, 21*(5), 1243-1247. doi:10.1093/humrep/dei491

Duffy, B., Smith, K., Terhanian, G., & Bremer, J. (2005). Comparing data from online and face-to-face surveys. *International Journal of Market Research, 47*(6), 615-639.

Dunselman, G. A., Vermeulen, N., Becker, C., Calhaz-Jorge, C., D'Hooghe, T., De Bie, B., . . . European Society of Human Reproduction Embryology. (2014). ESHRE guideline: management of women with endometriosis. *Hum Reprod, 29*(3), 400-412. doi:10.1093/humrep/det457

Eriksen, H. L., Gunnersen, K. F., Sorensen, J. A., Munk, T., Nielsen, T., & Knudsen, U. B. (2008). Psychological aspects of endometriosis: differences between patients with or without pain on four psychological variables. *Eur J Obstet Gynecol Reprod Biol, 139*(1), 100-105. doi:10.1016/j.ejogrb.2007.10.002

Evangelista, A., Dantas, T., Zendron, C., Soares, T., Vaz, G., & Oliveira, M. A. (2014). Sexual function in patients with deep infiltrating endometriosis. *J Sex Med, 11*(1), 140-145. doi:10.1111/jsm.12349

Evans, J. R., & Mathur, A. (2005). The value of online surveys. *Internet research, 15*(2), 195-219.

Facchin, F., Barbara, G., Saita, E., Erzegovesi, S., Martoni, R. M., & Vercellini, P. (2016). Personality in women with endometriosis: temperament and character dimensions and pelvic pain. *Hum Reprod, 31*(7), 1515-1521. doi:10.1093/humrep/dew108

Facchin, F., Barbara, G., Saita, E., Mosconi, P., Roberto, A., Fedele, L., & Vercellini, P. (2015). Impact of endometriosis on quality of life and mental health: pelvic pain makes the difference. *J Psychosom Obstet Gynaecol, 36*(4), 135-141. doi:10.3109/0167482X.2015.1074173

Facchin, F., Saita, E., Barbara, G., Dridi, D., & Vercellini, P. (2018). "Free butterflies will come out of these deep wounds": A grounded theory of how endometriosis affects women's psychological health. *J Health Psychol, 23*(4), 538-549. doi:10.1177/1359105316688952

Fagervold, B., Jenssen, M., Hummelshoj, L., & Moen, M. H. (2009). Life after a diagnosis with endometriosis - a 15 years follow-up study. *Acta Obstet Gynecol Scand, 88*(8), 914-919. doi:10.1080/00016340903108308

Fairbanks, F., Abdo, C. H., Baracat, E. C., & Podgaec, S. (2017). Endometriosis doubles the risk of sexual dysfunction: a cross-sectional study in a large amount of patients. *Gynecol Endocrinol, 33*(7), 544-547. doi:10.1080/09513590.2017.1302421

Ferrero, S., Esposito, F., Abbamonte, L. H., Anserini, P., Remorgida, V., & Ragni, N. (2005). Quality of sex life in women with endometriosis and deep dyspareunia. *Fertil Steril, 83*(3), 573-579. doi:10.1016/j.fertnstert.2004.07.973

Ferrero, S., Ragni, N., & Remorgida, V. (2008). Deep dyspareunia: causes, treatments, and results. *Curr Opin Obstet Gynecol, 20*(4), 394-399. doi:10.1097/GCO.0b013e328305b9ca

Folkman, S. (1997). Positive psychological states and coping with severe stress. *Soc Sci Med, 45*(8), 1207-1221. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/9381234

Folkman, S., Lazarus, R. S., Gruen, R. J., & DeLongis, A. (1986). Appraisal, coping, health status, and psychological symptoms. *J Pers Soc Psychol, 50*(3), 571-579. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/3701593

Ford, J., English, J., Miles, W. A., & Giannopoulos, T. (2004). Pain, quality of life and complications following the radical resection of rectovaginal endometriosis. *BJOG, 111*(4), 353-356. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/15008772

Fourquet, J., Gao, X., Zavala, D., Orengo, J. C., Abac, S., Ruiz, A., & Flores, I. (2010). Patients' report on how endometriosis affects health, work, and daily life. *Fertility and sterility, 93*(7), 2424-2428.

Fritzer, N., Haas, D., Oppelt, P., Renner, S., Hornung, D., Wolfler, M., . . . Hudelist, G. (2013). More than just bad sex: sexual dysfunction and distress in patients with endometriosis. *Eur J Obstet Gynecol Reprod Biol, 169*(2), 392-396. doi:10.1016/j.ejogrb.2013.04.001

Fritzer, N., Tammaa, A., Salzer, H., & Hudelist, G. (2014). Dyspareunia and quality of sex life after surgical excision of endometriosis: a systematic review. *Eur J Obstet Gynecol Reprod Biol, 173*, 1-6. doi:10.1016/j.ejogrb.2013.10.032

Gandek, B., Ware, J. E., Aaronson, N. K., Apolone, G., Bjorner, J. B., Brazier, J. E., . . . Sullivan, M. (1998). Cross-validation of item selection and scoring for the SF-12 Health Survey in nine countries: results from the IQOLA Project. International

Quality of Life Assessment. *J Clin Epidemiol, 51*(11), 1171-1178. doi:10.1016/S0895-4356(98)00109-7

Gao, X., Yeh, Y. C., Outley, J., Simon, J., Botteman, M., & Spalding, J. (2006). Health-related quality of life burden of women with endometriosis: a literature review. *Curr Med Res Opin, 22*(9), 1787-1797. doi:10.1185/030079906X121084

Garnefski, N., & Kraaij, V. (2006). Cognitive emotion regulation questionnaire–development of a short 18-item version (CERQ-short). *Personality and Individual Differences, 41*(6), 1045-1053. doi:10.1016/j.paid.2006.04.010

Garry, R., Clayton, R., & Hawe, J. (2000). The effect of endometriosis and its radical laparoscopic excision on quality of life indicators. *BJOG, 107*(1), 44-54. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/10645861

Gilmour, J. A., Huntington, A., & Wilson, H. V. (2008). The impact of endometriosis on work and social participation. *Int J Nurs Pract, 14*(6), 443-448. doi:10.1111/j.1440-172X.2008.00718.x

Giuliani, M., Cosmi, V., Pierleoni, L., Recine, A., Pieroni, M., Ticino, A., & Simonelli, C. (2016). Quality of life and sexual satisfaction in women suffering from endometriosis: An Italian preliminary study. *Sexologies, 25*(1), 12-19.

Gomibuchi, H., Taketani, Y., Doi, M., Yoshida, K., Mizukawa, H., Kaneko, M., . . . et al. (1993). Is personality involved in the expression of dysmenorrhea in patients with endometriosis? *Am J Obstet Gynecol, 169*(3), 723-725. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/8372887

Greszta, E., & Sieminska, M. J. (2008). Relationship of preoperative anxiety-state and anxiety-trait in patients qualified for coronary artery bypass graft surgery to the perception of postoperative pain and other pain complaints. *Ann Acad Med Stetin, 54*(1), 157-163. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/19127824

Grogan, S., Turley, E., & Cole, J. (2018; in press). “So many women suffer in silence”: A thematic analysis of women’s written accounts of coping with endometriosis. *Psychology and Health*.

Hållstam, A., Stålnacke, B. M., Svensén, C., & Löfgren, M. (2016). “Tears are also included”-women’s experience of treatment for painful endometriosis at a pain clinic. *Scandinavian Journal of Pain, 12*(1), 119-120.

Hansen, K. E., Kesmodel, U. S., Kold, M., & Forman, A. (2017). Long-term effects of mindfulness-based psychological intervention for coping with pain in endometriosis: a six-year follow-up on a pilot study. *Nordic Psychology, 69*(2), 100-109.

Harada, T. (2013). Dysmenorrhea and endometriosis in young women. *Yonago Acta Med, 56*(4), 81-84. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/24574576

Hendrickx, L., Gijs, L., & Enzlin, P. (2016). Sexual Difficulties and Associated Sexual Distress in Flanders (Belgium): A Representative Population-Based Survey Study. *J Sex Med, 13*(4), 650-668. doi:10.1016/j.jsxm.2016.01.014

Herbert, D. L., Lucke, J. C., & Dobson, A. J. (2010). Depression: an emotional obstacle to seeking medical advice for infertility. *Fertil Steril, 94*(5), 1817-1821. doi:10.1016/j.fertnstert.2009.10.062

Higgins, E. T. (1987). Self-discrepancy: a theory relating self and affect. *Psychol Rev, 94*(3), 319-340. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/3615707

Huntington, A., & Gilmour, J. A. (2005). A life shaped by pain: women and endometriosis. *J Clin Nurs, 14*(9), 1124-1132. doi:10.1111/j.1365-2702.2005.01231.x

Ireland, M. S. (1993). *Reconceiving women: Separating motherhood from female identity*. New York: Guilford.

James, J. E., & Hardardottir, D. (2002). Influence of attention focus and trait anxiety on tolerance of acute pain. *Br J Health Psychol, 7*(2), 149-162. doi:10.1348/135910702169411

Jensen, M. P., Turner, J. A., Romano, J. M., & Karoly, P. (1991). Coping with chronic pain: a critical review of the literature. *Pain, 47*(3), 249-283. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/1784498

Jia, S. Z., Leng, J. H., Shi, J. H., Sun, P. R., & Lang, J. H. (2012). Health-related quality of life in women with endometriosis: a systematic review. *J Ovarian Res, 5*(1), 2-9. doi:10.1186/1757-2215-5-29

Jones, G., Jenkinson, C., & Kennedy, S. (2004). The impact of endometriosis upon quality of life: a qualitative analysis. *Journal of Psychosomatic Obstetrics & Gynecology, 25*(2), 123-133.

Kaatz, J., Solari-Twadell, P. A., Cameron, J., & Schultz, R. (2010). Coping With Endometriosis. *JOGNN, 39*, 220-226.

Keefe, F. J., Brown, G. K., Wallston, K. A., & Caldwell, D. S. (1989). Coping with rheumatoid arthritis pain: catastrophizing as a maladaptive strategy. *Pain, 37*(1), 51-56. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/2726278

Kennedy, S., Bergqvist, A., Chapron, C., D'Hooghe, T., Dunselman, G., Greb, R., . . . Endometrium Guideline Development, G. (2005). ESHRE guideline for the diagnosis and treatment of endometriosis. *Hum Reprod, 20*(10), 2698-2704. doi:10.1093/humrep/dei135

Kikendall, K. A. (1994). Self-discrepancy as an important factor in addressing women's emotional reactions to infertility. *Professional Psychology: Research and Practice, 25*(3), 214-220.

Kodraliu, G., Mosconi, P., Groth, N., Carmosino, G., Perilli, A., Gianicolo, E. A., . . . Apolone, G. (2001). Subjective health status assessment: evaluation of the Italian version of the SF-12 Health Survey. Results from the MiOS Project. *J Epidemiol Biostat, 6*(3), 305-316. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/11437095

Kold, M., Hansen, T., Vedsted-Hansen, H., & Forman, A. (2012). Mindfulness-based psychological intervention for coping with pain in endometriosis. *Nordic Psychology, 64*(1), 2-16.

Kossi, J., Setala, M., Makinen, J., Harkki, P., & Luostarinen, M. (2013). Quality of life and sexual function 1 year after laparoscopic rectosigmoid resection for endometriosis. *Colorectal Dis, 15*(1), 102-108. doi:10.1111/j.1463-1318.2012.03111.x

Kumar, V., Khan, M., Vilos, G. A., & Sharma, V. (2011). Revisiting the association between endometriosis and bipolar disorder. *Journal of Obstetrics and Gynaecology Canada, 33*(11), 1141-1145.

Lagana, A. S., Condemi, I., Retto, G., Muscatello, M. R., Bruno, A., Zoccali, R. A., . . . Cedro, C. (2015). Analysis of psychopathological comorbidity behind the common symptoms and signs of endometriosis. *Eur J Obstet Gynecol Reprod Biol, 194*, 30-33. doi:10.1016/j.ejogrb.2015.08.015

Lagana, A. S., La Rosa, V. L., Rapisarda, A. M. C., Valenti, G., Sapia, F., Chiofalo, B., . . . Vitale, S. G. (2017). Anxiety and depression in patients with endometriosis: impact and management challenges. *Int J Womens Health*, *9*, 323-330. doi:10.2147/IJWH.S119729

Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal, and coping*. New York: Springer.

Leanza, V., Leanza, G., Nestori, A., & Leanza, A. (2015). Psychological stress and affective self-efficacy beliefs among women with endometriosis. *GIORNALE ITALIANO DI OSTETRICIA E GINECOLOGIA*, *37*(3), 116-120.

Leech, N. L., Barret, K. C., & Morgan, G. A. (2005). *SPSS for Intermediate Statistics: Use and Interpretation*. Mahwah, NJ: Lawrence Erlbaum Associates.

Lesser, I. M. (1981). A review of the alexithymia concept. *Psychosom Med*, *43*(6), 531-543. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/7034034

Li, C. C., & Shun, S. C. (2016). Understanding self care coping styles in patients with chronic heart failure: A systematic review. *Eur J Cardiovasc Nurs*, *15*(1), 12-19. doi:10.1177/1474515115572046

Loeser, J. D., & Treede, R. D. (2008). The Kyoto protocol of IASP Basic Pain Terminology. *Pain*, *137*(3), 473-477. doi:10.1016/j.pain.2008.04.025

Lorencatto, C., Petta, C. A., José Navarro, M., Bahamondes, L., & Matos, A. (2006). Depression in women with endometriosis with and without chronic pelvic pain. *Acta obstetricia et gynecologica Scandinavica*, *85*(1), 88-92.

Low, W. Y., Edelmann, R. J., & Sutton, C. (1993). A psychological profile of endometriosis patients in comparison to patients with pelvic pain of other origins. *J Psychosom Res*, *37*(2), 111-116. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/8463987

Macer, M. L., & Taylor, H. S. (2012). Endometriosis and infertility: a review of the pathogenesis and treatment of endometriosis-associated infertility. *Obstet Gynecol Clin North Am*, *39*(4), 535-549. doi:10.1016/j.ogc.2012.10.002

Maroufizadeh, S., Karimi, E., Vesali, S., & Omani Samani, R. (2015). Anxiety and depression after failure of assisted reproductive treatment among patients experiencing infertility. *Int J Gynaecol Obstet*, *130*(3), 253-256. doi:10.1016/j.ijgo.2015.03.044

Martin, C. E., Johnson, E., Wechter, M. E., Leserman, J., & Zolnoun, D. A. (2011). Catastrophizing: a predictor of persistent pain among women with endometriosis at 1 year. *Hum Reprod, 26*(11), 3078-3084. doi:10.1093/humrep/der292

Mazzotti, E., Fassone, G., Picardi, A., Sagoni, E., Ramieri, L., Lega, I., & Pasquini, P. (2003). The Patient Health Questionnaire (PHQ) for the screening of psychiatric disorders: a validation study versus the Structured Clinical Interview for DSM-IV axis I (SCID-I). *Ital J Psychopathol, 9*(235-242).

McPeak, A. E., Allaire, C., Williams, C., Albert, A., Lisonkova, S., & Yong, P. J. (2018). Pain Catastrophizing and Pain Health-Related Quality-of-Life in Endometriosis. *Clin J Pain, 34*(4), 349-356. doi:10.1097/AJP.0000000000000539

Medicine, A. S. f. R. (1997). Revised American Society for Reproductive Medicine classification of endometriosis,. *Fertility and sterility, 67*(5), 817-821.

Mehrabi, E., Hajian, S., Simbar, M., Hoshyari, M., & Zayeri, F. (2015). Coping response following a diagnosis of breast cancer: A systematic review. *Electron Physician, 7*(8), 1575-1583. doi:10.19082/1575

Mehrdad Moghimi, M. D., & Bahram Moazzami, M. D. (2017). Comparing the efficacy of surgery and medical therapy for pain management in endometriosis: a systematic review and meta-analysis. *Pain Physician, 20*, 185-195.

Meints, S. M., Stout, M., Abplanalp, S., & Hirsh, A. T. (2016). Pain-Related Rumination, But Not Magnification or Helplessness, Mediates Race and Sex Differences in Experimental Pain. *J Pain*. doi:10.1016/j.jpain.2016.11.005

Melis, I., Litta, P., Nappi, L., Agus, M., Melis, G. B., & Angioni, S. (2015). Sexual function in women with deep endometriosis: correlation with quality of life, intensity of pain, depression, anxiety, and body image. *International Journal of Sexual Health, 27*(2), 175-185.

Melzack, R. (1987). The short-form McGill Pain Questionnaire. *Pain, 30*(2), 191-197. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/3670870

Melzack, R., & Katz, J. (2013). Pain. *Wiley Interdisciplinary Reviews: Cognitive Science, 4*(1), 1-15. doi:doi:10.1002/wcs.1201

Meyer, T. J., Miller, M. L., Metzger, R. L., & Borkovec, T. D. (1990). Development and validation of the Penn State Worry Questionnaire. *Behav Res Ther, 28*(6), 487-495. doi:10.1016/0005-7967(90)90135-6

Ministero della salute. (2015). Linee guida contenenti le indicazioni delle procedure e delle tecniche di procreazione medicalmente assistita.

Missmer, S. A., Hankinson, S. E., Spiegelman, D., Barbieri, R. L., Marshall, L. M., & Hunter, D. J. (2004). Incidence of laparoscopically confirmed endometriosis by demographic, anthropometric, and lifestyle factors. *Am J Epidemiol, 160*(8), 784-796. doi:10.1093/aje/kwh275

Molnar, D. S., Sadava, S. W., Flett, G. L., & Colautti, J. (2012). Perfectionism and health: a mediational analysis of the roles of stress, social support and health-related behaviours. *Psychol Health, 27*(7), 846-864. doi:10.1080/08870446.2011.630466

Montanari, G., Di Donato, N., Benfenati, A., Giovanardi, G., Zannoni, L., Vicenzi, C., & ... & Schioppa, C. (2013). Women with deep infiltrating endometriosis: sexual satisfaction, desire, orgasm, and pelvic problem interference with sex. *The journal of sexual medicine, 10*(6), 1559-1566.

Moosbrugger, H., & Schermelleh-Engel, K. (1991). Determinants of pain experience: Perceived competence, trait anxiety, trait depression and moderator effects. *Personality and Individual Differences, 12*(12), 1261-1266.

Moradi, M., Parker, M., Sneddon, A., Lopez, V., & Ellwood, D. (2014). Impact of endometriosis on women's lives: a qualitative study. *BMC Womens Health, 14*(123), 1-12. doi:10.1186/1472-6874-14-123

Morani, S., Pricci, D., & Sanavio, E. (1999). Penn State Worry Questionnaire e Worry Domains Questionnaire. Presentazione delle versioni italiane ed analisi della fedeltà. *Psicoterapia cognitiva e comportamentale*, *5*(3), 13-34.

Morris, S. J., & Kanfer, F. H. (1995). Self-evaluation, self-description, and self-standards in subclinical depression. *Journal of psychopathology and behavioral assessment, 17*(3), 261-282.

Moura-Ramos, M., Gameiro, S., Canavarro, M. C., Soares, I., & Almeida-Santos, T. (2016). Does infertility history affect the emotional adjustment of couples undergoing assisted reproduction? the mediating role of the importance of parenthood. *Br J Health Psychol, 21*(2), 302-317. doi:10.1111/bjhp.12169

Murphy, A. A. (2002). Clinical aspects of endometriosis. *Ann N Y Acad Sci, 1*(10), 396-406. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/11949938

Namnoum, A. B., Hickman, T. N., Goodman, S. B., Gehlbach, D. L., & Rock, J. A. (1995). Incidence of symptom recurrence after hysterectomy for endometriosis. *Fertil Steril, 64*(5), 898-902. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/7589631

Newton, C. R., Sherrard, W., & Glavac, I. (1999). The Fertility Problem Inventory: measuring perceived infertility-related stress. *Fertil Steril, 72*(1), 54-62. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/10428148

Nnoaham, K. E., Hummelshoj, L., Webster, P., d'Hooghe, T., de Cicco Nardone, F., de Cicco Nardone, C., . . . World Endometriosis Research Foundation Global Study of Women's Health, c. (2011). Impact of endometriosis on quality of life and work productivity: a multicenter study across ten countries. *Fertil Steril, 96*(2), 366-373. doi:10.1016/j.fertnstert.2011.05.090

Nunnink, S., & Meana, M. (2007). Remembering the pain: accuracy of pain recall in endometriosis. *J Psychosom Obstet Gynaecol, 28*(4), 201-208. doi:10.1080/01674820701388781

Olive, D. L., & Pritts, E. A. (2001). Treatment of endometriosis. *N Engl J Med, 345*(4), 266-275. doi:10.1056/NEJM200107263450407

Osuga, Y., Koga, K., Tsutsumi, O., Yano, T., Maruyama, M., Kugu, K., . . . Taketani, Y. (2002). Role of laparoscopy in the treatment of endometriosis-associated infertility. *Gynecol Obstet Invest, 53 Suppl 1*, 33-39. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/11834866

Papageorgiou, C., & Wells, A. (2001). Metacognitive beliefs about rumination in recurrent major depression. *Cognitive and Behavioral Practice, 8*(2), 160-164.

Peters, M. L., & Vancleef, L. M. (2008). The role of personality traits in pain perception and disability. *Reviews in analgesia, 10*(1), 11-22.

Peterson, B. D., Newton, C. R., & Feingold, T. (2007). Anxiety and sexual stress in men and women undergoing infertility treatment. *Fertil Steril, 88*(4), 911-914. doi:10.1016/j.fertnstert.2006.12.023

Petrelluzzi, K. F., Garcia, M. C., Petta, C. A., Grassi-Kassisse, D. M., & Spadari-Bratfisch, R. C. (2008). Salivary cortisol concentrations, stress and quality of life in women with endometriosis and chronic pelvic pain. *Stress, 11*(5), 390-397. doi:10.1080/10253890701840610

Petticrew, M., Bell, R., & Hunter, D. (2002). Influence of psychological coping on survival and recurrence in people with cancer: systematic review. *BMJ, 325*, 1-10. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/12424165

Pluchino, N., Wenger, J. M., Petignat, P., Tal, R., Bolmont, M., Taylor, H. S., & Bianchi-Demicheli, F. (2016). Sexual function in endometriosis patients and their partners: effect of the disease and consequences of treatment. *Human reproduction update, 22*(6), 762-774.

Pope, C. J., Sharma, V., Sharma, S., & Mazmanian, D. (2015). A Systematic Review of the Association Between Psychiatric Disturbances and Endometriosis. *J Obstet Gynaecol Can, 37*(11), 1006-1015. doi:10.1016/j.jogc.2016.09.008

Practice Committee of the American Society for Reproductive, M. (2012). Endometriosis and infertility: a committee opinion. *Fertil Steril, 98*(3), 591-598. doi:10.1016/j.fertnstert.2012.05.031

Quartana, P. J., Campbell, C. M., & Edwards, R. R. (2009). Pain catastrophizing: a critical review. *Expert Rev Neurother, 9*(5), 745-758. doi:10.1586/ern.09.34

Quattropani, M. C., Lenzo, V., Mucciardi, M., & Toffle, M. E. (2014). Psychometric properties of the Italian version of the Short Form of the Metacognitions Questionnaire (MCQ-30). *Bollettino di Psicologia Applicata, 269*, 29-41.

Quattropani, M. C., Lenzo, V., Mucciardi, M., & Toffle, M. E. (2016). Metacognition as predictor of emotional distress in cancer patients. *Life span and Disability, 19*(2), 221-239.

Ramin-Wright, A., Kohl Schwartz, A. S., Geraedts, K., Rauchfuss, M., Wolfler, M. M., Haeberlin, F., . . . Leeners, B. (2018). Fatigue - a symptom in endometriosis. *Hum Reprod, 33*(8), 1459–1465. doi:10.1093/humrep/dey115

Rohleder, P., & Flowers, P. (2018). Towards a psychology of sexual health. *J Health Psychol, 23*(2), 143-147. doi:10.1177/1359105317750162

Roomaney, R., & Kagee, A. (2016). Coping strategies employed by women with endometriosis in a public health-care setting. *J Health Psychol, 21*(10), 2259-2268. doi:10.1177/1359105315573447

Rosen, R. C., Shifren, J. L., Monz, B. U., Odom, D. M., Russo, P. A., & Johannes, C. B. (2009). Correlates of sexually related personal distress in women with low sexual desire. *J Sex Med, 6*(6), 1549-1560. doi:10.1111/j.1743-6109.2009.01252.x

Ruggiero, G. M., Spada, M. M., Caselli, G., & Sassaroli, S. (2018). A Historical and Theoretical Review of Cognitive Behavioral Therapies: From Structural Self-Knowledge to Functional Processes. *Journal of Rational-Emotive & Cognitive-Behavior Therapy*, 1-26.

Ruiz-Aranda, D., Salguero, J. M., & Fernandez-Berrocal, P. (2010). Emotional regulation and acute pain perception in women. *J Pain, 11*(6), 564-569. doi:10.1016/j.jpain.2009.09.011

Šalamun, V., Verdenik, I., Laganà, A. S., & Vrtačnik-Bokal, E. (2018). Should we consider integrated approach for endometriosis-associated infertility as gold standard management? Rationale and results from a large cohort analysis. *ARCHIVES OF GYNECOLOGY AND OBSTETRICS, 297*(3), 613-621.

Santulli, P., Bourdon, M., Presse, M., Gayet, V., Marcellin, L., Prunet, C., . . . Chapron, C. (2016). Endometriosis-related infertility: assisted reproductive technology has no adverse impact on pain or quality-of-life scores. *Fertil Steril, 105*(4), 978-987. doi:10.1016/j.fertnstert.2015.12.006

Sayasneh, A., Tsivos, D., & Crawford, R. (2011). Endometriosis and ovarian cancer: a systematic review. *ISRN Obstet Gynecol, 1*(14), 1-6. doi:10.5402/2011/140310

Schaefer, D. R., & Dillman, D. A. (1998). Development of a standard e-mail methodology: Results of an experiment. *Public opinion quarterly, 62*(3), 378-397.

Senato della Repubblica, X. L. (2006). Doc. conclusivo indagine conoscitiva sul fenomeno dell'endometriosi. Retrieved from http://www.senato.it/leg/14/BGT/Schede/docnonleg/12211.htm

Sepulcri, R. P., & Do Amaral, V. F. (2009). Depressive symptoms, anxiety, and quality of life in women with pelvic endometriosis. *Eur J Obstet Gynecol Reprod Biol, 142*(1), 53-56. doi:10.1016/j.ejogrb.2008.09.003

Setala, M., Harkki, P., Matomaki, J., Makinen, J., & Kossi, J. (2012). Sexual functioning, quality of life and pelvic pain 12 months after endometriosis surgery including vaginal resection. *Acta Obstet Gynecol Scand, 91*(6), 692-698. doi:10.1111/j.1600-0412.2012.01394.x

Shakiba, K., Bena, J. F., McGill, K. M., Minger, J., & Falcone, T. (2008). Surgical treatment of endometriosis: a 7-year follow-up on the requirement for further surgery. *Obstet Gynecol, 111*(6), 1285-1292. doi:10.1097/AOG.0b013e3181758ec6

Sharbaf, A., Reza, H., Zarezade Kheibari, S., Horouf Ghanad, M., Abadi, H., & Ebrahim, M. (2014). The relationship between perfectionism and sexual function in infertile women. *The Iranian Journal of Obstetrics, Gynecology and Infertility, 17*(97), 9-17.

Sica, C., Steketee, G., Ghisi, M., Chiri, L. R., & Franceschini, S. (2007). Metacognitive beliefs and strategies predict worry, obsessive–compulsive symptoms and coping styles: A preliminary prospective study on an Italian non-clinical sample. *Clinical Psychology & Psychotherapy, 14*(4), 258-268.

Siedentopf, F., Tariverdian, N., Rücke, M., Kentenich, H., & Arck, P. C. (2008). Immune status, psychosocial distress and reduced quality of life in infertile patients with endometriosis. *American Journal of Reproductive Immunology, 60*(5), 449-461.

Simoens, S., Dunselman, G., Dirksen, C., Hummelshoj, L., Bokor, A., Brandes, I., . . . D'Hooghe, T. (2012). The burden of endometriosis: costs and quality of life of women with endometriosis and treated in referral centres. *Hum Reprod, 27*(5), 1292-1299. doi:10.1093/humrep/des073

Sinaii, N., Cleary, S. D., Ballweg, M. L., Nieman, L. K., & Stratton, P. (2002). High rates of autoimmune and endocrine disorders, fibromyalgia, chronic fatigue syndrome and atopic diseases among women with endometriosis: a survey analysis. *Hum Reprod, 17*(10), 2715-2724. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/12351553

Smeenk, J. M., Verhaak, C. M., Eugster, A., van Minnen, A., Zielhuis, G. A., & Braat, D. D. (2001). The effect of anxiety and depression on the outcome of in-vitro fertilization. *Hum Reprod, 16*(7), 1420-1423. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/11425823

Soave, I., Occhiali, T., Wenger, J. M., Pluchino, N., Caserta, D., & Marci, R. (2018). Endometriosis and food habits: Can diet make the difference? *Journal of Endometriosis and Pelvic Pain Disorders, 10*(2), 59-71.

Souza, C. A., Oliveira, L. M., Scheffel, C., Genro, V. K., Rosa, V., Chaves, M. F., & Cunha Filho, J. S. (2011). Quality of life associated to chronic pelvic pain is independent of endometriosis diagnosis--a cross-sectional survey. *Health Qual Life Outcomes*, *9*(41), 1-5. doi:10.1186/1477-7525-9-41

Spada, M. M., Gay, H., Nikčevic, A. V., Fernie, B. A., & Caselli, G. (2016). Meta-cognitive beliefs about worry and pain catastrophising as mediators between neuroticism and pain behaviour. *Clinical Psychologist*, *20*(3), 138-146.

Spitzer, R. L., Kroenke, K., & Williams, J. B. (1999). Validation and utility of a self-report version of PRIME-MD: the PHQ primary care study. Primary Care Evaluation of Mental Disorders. Patient Health Questionnaire. *JAMA*, *282*(18), 1737-1744. doi:10.1001/jama.282.18.1737

Stephenson, K. R., & Meston, C. M. (2010a). Differentiating components of sexual well-being in women: are sexual satisfaction and sexual distress independent constructs? *J Sex Med*, *7*(7), 2458-2468. doi:10.1111/j.1743-6109.2010.01836.x

Stephenson, K. R., & Meston, C. M. (2010b). When are sexual difficulties distressing for women? The selective protective value of intimate relationships. *J Sex Med*, *7*(11), 3683-3694. doi:10.1111/j.1743-6109.2010.01958.x

Strobel, C., Hunt, S., Sullivan, R., Sun, J., & Sah, P. (2014). Emotional regulation of pain: the role of noradrenaline in the amygdala. *Sci China Life Sci*, *57*(4), 384-390. doi:10.1007/s11427-014-4638-x

Stull, D. E., Wasiak, R., Kreif, N., Raluy, M., Colligs, A., Seitz, C., & Gerlinger, C. (2014). Validation of the SF-36 in patients with endometriosis. *Qual Life Res*, *23*(1), 103-117. doi:10.1007/s11136-013-0442-5

Sullivan, M. J., Thorn, B., Haythornthwaite, J. A., Keefe, F., Martin, M., Bradley, L. A., & Lefebvre, J. C. (2001). Theoretical perspectives on the relation between catastrophizing and pain. *Clin J Pain*, *17*(1), 52-64. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/11289089

Sullivan, M. J. L. (2009). *The pain catastrophizing scale: user manual.* Montreal: McGill University.

Sun, X., Zhu, C., & So, S. H. W. (2017). Dysfunctional metacognition across psychopathologies: A meta-analytic review. *Eur Psychiatry*, *45*, 139-153. doi:10.1016/j.eurpsy.2017.05.029

Tabachnick, B. G., & Fidell, L. S. (2007). *Using multivariate statistics* (5th ed.). Boston, MA: Pearson Education, Inc.

Tan, B. K., Maillou, K., Mathur, R. S., & Prentice, A. (2013). A retrospective review of patient-reported outcomes on the impact on quality of life in patients undergoing total abdominal hysterectomy and bilateral salpingo-oophorectomy for endometriosis. *Eur J Obstet Gynecol Reprod Biol, 170*(2), 533-538. doi:10.1016/j.ejogrb.2013.07.030

Taylor, S. E., & Stanton, A. L. (2007). Coping resources, coping processes, and mental health. *Annu Rev Clin Psychol, 3*, 377-401. doi:10.1146/annurev.clinpsy.3.022806.091520

The National Institute for Health and Care Excellence (NICE). (2017). Endometriosis: diagnosis and Management. NICE guideline. Retrieved from https://www.nice.org.uk/guidance/ng73/resources/endometriosis-diagnosis-and-management-pdf-1837632548293

Thewes, B., Bell, M. L., & Butow, P. (2013). Fear of cancer recurrence in young early-stage breast cancer survivors: the role of metacognitive style and disease-related factors. *Psychooncology, 22*(9), 2059-2063. doi:10.1002/pon.3252

Thomas, E., Moss-Morris, R., & Faquhar, C. (2006). Coping with emotions and abuse history in women with chronic pelvic pain. *J Psychosom Res, 60*(1), 109-112. doi:10.1016/j.jpsychores.2005.04.011

Toneatto, T. (1999). Metacognition and substance use. *Addictive behaviors, 24*(2), 167-174.

Tripoli, T. M., Sato, H., Sartori, M. G., de Araujo, F. F., Girao, M. J., & Schor, E. (2011). Evaluation of quality of life and sexual satisfaction in women suffering from chronic pelvic pain with or without endometriosis. *J Sex Med, 8*(2), 497-503. doi:10.1111/j.1743-6109.2010.01976.x

van der Houwen, L. E., Schreurs, A. M., Schats, R., Lambalk, C. B., Hompes, P. G., & Mijatovic, V. (2014). Patient satisfaction concerning assisted reproductive technology treatments in moderate to severe endometriosis. *Gynecol Endocrinol, 30*(11), 798-803. doi:10.3109/09513590.2014.932341

Veneziani, C. A., & Voci, A. (2015). The Italian adaptation of the Mindful Awareness Attention Scale and its relation with individual differences and quality of life indexes. *Mindfulness, 6*(2), 373-381.

Vercellini, P., Crosignani, P. G., Abbiati, A., Somigliana, E., Vigano, P., & Fedele, L. (2009). The effect of surgery for symptomatic endometriosis: the other side of the story. *Hum Reprod Update, 15*(2), 177-188. doi:10.1093/humupd/dmn062

Vercellini, P., Fedele, L., Pietropaolo, G., Frontino, G., Somigliana, E., & Crosignani, P. G. (2003). Progestogens for endometriosis: forward to the past. *Hum Reprod Update, 9*(4), 387-396. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/12926531

Vercellini, P., Frattaruolo, M. P., Somigliana, E., Jones, G. L., Consonni, D., Alberico, D., & Fedele, L. (2013). Surgical versus low-dose progestin treatment for endometriosis-associated severe deep dyspareunia II: effect on sexual functioning, psychological status and health-related quality of life. *Hum Reprod, 28*(5), 1221-1230. doi:10.1093/humrep/det041

Verket, N. J., Uhlig, T., Sandvik, L., Andersen, M. H., Tanbo, T. G., & Qvigstad, E. (2018; in press). Health-related quality of life in women with endometriosis, compared with the general population and women with rheumatoid arthritis. *Acta Obstet Gynecol Scand*. doi:10.1111/aogs.13427

Vigano, P., Parazzini, F., Somigliana, E., & Vercellini, P. (2004). Endometriosis: epidemiology and aetiological factors. *Best Pract Res Clin Obstet Gynaecol, 18*(2), 177-200. doi:10.1016/j.bpobgyn.2004.01.007

Vitale, S. G., La Rosa, V. L., Rapisarda, A. M. C., & Lagana, A. S. (2017). Impact of endometriosis on quality of life and psychological well-being. *J Psychosom Obstet Gynaecol, 38*(4), 317-319. doi:10.1080/0167482X.2016.1244185

Vitale, S. G., La Rosa, V. L., Rapisarda, A. M. C., & Laganà, A. S. (2017). Endometriosis and infertility: the impact on quality of life and mental health. *Journal of Endometriosis and Pelvic Pain Disorders, 9*(2), 112-115.

Wattier, J. M. (2018). Conventional analgesics and non-pharmacological multidisciplinary therapeutic treatment in endometriosis: CNGOF-HAS Endometriosis Guidelines. *Gynecol Obstet Fertil Senol, 46*(3), 248-255. doi:10.1016/j.gofs.2018.02.002

Wells, A. (1995). Meta-cognition and worry: A cognitive model of generalized anxiety disorder. *Behavioural and cognitive psychotherapy, 23*(3), 301-320.

Wells, A. (2000). *Emotional disorders and metacognition: Innovative cognitive therapy*. Chichester, UK: Wiley.

Wells, A. (2009). *Metacognitive therapy for anxiety and depression*. London: The Guilford Press.

Wells, A., & Cartwright-Hatton, S. (2004). A short form of the metacognitions questionnaire: properties of the MCQ-30. *Behav Res Ther, 42*(4), 385-396. doi:10.1016/S0005-7967(03)00147-5

Wells, A., & Matthews, G. (1996). Modelling cognition in emotional disorder: the S-REF model. *Behav Res Ther, 34*(11-12), 881-888. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/8990539

Wells, A., & Simons, M. (2009). *Metacognitive therapy*. Ltd: John Wiley & Sons.

Whelan, E. (2007). 'No one agrees except for those of us who have it': endometriosis patients as an epistemological community. *Sociol Health Illn, 29*(7), 957-982. doi:10.1111/j.1467-9566.2007.01024.x

Wiech, K., & Tracey, I. (2009). The influence of negative emotions on pain: behavioral effects and neural mechanisms. *Neuroimage, 47*(3), 987-994. doi:10.1016/j.neuroimage.2009.05.059

Williams, K. E., Marsh, W. K., & Rasgon, N. L. (2007). Mood disorders and fertility in women: a critical review of the literature and implications for future research. *Hum Reprod Update*, *13*(6), 607-616. doi:10.1093/humupd/dmm019

World Health Organization. (2002). *Current Practices and Controversies in Assisted Production*, Geneva, Switzerland.

World Medical Association. (2013). World Medical Association Declaration of Helsinki: ethical principles for medical research involving human subjects. *JAMA, 310*(20), 2191-2194. doi:10.1001/jama.2013.281053

Yoshida, T., Molton, I. R., Jensen, M. P., Nakamura, T., Arimura, T., Kubo, C., & Hosoi, M. (2012). Cognitions, metacognitions, and chronic pain. *Rehabilitation psychology, 57*(3), 207-2013.

Young, K., Fisher, J., & Kirkman, M. (2015). Women's experiences of endometriosis: a systematic review and synthesis of qualitative research. *J Fam Plann Reprod Health Care, 41*(3), 225-234. doi:10.1136/jfprhc-2013-100853

Zafrakas, M., Grimbizis, G., Timologou, A., & Tarlatzis, B. C. (2014). Endometriosis and ovarian cancer risk: a systematic review of epidemiological studies. *Front Surg, 2011,* 1-6. doi:10.3389/fsurg.2014.00014

Zarbo, C., Brugnera, A., Frigerio, L., Malandrino, C., Rabboni, M., Bondi, E., & Compare, A. (2017). Behavioral, cognitive and emotional coping strategies of women with endometriosis: a critical narrative review. *Archives of Women's Mental Health, 21*(1), 1-13. doi:10.1007/s00737-017-0779-9

Zarbo, C., Bugnera, A., Compare, A., Candeloro, I., Secomandi, R., Betto, E., . . . Frigerio, L. (2018). Perfectionistic traits and importance given to parenthood are associated with infertility-related quality of life in a sample of infertile women with and without endometriosis. *Sexual & Reproductive Healthcare, 17,* 86-90.

Zondervan, K. T., Becker, C. M., Koga, K., Missmer, S. A., Taylor, R. N., & Vigano, P. (2018; in press). Endometriosis. *Nat Rev Dis Primers, 4*(9), 9. doi:10.1038/s41572-018-0008-5

Acknowledgments

Ringrazio tutte le donne che hanno partecipato a questo studio e i professionisti del reparto di Ostetricia e Ginecologia dell’Ospedale di Bergamo per la disponibilità mostrata in questi anni.

Ringrazio il Prof.Compare, il Prof. Frigerio e il Prof.Rabboni per le opportunità di crescita professionale e la fiducia che mi hanno concesso in questi anni di collaborazione.

Ringrazio la mia famiglia, i miei parenti, gli amici e i colleghi più cari per esserci sempre.