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1 **Delineating Sociodemographic, Medical and Quality of Life Factors Associated with**
2 **Psychological Distress in Individuals with Endometriosis**

3 Running Title: Psychological distress, QoL in Endometriosis
4

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19

20 **Title Delineating Sociodemographic, Medical and Quality of Life Factors Associated with Psychological**
21 **Distress in Individuals with Endometriosis**

22 **Abstract**

23 **Study question:** What is the relationship between specific quality of life domains and depression, anxiety and
24 stress in the endometriosis population?

25 **Summary answer:** Psychosocial domains of quality of life, such as perceived social support and self-image are
26 more strongly associated with depression, anxiety and stress than pain and medical factors.

27 **What is known already:** Prior research indicates a high prevalence of anxiety and depression in individuals
28 with endometriosis. Pain is thought to be critical in the development of psychological distress, however, prior
29 research has investigated this association without consideration of psychosocial quality of life domains such as
30 social functioning, perceived social support and self-image.

31 **Study design, size, duration:** This study is a cross-sectional analysis of baseline data collected in a longitudinal
32 study exploring psychological distress in endometriosis (n=584).

33 **Participants/materials, setting, methods:** Individuals living with endometriosis participated in this study.
34 Demographic and medical information concerning endometriosis treatment and diagnosis was self-reported.
35 Psychological distress and quality of life was measured using the Depression, Anxiety and Stress Scale
36 (DASS21), Endometriosis Health Profile-30 (EHP-30) and the Short Form Survey (SF36v2). A series of linear
37 regression analyses explored the relationship between specific quality of life domains and the primary outcomes
38 of depression, anxiety and stress.

39 **Main results and the role of chance:** Approximately half of the participants in this sample reported moderate
40 to severe anxiety, depression and stress. Quality of life domains, particularly perceived social support, social
41 functioning, and self-image were more strongly associated with psychological distress than medical or
42 demographic factors. Pain was associated with anxiety, but not depression or stress. Greater number of
43 endometriosis symptoms was only associated with depression.

44 **Limitations, reasons for caution:** These data are cross-sectional and therefore causality cannot be inferred
45 from this analysis. Information about endometriosis diagnosis and treatment was self-reported, and not verified
46 against medical records.

47 **Wider implications of the findings:** This study indicates that psychosocial factors may be more salient factors
48 underlying depression, anxiety and stress in the endometriosis population than pain and medical factors. There

49 is a need for interventions targeting psychological distress in this population that focus on the broader impact of
50 endometriosis beyond pain and physical symptomatology.

51 **Study funding/competing interest(s):** This research was supported by the Research Training Program (RTP)

52 Scholarship awarded to Author 1 by Macquarie University. The remaining authors have nothing to declare.

53 **Trial Registration Number:** ACTRN12619001508167

54

55 **Key words:** Endometriosis, depression, anxiety, stress, quality of life

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59 **Introduction**

60 Endometriosis is a chronic, incurable condition with debilitating physical symptoms including persistent pelvic
61 pain, dyspareunia, altered bowel and bladder function, abdominal bloating and infertility (Agarwal, Foster, and
62 Groessl 2019). Comorbidity with other conditions such as migraine, irritable bowel syndrome, chronic fatigue
63 syndrome and fibromyalgia is experienced by 95% of affected individuals (As-Sanie et al. 2019). Endometriosis
64 can negatively impact all aspects of a person's daily life, including social and work activities (As-Sanie et al.
65 2019; Simoens et al. 2012) and personal relationships (Aerts et al. 2018; Di Donato et al. 2014; La Rosa, De
66 Franciscis, Barra, Schiattarella, Torok, et al. 2020; La Rosa, De Franciscis, Barra, Schiattarella, Tropea, et al.
67 2020). Extensive diagnostic delays are common (Agarwal, Foster, and Groessl 2019), as is recurrence of
68 symptoms even after invasive treatments (Aerts et al. 2018). Taken together, it is not surprising that individuals
69 with endometriosis experience high symptom burden, particularly in the domain of mental health (Friedl et al.
70 2015).

71 The prevalence of psychological distress in endometriosis populations is high with up to 1 in 3
72 individuals (33%) experiencing severe depression and up to 87% experiencing anxiety (Sepulcri and Amaral
73 2009). The prevalence of this psychological distress far exceeds incidence in healthy populations [(11-15%
74 depression; Kessler and Bromet 2013), (34% anxiety; (Bandelow and Michaelis 2015))] and even in recently
75 diagnosed oncology populations (21-24% depression; 21% anxiety; (Brandenburg et al. 2019). Moreover, many
76 people experience anxiety and depressive symptoms comorbidly along with the burden of the physical
77 symptoms of endometriosis (Friedl et al. 2015).

78 Beyond documenting the prevalence of depression and anxiety in endometriosis populations, there is a
79 need to understand the factors contributing to this distress. There is robust evidence linking physical aspects of
80 endometriosis, such as chronic pelvic pain with depression (Chen et al. 2016; Facchin, Barbara, Dridi, et al.
81 2017; Facchin et al. 2015; Gambadauro, Carli, and Hadlaczky 2019; Laganà et al. 2017; Lorençatto et al. 2006;
82 Rowlands et al. 2016) and anxiety (Sepulcri and Amaral 2009). Yet, little is known about how factors beyond
83 the physical such as psychological or social factors, contribute to the burden of psychological distress in those
84 with endometriosis (Suls and Rothman 2004; Frazier 2020). Working within a biopsychosocial framework,
85 quality of life (QoL) (Colwell et al. 1998) is a multidimensional construct reflecting different physical and
86 psychosocial aspects of wellbeing and functioning, including perceived physical ability in terms of everyday
87 activities (i.e., role limitation), social functioning and support, feelings of wellness or vitality, and self-image
88 (Stewart et al. 1989; Tarlov et al. 1989). There is evidence that individuals with endometriosis who are

89 experiencing psychological distress (i.e., anxiety and/or depression) also report diminished QoL (Pope et al.
90 2015; Sepulcri and Amaral 2009), consistent with other chronic illness research, including diabetes (de Groot et
91 al. 2001), cancer (Maass et al. 2015) and rheumatoid arthritis (Gambadauro, Carli, and Hadlaczky 2019). There
92 is no current consensus about which QoL domains are most impacted in endometriosis, with some research
93 indicating pain and physical limitations to be most affected (Nnoaham et al. 2011) and others indicating mental
94 health and psychological functioning to be more of a concern (Gao et al. 2006). There is also currently a
95 paucity of research which explores the relationship between specific QoL domains and psychological distress
96 more broadly.

97 In light of the inconsistencies in the evidence base investigating the link between QoL and
98 psychological distress in endometriosis populations, there is a need for a more in-depth understanding of this
99 relationship, as being able to identify the factors associated with psychological distress will help inform the
100 design and development of interventions targeting distress in this population. Moreover, despite documenting
101 the rates of depression and anxiety experienced by those with endometriosis, prior investigations have neglected
102 to investigate stress, another domain of psychological distress characterised by nervous tension, difficulty
103 relaxing and irritability (Lovibond and Lovibond 1995), that typically reflects responses to everyday
104 experiences and challenges and which is likely to be relevant to the experience of managing the fluctuating
105 symptoms of endometriosis. Prior research within endometriosis investigating the prevalence of anxiety and
106 depression (Facchin, Barbara, Dridi, et al. 2017; Friedl et al. 2015) has often utilised the Hospital Anxiety and
107 Depression Scale (HADS) (Norton et al. 2013) despite this measure being methodologically criticised (Coyne
108 and van Sonderen 2012). This study aimed to address these issues by aiming 1) to extend prior research by
109 documenting the prevalence of psychological distress in people with endometriosis, where psychological
110 distress is broadly conceived reflecting depression, anxiety, and stress, and 2) to delineate which specific
111 domains of QoL are most strongly associated with psychological distress in this population.

112

113 **Materials and Methods**

114 **Study Population**

115 English speaking persons (18+ years) who had received a prior surgical or clinical diagnosis (either via
116 diagnostic imaging, or diagnosis by a medical professional) of endometriosis were eligible to participate in the
117 study. Following approval from the Macquarie University Human Research Ethics Committee, participants were
118 recruited through the social media pages (Facebook and Instagram) of several Australian endometriosis

119 organisations including Endometriosis Australia, EndoActive, Canberra Endometriosis Network, and
120 Endogram. The invitation to join the study was extended by providing the web address to access the online
121 questionnaire. Participants provided informed consent and then completed a survey assessing self-reported
122 demographic information and medical history, as well as a battery of questionnaires, taking approximately 30
123 minutes to complete. This study reports analyses of baseline data of a longitudinal study investigating
124 psychological distress in individuals with endometriosis.

125

126 **Measures**

127 **Demographic and medical history** Information regarding age, Australian Aboriginal or Torres Strait Islander
128 status, highest education level achieved, marital and employment status was collected. Participants additionally
129 reported endometriosis-specific medical history, including method of diagnosis (surgical, clinical [by a medical
130 professional based upon symptomatology], or diagnostic imaging [MRI or ultrasound] and prior treatment, self-
131 reported severity of endometriosis [Likert-type item rated 1 (Asymptomatic) to 4 (Severe)], time since
132 diagnosis, age of symptomatic onset, fertility [Likert-type item; “Have you ever tried to get pregnant for 12
133 months or more without success?” - 1 (Yes) to 0 (No)] and the presence of a range of common endometriosis
134 symptoms experienced (from which an individual score for average number of symptoms was calculated).

135 **Psychological Distress** The Depression, Anxiety and Stress Scales (DASS-21) is a valid and reliable measure
136 of psychological distress (Lovibond and Lovibond 1995) comprising three subscales measuring distinct
137 constructs of depression (e.g., “I couldn’t seem to experience any positive feeling at all”), anxiety (e.g., “I was
138 aware of dryness in my mouth”), and stress (e.g., “I found it hard to wind down”) with Likert-type items rated
139 from 0 (did not apply to me at all) to 3 (applied to me very much or all of the time). Total summed scores out of
140 21 are calculated for each individual subscale, with indicative cut-off scores for moderate distress indicated by
141 scores for depression >7, anxiety >6, and stress >10 (Lovibond & Lovibond, 1995). Each subscale reported
142 acceptable internal consistency in this sample, with Cronbach’s $\alpha = 0.93$ (depression subscale), 0.81 (anxiety
143 subscale) and 0.84 (stress subscale), respectively.

144 **Endometriosis-Specific Quality of Life** The Endometriosis Health Profile Questionnaire (EHP-30) (Jones,
145 Jenkinson, and Kennedy 2004) is a validated and reliable (Khong, Lam, and Luscombe 2010) measure assessing
146 the impact of endometriosis on physical, psychological and social aspects of life. Five subscales assess different
147 dimensions of endometriosis-related QoL: Pain (e.g. “found it difficult to walk because of the pain”), Control &
148 Powerlessness (e.g. “have you felt that your symptoms are ruling your life?”), Emotional Well-Being (e.g. “felt

149 depressed”), Social Support (e.g. “have you felt others do not understand what you are going through?”), Self-
150 Image (e.g. “my appearance has been affected”), with Likert-type scale items (1- never to 5 - always) summed
151 to yield total subscale scores. Higher scores represent worse QoL, and all subscales indicated acceptable internal
152 consistency, with Cronbach’s $\alpha=0.94$ (pain), 0.93 (Control & Powerlessness), 0.87 (Emotional Well-Being),
153 0.86 (Social Support) and 0.87 (Self-Image). For this study, the Emotional Well-Being subscale was excluded
154 from further analyses, as this construct overlaps strongly with the dependent variable (psychological distress).

155 **General Quality of Life** The Short Form 36 Version 2 (SF-36v2) is a validated, reliable and non-specific QoL
156 measure that explores different aspects of mental and physical health and allows for comparisons with a general
157 standard population (Ware, Gandek, and Group 1994; Ware and Sherbourne 1992). The measure is comprised
158 of nine individual subscales, with higher scores indicating better QoL. The following four subscales were
159 included in this study: Physical Functioning (e.g. “to what extent were you limited in lifting or carrying
160 groceries?”), Role Limitations due to Physical Health (e.g. “to what extent did you accomplish less than you
161 would like?”), Vitality (e.g. “did you feel full of pep?”) and Social Functioning (e.g. “to what extent has your
162 physical health or emotional problems interfered with normal social activities?”). For each of the included SF-
163 36v2 subscales, item scores were coded, summed and transformed to norm-based scores, which have a mean of
164 50 and a SD of 10 (Ware and Sherbourne 1992). The Mental Health and Role Limitations due to Emotional
165 Health subscales were not included as these constructs overlap considerably with the psychological distress
166 outcome measures. Most subscales demonstrated acceptable internal consistency, with Cronbach’s $\alpha =0.92$
167 (Physical Functioning), 0.84 (Role Limitation due to Physical Health), 0.75 (Vitality) and 0.82 (Social
168 Functioning). The Bodily Pain (Cronbach’s $\alpha=0.59$) and General Health (Cronbach’s $\alpha=0.50$) subscales were
169 also excluded from all analyses due to poor internal reliability.

170 **Statistical Analysis**

171 Power calculations were computed using G*Power (Faul et al. 2007). We conservatively estimated models may
172 need to control for up to fifteen covariates, with eight main variables of interest. Based on a small to medium
173 effect size, the minimum sample size required was 463 to achieve power of at least 0.8 with a critical p of .05.
174 Descriptive statistics were calculated using SPSS version 26 for the demographic and medical history variables.
175 The mean, standard deviation and range were calculated for the various subscales of the EHP-30, SF-36v2 and
176 DASS-21. Associations with the three dependent variables (depression, anxiety, stress) were conducted using t -
177 tests or one-way ANOVA for categorical independent variables, and Pearson’s correlations for all continuous
178 independent variables in order to identify significant medical or demographic factors which may predict

179 psychological distress ($p < .05$). Pearson's correlations were also conducted between DASS-21 subscale scores
180 and scores for the EHP-30 and SF-36v2 subscales. A sequence of stepwise linear regression models
181 (demographic variables in the first block, medical variables in the second block and QoL variables in the third
182 block) was used to assess the extent to which demographic or medical variables, and domains of QoL were
183 associated with psychological distress. Demographic and medical variables included in the linear regression
184 models were based upon the preliminary associations determined in earlier bivariate analyses.

185 **Ethics Approval**

186 This study was approved by the Macquarie University Human Research Ethics Committee (HREC); Reference
187 No:52019565110023.

188 **Results**

189 A total of 584 individuals consented to participate in the study. Sample characteristics are displayed in Table I
190 along with t -statistics and Pearson's correlation coefficients for each variable. The results of these preliminary
191 analyses demonstrated that greater depression was significantly associated with unemployment, lower
192 education, higher self-rated endometriosis severity, higher BMI, greater number of symptoms and the use of
193 pain medication as a treatment for endometriosis. Worse anxiety was associated with lower education,
194 unemployment, older age, greater number of symptoms and having had surgical treatment. Finally, worse stress
195 was only associated with older age and greater number of symptoms. Table II reports the prevalence of
196 psychological distress in terms of severity within the DASS-21 scoring spectrum, across the sample population.
197 Approximately half of the participants reported experiencing moderate to severe clinically significant levels of
198 depression (54.07%), anxiety (46.11%) and stress (46.77%). Descriptive statistics for psychological distress
199 (depression, anxiety, stress) and QoL variables are displayed in Table III, as well as correlations between these
200 variables. Depression, anxiety and stress correlated with all of the QoL domains as depicted in Table III
201 ($p < 0.01$).

202 The results of the separate linear regression analyses for depression, anxiety and stress respectively are
203 provided in Table IV. For depression, the overall model was significant ($F=19.66$), demonstrating that the
204 combination of sociodemographic (unemployment), medical (greater number of endometriosis symptoms), and
205 worse QoL (EHP-Social Support, EHP-Self-Image, SF36-Vitality, SF36-Social Functioning) explained 38.1%
206 of the total variance. Furthermore, QoL factors independently accounted for 27.9% of this variance. For anxiety,
207 the overall model was significant ($F=14.65$) accounting for 29.1% of the variance, with significant predictors
208 being sociodemographic (higher education), medical (having had surgical treatment) and QoL variables (EHP-

209 Pain, EHP-Control & Powerlessness, EHP-Social Support, EHP-Self-Image, SF36-Social Functioning;
210 independently accounting for 18.2% of variance). Stress yielded similar results with the full model ($F=18.22$)
211 accounting for 30.2% of variance, with four QoL domains (EHP-Social Support, EHP-Self-Image, SF36-Social
212 Functioning, SF36-Vitality) independently accounting for 24.6% of variance. There were no medical or
213 demographic variables associated with the domain of stress.

214 **Discussion**

215 In light of extensive physical symptom burden associated with endometriosis, this study aimed to
216 assess the prevalence of psychological distress, characterised by depression, anxiety and stress, and to identify
217 the domains of QoL associated with this distress. We identified very high prevalence of moderate to severe
218 psychological distress (depression 54%, anxiety 46%, stress 47%) in this sample, comparable to the higher end
219 of prior endometriosis distress prevalence research previously reported [(depression 63.5%; Sepulcri and
220 Amaral 2009); (anxiety 29%; Laganà et al. 2017)] and exceeding prevalence in other chronic disease
221 populations in both rate and severity [e.g., cancer (Brandenburg et al. 2019); cardiovascular disease (Hare et al.
222 2014; Celano et al. 2016); type 1 diabetes (Hislop et al. 2008)]. Moreover, prevalence of anxiety and depression
223 in our endometriosis sample exceeds that reported for those with chronic low back pain (depression-32%,
224 anxiety-30.9%; Fernandez et al. 2017) and rheumatoid arthritis (depression-38.8%; Matcham et al. 2013).
225 Additionally, our finding that slightly less than 1 in 2 individuals reported experiencing high stress, adds to our
226 understanding of psychological distress in this population and suggests that affected individuals experience
227 widespread difficulty in managing the constellation of daily stressors associated with endometriosis, including
228 the unpredictable and unwanted symptom flare-ups that characterise this condition (Young, Fisher, and Kirkman
229 2015; Denny 2009). Taken together, these very high levels of psychological distress identified indicate an unmet
230 need for psychosocial support in assisting individuals to manage the ongoing challenges of living with this
231 condition.

232 In light of the very high prevalence of psychological distress, it is noteworthy that QoL domains
233 accounted for the greatest variance in distress compared with either of the combined demographic or medical
234 characteristics variables. Two of the strongest QoL predictors were related to social aspects, namely Social
235 Functioning (i.e., perceived impact of physical or emotional issues on participation in social activities; SF36v2),
236 and Social Support (perceptions of available support; EHP-30), and a third strong QoL predictor was Self-Image
237 (Self-Image EHP-30) reflecting the individual's subjective perceptions of their self-identity, akin to the
238 construct of body image (Fingeret, Teo, and Epner 2014). The findings regarding social support are consistent

239 with chronic disease research in general that identifies the role of social support (Kroenke et al. 2013) in
240 improving coping strategies, encouraging positive health behaviours and potentially reducing physiological
241 responses to stress (Stanton, Revenson, and Tennen 2007). Individuals with endometriosis often experience
242 social isolation and lack of support (Young, Fisher, and Kirkman 2015), avoiding discussing their disease
243 experience for fear of being disbelieved or misunderstood (Culley et al. 2013) and turning to sources of
244 information and support such as online forums (Whelan 2007) that are frequently not moderated or tailored to
245 the individual's specific support needs (White and Dorman 2001). In reference to social functioning, individuals
246 with endometriosis have reported needing to change plans or miss out on social activities (Young, Fisher, and
247 Kirkman 2015) similar to research indicating that people with chronic pain generally are more likely to
248 experience problematic social relationships (Sturgeon et al. 2015) and withdraw from social activities (Sturgeon,
249 Zautra, and Arewasikporn 2014). Whilst seeking out social support is reported to be one of the more adaptive
250 coping strategies utilised by those affected by endometriosis (Zarbo et al. 2017), the current findings suggest
251 that not feeling supported or being freely able to discuss the challenges of living with endometriosis is strongly
252 linked with poor psychological functioning.

253 The finding that individuals with a poor self-image are more likely to experience symptoms of
254 depression, anxiety and stress, extends prior endometriosis that low self-esteem is associated with anxiety and
255 depression (Facchin, Saita, et al. 2017). Negative body image has been linked with psychological distress in
256 healthy populations (Duchesne et al. 2017), and in oncology settings, where cancer surgery and treatments may
257 lead to scarring, weight changes and infertility (Fingeret, Teo, and Epner 2014; Przewdziecki et al. 2013).
258 Similar to the effects of cancer treatments, symptoms of endometriosis such as abdominal bloating or scarring
259 from surgery can be disfiguring, and hormonal treatments associated with weight gain further compromise the
260 woman's self-image (Denny 2009). Functional changes such as endometriosis-related infertility may threaten a
261 person's sense of femininity or sense of sexuality (Facchin, Barbara, Saita, et al. 2017). These body image
262 concerns are commonly reported in breast and gynaecological cancer populations and are associated with
263 psychological distress (Teo et al. 2018). Critically, self-image evaluations entail appraisals both within the
264 individual and outwardly, in comparison with others invoking the social perspective of self-image (Jones 2001;
265 Levine and Piran 2004). Combined with the findings that social functioning and social support are strongly
266 linked with psychological distress, these results suggest that supportive interventions for individuals living with
267 endometriosis should target the social dimensions of wellbeing that also reflect self-image.

268 Lower levels of the QoL domain vitality (as measured by the SF36v2), reflecting self-reported energy
269 levels and fatigue, were also associated with depression and stress, similar to other chronic illness samples (e.g.,
270 rheumatoid arthritis (Nikolaus et al. 2013) and breast cancer (Bennett et al. 2004). Given that feelings of fatigue
271 are a symptom of depression, it is not surprising that this was a key factor in this sample, particularly in light of
272 the high prevalence of fatigue reported as a regularly experienced symptom (89.7% of participants). Moreover,
273 since fatigue is typically associated with the experience of accumulated stress over time (Kocalevent et al.
274 2011), the high symptom burden and stress reported in this sample suggests that the constant need to monitor
275 and manage these symptoms exceeds many individuals' ability to cope effectively. The prevalence of fatigue in
276 this sample exceeds prior reported rates in endometriosis samples (e.g., 57% of individuals (Ramin-Wright et al.
277 2018) and is likely associated with the high use of hormone-based treatments (67.8% of participants), for which
278 fatigue is a common side-effect (Bezerra et al. 2020).

279 Another aspect of QoL associated with psychological distress, in this case anxiety, was a sense of
280 perceived control (pain and symptoms: EHP-30 Pain and EHP-Control and Powerlessness). Since perceptions of
281 reduced control over adverse bodily or environmental events increase susceptibility to anxiety (Chorpita and
282 Barlow 1998; Gallagher, Bentley, and Barlow 2014), the variable and highly unpredictable nature of
283 endometriosis symptoms (Aerts et al. 2018) heightens perceptions of lack of control and increases the likelihood
284 of anxiety manifesting in endometriosis-affected individuals. Having had surgical treatment was the only
285 medical variable associated with anxiety. For many individuals, surgical intervention may be a last resort.
286 treatment option, having trialled more conservative approaches, and unfortunately the effectiveness of surgical
287 treatments is often short-lived or unsuccessful (As-Sanie et al. 2019; Young, Fisher, and Kirkman 2015).
288 Additionally, surgery for endometriosis is often a method of addressing fertility issues (As-Sanie et al. 2019),
289 which in and of themselves are emotionally laden (Aerts et al. 2018) and may contribute to anxiety (Young,
290 Fisher, and Kirkman 2015).

291 One surprising finding was the lack of association of pain with psychological distress. Prior studies
292 report that increased pain, rather than the endometriosis itself, is assumed to be the main driver for
293 psychological distress (Zarbo et al. 2017). Yet, our findings point to a range of additional psychosocial factors
294 that are more strongly linked with psychological distress in this population. The inconsistency in these findings
295 may be attributed at least in part to differences in methodological approaches including that: studies reporting
296 the link between pain and psychological distress have neglected to investigate the broader psychosocial context;
297 and our study used QoL pain measures, rather than specific assessments of pain per se.

298 Taken together, these findings indicate that individuals living with endometriosis have a very high
299 prevalence of co-morbid mental health disorders, and the range of factors associated with the different domains
300 of psychological distress (depression, anxiety, stress) re-affirms the importance of investigating these
301 conceptually distinct domains individually within the endometriosis context. The extent of depression, anxiety
302 and stress evident in this sample along with the identified links highlighting poor functioning in social, self-
303 identity and perceived control domains of QoL suggests a strong unmet need for appropriately targeted and
304 tailored psychosocial interventions to meet the support needs of these individuals. In other chronic illness
305 contexts, mindfulness and self-compassion focused interventions are proving efficacious in managing different
306 aspects of mental health including body image distress (Sherman et al. 2018), depression (Klainin-Yobas, Cho,
307 and Creedy 2012; DiRenzo et al. 2018) and overall wellbeing more broadly (DiRenzo et al. 2018; Grossman et
308 al. 2004). Preliminary data in the endometriosis context suggest that mindfulness-based interventions may be
309 effective in helping with pain management, and improving daily functioning and wellbeing, although
310 methodological limitations in this body of research limit definitive conclusions regarding the suitability of this
311 intervention approach for individuals living with endometriosis (Evans et al. 2019).

312 In consideration of the findings of this study, our analysis of cross-sectional data precludes the ability
313 to infer causality regarding the relationship between QoL domains and psychological distress; yet evidence from
314 other disease contexts indicates the impact of psychological distress can be as adverse as the experience of
315 chronic disease itself, and that it comorbidly further impacts QoL (Keles et al. 2007). Another potential
316 limitation is that the sample was primarily recruited via online forums, thus, it may not be representative of the
317 greater population of women with endometriosis. Additionally, in this study, information about endometriosis
318 diagnosis and treatment was self-reported, rather than being verified against medical records. We also focused
319 on prior treatment, and did not account for planned surgery or treatment, which may have implications for QoL
320 and psychological distress. Future longitudinal research with more representative samples is clearly needed to
321 understand the trajectory of psychological distress over time and to identify causal pathways of factors
322 impacting on depression, anxiety and stress in women with endometriosis.

323 In conclusion, this study adds to the growing evidence pointing to the very high prevalence of
324 psychological distress and psychological burden experienced by individuals living with endometriosis. This
325 study reveals the need for targeted psychological interventions that look beyond pain and physical
326 symptomatology in addressing mental health in this population. Further longitudinal research is required to

327 explore potential causal mechanisms in the association between psychological distress and different domains of

328 QoL.

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361 Author's roles

362 All authors contributed to study design and recruitment for this study as well as composition and revision of this
363 manuscript. C.S.M, K.A.S and A.B also contributed to data analysis and reporting.

364 Data availability

365 Original data for this manuscript are available on request in accordance with the conditions of ethics approval.

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369 Conflicts of Interest

370 The authors of this manuscript do not have any conflicts of interest to declare.

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