J Rat-Emo Cognitive-Behav Ther (2018) 36:119–136
https://doi.org/10.1007/s10942-017-0277-z

Catastrophizing, Depression and Anxiety During Pregnancy: Relation Between Lumbopelvic Pain and Physical/Social Functioning

Hatice Yılmaz Doğru[1] · Filiz Özsoy[2] · Serkan Doğru[3] · Tuğba Karaman[3] · Aynur Şahin[3] · Asker Zeki Özsoy[1] · Bülent Çakmak[1] · Mustafa Süren[3]

Published online: 21 July 2017
© Springer Science+Business Media, LLC 2017

Abstract Catastrophizing, a cognitive behavioral aspect of pain, is defined as an excessively negative orientation against a noxious stimulus. The primary goal of the present study is to assess the association between catastrophizing and lumbopelvic pain intensity during the pregnancy period, the secondary goal is to explore the variation of pain catastrophizing, anxiety and depression, and the tertiary goal is to investigate the relationship between catastrophizing and quality of life. After approval, pregnant women with lumbopelvic pain were invited to join in the study. During admission, participants were asked to complete questionnaires including Pain Catastrophizing Scale, Beck Anxiety Inventory, Beck Depression Inventory-II, and Short Form-36. Age, gravida, parity, number of abortus, number of live-births and the pain intensity score were recorded. A total of 429 women were enrolled in the study. Pain catastrophizing scores showed a fluctuation during pregnancy, and were significantly correlated with the scores of Beck Anxiety Inventory, Beck Depression Inventory, Visual Analog Scale, and Short Form-36 sub-scales including social functioning, vitality, physical functioning and mental health. The present study demonstrated that catastrophizing level shows an alteration throughout the pregnancy period, and variation in catastrophizing shows an approximately similar course with pain intensity, depression and anxiety.

Keywords Pain catastrophizing · Pregnancy · Depression · Anxiety · Quality of life

✉ Hatice Yılmaz Doğru
hatice_yilmaz47@hotmail.com

[1] Department of Obstetrics and Gynecology, Medical Faculty, Gaziosmanpaşa University, Ali Şevki Erek Yerleşkesi, 60200 Tokat, Turkey

[2] Department of Psychiatry, Tokat State Hospital, Tokat, Turkey

[3] Department of Anesthesiology and Reanimation, Medical Faculty, Gaziosmanpaşa University, Tokat, Turkey

Introduction

Pregnancy and childbirth are natural processes for every pregnant woman on Earth (Benza and Liamputtong 2014). In contrast to its inherent status, several problems have been reported during the stages of pregnancy. Anxiety and depression, of which depression is the leading cause of disability among women have particular importance in prenatal period. Anxiety during pregnancy is related to adverse outcomes including miscarriage, preeclampsia, preterm delivery, and low birth weight. Prenatal anxiety is strongly associated with postpartum depression. The prevalence of prenatal anxiety ranges from 13 to 21%. Depression and anxiety are major risk factors for postpartum depression in which postpartum depression leads to impaired social and physical functioning. Inevitably, pregnancy can be a source of stress and anxiety implying threats to the health and well-being of the mother (Fairbrother et al. 2015).

Regardless of the type of delivery, low back pain is one of the major problems among women with pregnancy. About 50% of pregnant women complain of back pain and 25% of these require medical care (Bishop et al. 2016; Glinkowski et al. 2016). It is well known that pain is not only a sensation but also a complex mixture of sensory, affective and cognitive psychological states (Tiemann et al. 2014). Therefore, pain should be analyzed in a biopsychosocial model.

Catastrophizing, a cognitive behavioral aspect of pain, is determined as an excessively negative orientation against a noxious stimulus (Sullivan et al. 1995). Catastrophizing was first described by the American Psychologist Ellis (1962), and refined by Beck in 1987 to define an impaired cognitive behaviour especially observed in patients with anxiety and depression with an irrational negative forecast of future events (Leung 2012). The first research on pain catastrophizing was conducted by Spanos et al. (1979) in which participants asked to report on their pain experience after a cold pressor task and those have worry, fear and inability to manage their focus out of pain were characterised as pain catastrophizers. Thereafter, the early blueprints of pain catastrophizing scale were constructed by Spanos et al. (1979) and Chaves and Brown (1987). This development further led to the essentials of Pain Catastrophizing Scale which contains 13 items grouped in three sub-scales (Sullivan et al. 1995).

In recent years, research has focused on affective and cognitive compounds of pain. Clinicians reported that pain catastrophizing and fear of movement are significant predictors in the etiology of low back pain and related disability (Carriere et al. 2015). Cross-sectional studies have confirmed the association between catastrophizing and higher disability in several populations with pain (Ogunlana et al. 2015; Sullivan et al. 2002; Vincent et al. 2014). Two pathways can be described to elucidate the cascade of events in individuals who catastrophically misinterpret pain (bodily sensations). First, pain-related fear leads to avoidance behavior, especially towards movement and physical activity. Second, pain-associated fear causes increased bodily awareness and pain hyper-vigilance (Taylor et al. 2015). In turn, hyper-vigilance, depression and disability can be associated with increased levels of pain, leading to a vicious circle (Herbert et al. 2014).

Consequently, pregnant women high in catastrophizing may experience more intensive pain and show poorer daily physical activity during the following stages of pregnancy. A recent study showed that women with higher levels of catastrophizing during pregnancy period have a doubled risk for postpartum lumbopelvic pain (Olsson et al. 2012a). However, few studies have evaluated the fluctuation of catastrophizing, anxiety, and depression over time during pregnancy, thus leading to a lack of knowledge about the presence or the absence of a possible association among these factors (Olsson et al. 2012b).

Anxiety levels vary at the different stages of pregnancy with high levels in first and third trimesters (Madhavanprabhakaran et al. 2015). Associated with the information above, the fluctuation in anxiety suggested that depression, catastrophizing and pain levels may show the same alteration during the normal course of pregnancy as well.

Therefore, the primary goal of the present study is to explore the variation of pain catastrophizing, anxiety, depression and low back pain levels in different stages of pregnancy, the secondary goal is to assess the association between pain catastrophizing and lumbopelvic pain intensity during the pregnancy period, and the tertiary goal is to demonstrate the relationship between pain catastrophizing and social/physical functioning, vitality, and mental health.

Methods

Subjects

After approval from the Clinical Researches Ethics Committee (13-KAEK-213), this study was initiated in the Department of Obstetrics and Gynecology. Pregnant women with lumbopelvic pain who were admitted to the outpatient unit between November 2013 and May 2015 were invited to join in the study and were asked to complete questionnaires including Pain Catastrophizing Scale (PCS), Beck Anxiety Inventory (BAI), Beck Depression Inventory-II (BDI-II), and Short Form-36 (SF-36). Lumbopelvic pain is determined as self-reported pain in the region of the lower back, the anterior/posterior region of the pelvis, or any combination of these locations (Olsson et al. 2009). Women were excluded when history or recent physical examination showed signs or symptoms for any kind of disorder which might cause pain in the lumbopelvic region. A positive answer for the question: “Have you felt low back and/or pelvic pain at this moment or during the previous seven days?” was considered to have a current lumbopelvic pain. The questionnaires included items about age, gravida, parity, number of abortus, and number of live-births. In addition, the pain intensity (lumbopelvic pain) was evaluated using visual analog scale (VAS) and the score was recorded on the questionnaire. Participants with the absence of lumbopelvic pain described above or a value of zero in VAS (means no pain) were excluded from the study.

Design

The design of the study was cross-sectional.

Instruments

The questionnaires were given to the participants while they were waiting for the examination. All data was collected for all subjects at once during routine examination of the women with pregnancy (each being in a different week of gestation).

Visual Analog Scale

The VAS is an instrument to measure the intensity of pain that consists of a straight line (100 mm in length) with the end points from "no pain" to "extremely severe pain ever before". The patient marks the current pain level that they feel. The VAS score is defined by measuring in millimetres from left side to the point that the patient marks. Then the result is turned into whole numbers (Hawker et al. 2011).

Pain Catastrophizing Scale

Pain Catastrophizing Scale is a self-rated questionnaire consisting of 13 items to evaluate the magnitude of the catastrophizing thoughts and behaviors. It is the combination of the three dimensions of helplessness, magnification, and rumination. Each item is evaluated on a five-point scale ranging from zero (not at all) to four (all the time). The scores for the sub-scales are calculated by the sum of the corresponding items, and the total score is calculated by the summation of all items. Total score ranges from 0 to 52 points, with higher scores indicating heightened levels of catastrophizing (Sullivan et al. 1995). The Turkish validity and reliability of PCS was conducted by Suren et al. (2014).

Beck Depression Inventory-II

In addition, the BDI-II is a self-administered, 21-item questionnaire that was developed by Beck et al. (1996) to detect the level and intensity of depressive symptoms in adults (Beck et al. 1996). A value of 0–3 is assigned for each answer. A total score below 13 considered as minimal depression; 14–19, mild depression; 20–28, moderate depression; and 29–63, severe depression. The cognitive-affective scores are constructed from the first 14 items (sadness, pessimism, past failure, loss of pleasure, guilty feelings, punishment feelings, self-dislike, self-criticalness, suicidal ideation, crying, agitation, loss of interest, indecisiveness, worthlessness; BDI-C), and the somatic-performance sub-scale from items 15 to 21 (loss of energy, sleep problems, irritability, appetite problems, concentration, fatigue, loss of interest in sex; BDI-S) (Emmons et al. 1987). The Turkish adaptation of BDI and BDI-II were performed by Hisli (1989) and Kapçı et al. (2008), respectively.

The BDI-C score was used in all analysis to suppress the effects of somatic components on the score.

Beck Anxiety Inventory

Furthermore, the BAI has 21 items and is constructed to measure anxiety symptoms. It was also developed to discriminate between anxiety and depression (Beck et al. 1988). Participants are asked to show on a 4-point Likert scale ranging from 0 (not at all) to 3 (severely) that how much each of these symptoms disturbed them over the past week; the total score ranges from zero to 63. The Turkish validation of BAI was completed by Ulusoy et al. (1998). Summation of the score indicated different levels of anxiety as 0–7 as "Minimal"; 8–15 as "Mild"; 16–25 as "Moderate", and; 26–63 as "Severe".

Short Form-36

Moreover, the quality of life during pregnancy was evaluated using the Turkish version of the SF-36 questionnaire. The SF-36 comprises 36 items and consists of eight multi-item scales, including physical functioning (PF), role limitations due to physical health problems (RLPHP), bodily pain (BP), general health perceptions (GHP), vitality (VT), social functioning (SF), role limitations due to emotional problems (RLEP), and general mental health (MH). All sub-scale scores range from 0 to 100, with higher scores indicating higher levels of functioning or well-being (Ware et al. 2007).

Procedure

The scores belonging to PCS, BDI-C, BAI, and SF-36 sub-scales including PF, VT, SF and MH are presented on a graph with time frames in months. This graph shows the fluctuation and relationship of each factor. The scores belonging to PCS were dichotomized according to the cut-off point; as below or equal to 17 (non-catastrophizing), and above 17 (catastrophizing) to compare the difference between BDI-C, BAI, and SF-36 sub-scales including PF, VT, SF and MH.

Assuming a 5% of type I error and a confidence interval of 95%, and also assuming that 70% of the population presents pain catastrophizing perception with lumbopelvic pain: a total of 322 subjects are required. However, allowing for an attrition rate of 20%, we aim to include an additional 65 subjects in the study.

Data Analysis

Normality and variance were tested using the one-sample Kolmogorov–Smirnov test for each variable. Quantitative data are presented as means and standard deviation, and qualitative data as frequency and percentage. Associations between PCS and other measurements were performed by using the Pearson correlation coefficient (r). Pearson's correlation with a coefficient above 0.50 was considered as large effect size; 0.30 as medium effect size, and below 0.10 as small effect size (Cohen 1992). The comparisons between the dichotomized values were carried out by using the independent samples t test. A multivariate linear regression modelling method was performed to predict PCS in which age, gestation week, gravida, parity,

number of abortus, number of live-births, BAI, BDI-C, and SF-36 sub-scales including PF, VT, SF and MH of the participants were considered. Partial correlations were calculated to get the unique variance which the significant variables have. A second regression analysis was computed to predict VAS with the same independent variables. Analyses were completed by using the Statistical Package for the Social Sciences (SPSS Inc., Chicago, IL) version 20.0 program. The statistical significance for all analyses was set at $p < 0.05$.

Results

A total of 429 women were enrolled in the study where 64 were excluded (Fig. 1). The mean age was 25.94 ± 5.03. The mean gestational week was 16.59 ± 8.14 (%95 CI 15.91–17.51; minimum–maximum: 4–40). The demographic data are presented in Table 1. The pattern of the means PCS in 9 months of pregnancy is presented in Fig. 2 and VAS is in Fig. 3. The percentage of subjects whose scores were above the PCS cut-off is 38.7%. The PCS level was close to the cut-off value in 1st month, and passed the threshold in 8th and 9th months of pregnancy. The PCS values were significantly higher in the 9th month compared to the 4th and the 5th month ($p = 0.024$, $p = 0.035$, respectively). The VAS value was significantly higher in the 6th month compared to the 3rd and 4th months ($p = 0.024$, $p = 0.023$, respectively); and in the 9th month than in the first, 3rd and 4th ($p = 0.039$, $p = 0.024$, $p = 0.003$, respectively). The VAS level showed two peaks

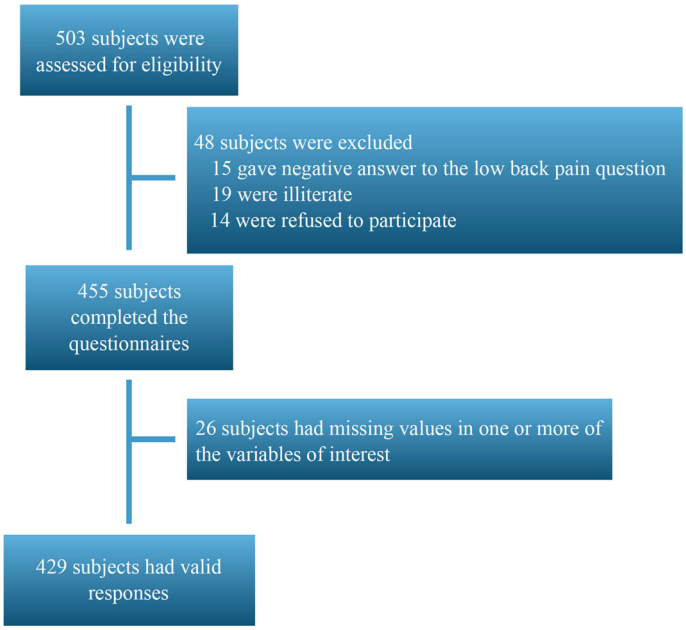


Fig. 1 Flow chart

Table 1 Demographic characteristics

	Mean ± SD	Min–max	Median
Age (years)	25.95 ± 5.03	16–41	26
Gravida		0–7	2
Parity		0–6	1
Number of previous miscarriages		0–3	0
Number of livebirths		0–6	1
Gestational week	16.59 ± 8.14	4–40	13

SD standard deviation, *min–max* minimum–maximum

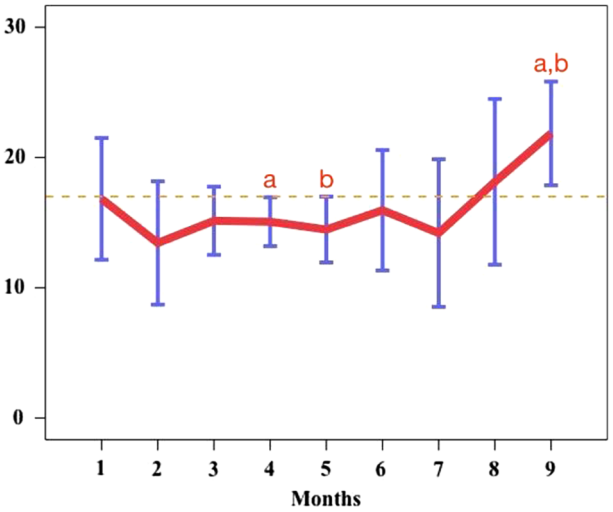


Fig. 2 Mean PCS values during 9 months of pregnancy. *PCS* pain catatsrophizing scale. The comparison of mean PCS values among months are performed by one-way ANOVA test ($p = 0.059$). Post-hoc comparisons are completed using Tukey's HSD test. Post-hoc comparisons. *a* 4th–9th month ($p = 0.024$); *b* 5th–9th month ($p = 0.035$). **Blue lines* indicates the error bars (±2 SE). *Yellow line* indicates the cut-off value of PCS [below or equal to 17 (non-catastrophizing), and above 17 (catastrophizing)]. The participant distributions among months are in the following order: 1st month (n = 17); 2nd month (n = 25); 3rd month (n = 77); 4th month (n = 154); 5th month (n = 66); 6th month (n = 20); 7th month (n = 15); 8th month (n = 15); 9th month (n = 40) (Color figure online)

in the 6th and 9th months of pregnancy. The mean BDI-C and BAI scores are shown in Fig. 4. The mean SF-36 sub-scale scores including PF, VT, SF and MH are displayed in Fig. 5. The relationship among PCS and VAS, BAI, BDI-C, PF, VT, SF and MH are presented on a correlation matrix (Table 2). A negative correlation with medium effect size was found between PCS and BAI, BDI-C, and SF-36 sub-scales including PF, VT, SF, and MH ($r = 0.434$, $p < 0.001$; $r = 0.366$, $p < 0.001$; $r = -0.231$, $p < 0.001$; $r = -0.331$, $p < 0.001$; $r = -0.320$, $p < 0.001$; -0.270, $p < 0.001$; respectively).

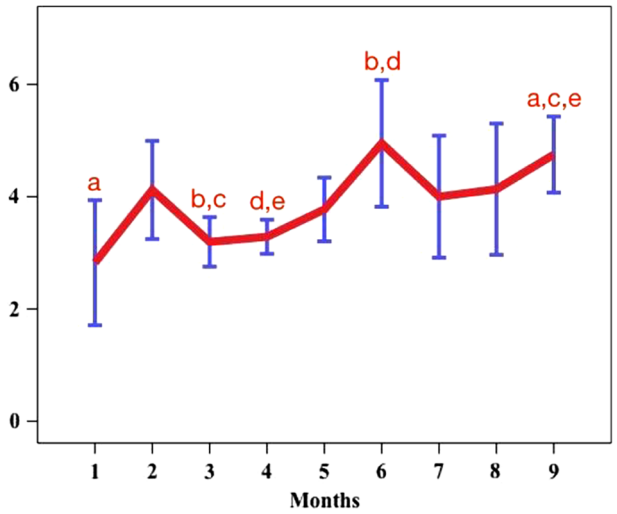


Fig. 3 The mean VAS values. *VAS* visual analog scale. The comparison of mean VAS values among months are performed by one-way ANOVA test ($p < 0.001$). Post-hoc comparisons are completed using Tukey's HSD test. Post-hoc comparisons. *a* 1st–9th month ($p = 0.039$); *b* 3rd–6th month ($p = 0.024$); *c* 3rd–9th month ($p = 0.004$); *d* 4th–6th month ($p = 0.023$); *e* 4th–9th month ($p = 0.003$). **Blue lines* indicates the error bars (±2 SE). The participant distributions among months are in the following order: 1st month (n = 17); 2nd month (n = 25); 3rd month (n = 77); 4th month (n = 154); 5th month (n = 66); 6th month (n = 20); 7th month (n = 15); 8th month (n = 15); 9th month (n = 40) (Color figure online)

A multivariate linear regression analysis using age, gestation week, gravida, parity, number of abortus, number of live-births, BAI, BDI-C, and SF-36 sub-scales including PF, VT, SF and MH as candidate–independent variables and the PCS value as a dependent variable revealed that BAI ($\beta = 0.347$, $p < 0.001$) was the significant predictor associated with pain catastrophizing. A second regression analysis to predict VAS with the same independent variables demonstrated that gestation week ($\beta = 0.040$, $p = 0.001$) and BAI ($\beta = 0.052$, $p < 0.001$) were the significant predictors associated with VAS (Table 3).

The comparison of VAS, BAI, BDI-C and SF-36 sub-scale scores including PF, VT, SF, and MH, those dichotomized according to the cut-off value of PCS ($\leq$17 and >17) are shown in Table 4 and it was observed that all catastrophizers had higher VAS, BAI and BDI-C with lower PF, VT, SF and MH values.

Discussion

The present study demonstrated that the lumbopelvic pain intensity in catastrophizing women is evidently higher than in non-catastrophizing women. The levels of catastrophizing in lumbopelvic pain also fluctuate during the pregnancy period, showing the peak value in the 9th month or third trimester. In addition, a similar pattern appeared between catastrophizing and depression and anxiety, and it was revealed that individuals with higher catastrophizing scores have decreased

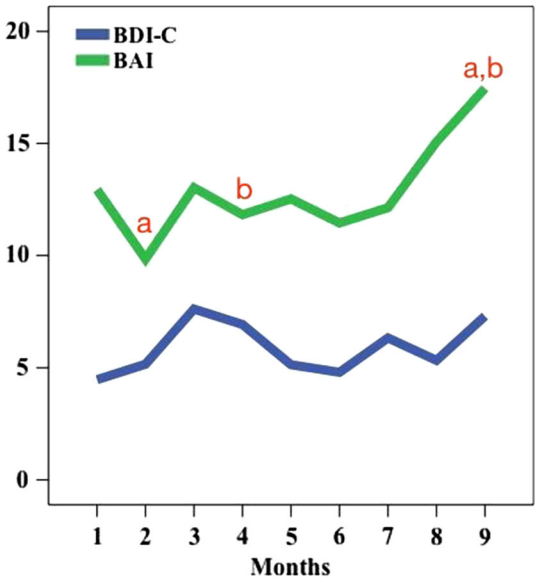


Fig. 4 The mean BAI, BDI-13, BDI-8 and BDI scores during nine months of pregnancy. *BAI* Beck anxiety inventory, *BDI* Beck depression inventory. The comparison of mean BDI-C and BAI values among months are performed by one-way ANOVA test ($p = 0.079$ and $p = 0.041$, respectively). Post-hoc comparisons are completed using Tukey's HSD test. Post-hoc comparisons for BAI. *a* 2nd–9th month ($p = 0.031$); *b* 4th–9th month ($p = 0.017$). The participant distributions among months are in the following order: 1st month (n = 17); 2nd month (n = 25); 3rd month (n = 77); 4th month (n = 154); 5th month (n = 66); 6th month (n = 20); 7th month (n = 15); 8th month (n = 15); 9th month (n = 40)

physical/social functioning, mental health and vitality, and increased anxiety and depression levels compared to non-catastrophizers.

As mentioned previously, pregnancy is accepted as a natural condition in human physiology. However, the physical and psychological parts of it have not been completely understood. Sullivan et al. (1995) demonstrated that the level of catastrophizing is a stable condition for an individual and does not alter over time. However, some authors indicated that catastrophizing is a situational factor rather than a personal factor (Campbell et al. 2010). In this respect, it seems that there has been no consensus on the origin of catastrophizing.

Furthermore, the catastrophizing levels found in the present study shows similarity with the findings of Olsson et al. (2012b) whose previously reported the fluctuation of catastrophizing thoughts during pregnancy and after delivery. A considerable number of women (38.7%) reported catastrophizing in all periods of pregnancy. Therefore, it can be speculated that pregnancy is an unusual state with regard to catastrophizing. It is a severe condition in a limited time, beginning with fertilization and ending with delivery and becoming a mother. A pregnant woman's preoccupations, including concern about giving birth, endless fear of something going wrong with the baby, or worries about taking care of a newborn may affect the apparent levels of catastrophizing.

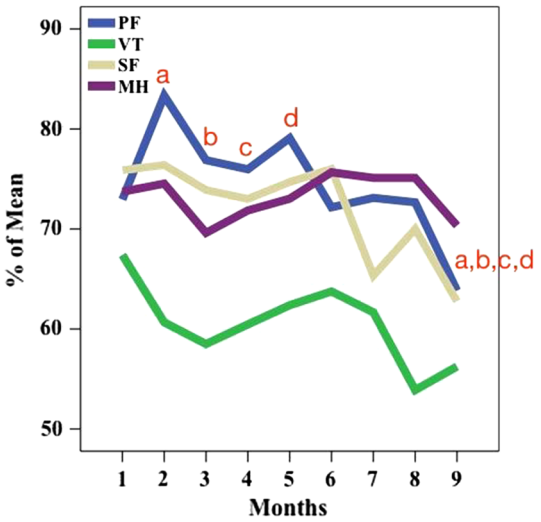


Fig. 5 The mean scores of SF-36 sub-scales. *SF-36* short form (quality of life)-36 questionnaire, *PF* physical functioning, *VT* vitality, *SF* social functioning, *MH* mental health. The comparison of mean PF, VT, SF and MH values among months are performed by one-way ANOVA test ($p < 0.001$, $p = 0.242$, $p = 0.053$ and $p = 0.605$, respectively). Post-hoc comparisons are completed using Tukey's HSD test. Post-hoc comparisons for PF. *a* 2nd–9th month ($p < 0.001$); *b* 3rd–9th month ($p = 0.001$); *c* 4th–9th month ($p < 0.001$); 5th–9th month ($p < 0.001$). The participant distributions among months are in the following order: 1st month (n = 17); 2nd month (n = 25); 3rd month (n = 77); 4th month (n = 154); 5th month (n = 66); 6th month (n = 20); 7th month (n = 15); 8th month (n = 15); 9th month (n = 40)

Table 2 Correlation matrix

	PCS	VAS	BAI	BDI-C	PF	VT	SF
VAS	0.205	–	–	–	–	–	–
BAI	0.434	0.281	–	–	–	–	–
BDI-C	0.366	0.171	0.434	–	–	–	–
PF	−0.231	−0.210	−0.293	−0.275	–	–	–
VT	−0.331	−0.234	−0.414	−0.447	0.361	–	–
SF	−0.320	−0.166	−0.415	−0.387	0.333	0.471	–
MH	−0.270	−0.208	−0.336	−0.426	0.300	0.631	0.394

Bivariate Pearson's correlation coefficients; all correlation comparisons showed a significance level of $p < 0.001$

PCS Pain Catastrophizing Scale, *VAS* Visual Analog Scale, *BAI* Beck anxiety inventory, *BDI-C* Beck depression inventory-cognitive. SF-36 (quality of life questionnaire) sub-scales: *PF* physical functioning, *VT* vitality, *SF* social functioning, *MH* mental health

Moreover, there is a need to enhance the knowledge about the variation of catastrophizing thoughts, anxiety and depression in pregnant women. A systematic search of the literature revealed that this study is the first one to elucidate the associations between catastrophizing, anxiety and depression, and quality of life in

Table 3 Regression analysis

For PCS*	Beta	t	*p*	Partial correlations
Age	−0.113	−0.941	0.347	−0.047
Gestation week	0.099	1.542	0.124	0.076
Gravida	−2.931	−1.951	0.052	−0.096
Parity	3.338	1.041	0.298	0.052
Number of abortus	3.135	1.754	0.080	0.087
Number of live-births	0.895	0.286	0.775	0.014
BAI	0.347	5.329	<0.001	0.256
BDI-C	0.151	1.409	0.160	0.070
PF	−0.029	−0.803	0.423	−0.04
VT	−0.072	−1.669	0.096	−0.083
SF	−0.050	−1.633	0.103	−0.081
MH	−0.002	−0.047	0.962	−0.002
For PCS**	Beta	t	*p*	Partial correlations
Age	−0.008	−0.355	0.723	−0.018
Gestation week	0.040	3.237	0.001	0.159
Gravida	−0.214	−0.735	0.463	−0.137
Parity	−0.004	−0.006	0.995	0.0002
Number of abortus	0.521	1.504	0.133	0.075
Number of live-births	0.168	0.277	0.782	0.014
BAI	0.052	4.151	<0.001	0.202
BDI-C	−0.018	−0.888	0.375	−0.044
PF	−0.008	−1.223	0.222	−0.061
VT	−0.003	−0.418	0.676	−0.021
SF	−0.002	−0.332	0.740	−0.017
MH	−0.014	−1.520	0.129	−0.075

BAI Beck depression inventory, *BDI-C* Beck anxiety inventory-cognitive, *PF* physical functioning, *VT* vitality, *SF* social functioning, *MH* mental health

* $F(12, 405) = 10.209$, $p < 0.001$. This model explains 23.2% of the variance of the PCS

** $F(12, 405) = 5.828$, $p < 0.001$. This model explains 14.7% of the variance of the VAS

the context of lumbopelvic pain. The PCS, BAI, BDI-C and SF-36 scores were investigated with three (trimesters) and nine (months) subgroups. Approximately 50% of pregnant women are admitted to medical services for back and/or pelvic pain at some time during pregnancy (Glinkowski et al. 2016). In addition, 10% of women with back pain state that they are unable to work (Katonis et al. 2011). Considering the number of women with back pain, it inevitably requires attention. In addition, daily activities such as working or meeting family responsibilities can be affected. Several studies reported that postpartum pelvic pain leads to difficulties in returning to normal life (Gutke et al. 2011; Hansen et al. 2005; Ronchetti et al.

Table 4 Comparison of VAS and questionnaire scores according to PCS

	PCS ≤ 17 (n = 263)	PCS > 17 (n = 166)	*p*
VAS	3.39 ± 2.18	4.05 ± 1.99	0.002*
BAI	10.25 ± 7.74	16.58 ± 9.89	<0.001*
BDI-C	5.35 ± 5.39	8.19 ± 5.71	<0.001*
PF	77.62 ± 15.83	71.74 ± 15.43	<0.001*
VT	63.29 ± 17.23	55.47 ± 15.09	<0.001*
SF	76.14 ± 19.71	66.86 ± 18.71	<0.001*
MH	73.86 ± 15.34	69.37 ± 13.27	0.001*

Independent samples *t* test

PCS pain catastrophizing scale, *BAI* Beck anxiety inventory, *BDI* Beck depression inventory

SF-36 (quality of life questionnaire) sub-scales: *PF* physical functioning, *VT* vitality, *SF* social functioning, *MH* mental health

* $p < 0.001$. Non-catastrophizing group (PCS ≤ 17) and catastrophizing group (PCS > 17)

2008). Paired with the high rate of back pain, it seems that the women at risk for this condition are underestimated, hence the supplementary goal during pregnancy should include a focus on interventions to prevent such problems.

Observing approximately similar pattern with the pain catastrophizing, the present study showed that lumbopelvic pain intensity peaks in the sixth and 9th months of pregnancy. It is known that Braxton Hicks contractions (spontaneous low-amplitude uterine contractions), a normal situation for pregnancy, occurs at the end of second trimester which can be associated with the peak in VAS value at the 6th month of pregnancy (Bower et al. 1991). Catastrophizing is shown to involve acute or chronic pain and physical disability as well, and investigators displayed that catastrophizing has a closer relationship to pain-related disability rather than pain itself (Arnow et al. 2011; Ogunlana et al. 2015; Vincent et al. 2014). In relation, researchers demonstrated that catastrophizing shows a close relationship to disability in the presence of either acute or chronic pain (Woby et al. 2004a). A recent study by Olsson et al. (2012b) found no relationship between catastrophizing and physical ability using the Disability Rating Index, and concluded this result as the measurement error. The outcomes of the present study confirmed the previous findings that there has been an association between catastrophizing and physical functioning. Disability was increased compared to the previous months of pregnancy while pain catastrophizing levels showed a tendency to increase in the last months of pregnancy. The disability of pregnant women can be related to the weight gain of both the baby and the mother, due to restricting her daily physical activities. However, the increased catastrophizing levels in the last months of pregnancy suggested that merely catastrophizing holds the key role on the diminishing of physical functioning.

Previous studies indicated that psychological factors may be involved in pain perception (Ip et al. 2009; Thibault et al. 2008). The presence of anxiety and

depression is a distinct aspect of interest in studies. While some authors demonstrated that higher levels of preoperative anxiety is related to increased levels of postoperative pain, others declared that state but not trait anxiety is associated with postoperative pain (Carr et al. 2005; Robleda et al. 2014; Vaughn et al. 2007). Furthermore, depression is shown to have a relationship with increased postoperative pain intensity and analgesic consumption (Ozalp et al. 2003). In contrast, Katz et al. (2005) reported that depression has no effect on pain perception after controlling anxiety. In keeping with the studies mentioned above, anxiety and depression levels were closely associated with catastrophizing severity in the present study. The fluctuation of depression, anxiety and catastrophizing showed an analogue pattern and all reached the peak value on the 9th month. This result suggested that expecting a baby has an important factor on the course of the mother's psychological condition and it converges at the highest level close to delivery. The Beck Depression Inventory also showed the affective and somatic features of the subjects. The somatic component consists of the capability to do daily activities and the sleep pattern, fatigue, weight loss, and health status of the subjects, whereas the affective component represents psychological condition. Despite taking the somatic component of BDI scores out of the analysis, the present study showed that catastrophizing has close association with BAI not BDI-C. Depending on the results of the present study, it seems that both components are equally affected during pregnancy. In relation, Edwards et al. (2011) demonstrated that catastrophizing is closely associated with depression. On the other hand, fear-avoidance and depression are important factors affecting pain intensity and disability (Turk and Wilson 2010; Woby et al. 2004b). However, it is not clearly known whether pain catastrophizing holds a unique impact on pain and disability, since other factors including negative mood, somatic hyper-vigilance or fear-avoidance thoughts have been encountered. In this context, distress and depression might be of importance for reporting lumbopelvic pain during the pregnancy period. A cross-sectional study by Olsson et al. revealed that lumbopelvic pain during pregnancy was related to increased pain intensity and heightened levels of catastrophizing, fear-avoidance thoughts and disability. In addition, the authors also showed that catastrophizing and disability amplifies the risk of postpartum lumbopelvic pain incidence in pregnant women (Olsson et al. 2009). Nevertheless, more prospective trials are required to uncover the possible relationships among variables included in this equation.

In the general population, an active lifestyle has been linked with more positive mood states, decreased risk of depression, and better health-related quality of life (Atlantis et al. 2004; Bize et al. 2007). Several studies reported that the pregnancy period is a vulnerable time for depression and a lower health-related quality of life when compared with other periods of life (Gorman et al. 2004; Haas et al. 2005; Vinturache et al. 2015). Pregnancy reduces the potential to perform daily physical activities. During the first trimester of pregnancy, decreased leisure physical activity in previously active women is associated with poor psychological condition and increased distress in the second trimester compared to pregnant women who had already lower physical activity before pregnancy. However, it is unknown whether decreased mental health in pregnant women leads to low physical activity, or less

activity causes impaired mental health (Tendais et al. 2011). In this context, the social functioning sub-scale scores of SF-36 revealed a significant relationship to the levels of depression and anxiety. Pregnant women with higher depression and anxiety intensity exhibited impaired psychological health status, which may also be affected by the poorer physical activity. As mentioned above, there has been an ongoing causal argument on the basis of depression and anxiety. This study clearly demonstrated the association between depression, anxiety, social functioning and physical activity. However, the main factor that triggers the cascade of events requires further research in this kind of population.

Nevertheless, there has been one study on patients with chronic low back pain enrolling in a pain program showed that alterations in catastrophizing regulated the improvement in disability and pain levels after treatment (Smeets et al. 2006). Several studies reported that cognitive behavioral therapy works to lower the catastrophizing levels (Herbert et al. 2014; Thorn et al. 2007). Treatment strategies including education, active exercises, and activities decrease catastrophizing and enhance physical ability (Smeets et al. 2006; Moseley 2004; Sullivan et al. 2006). In contrast to the knowledge on catastrophizing, there has been limited data to cope with the occurrence of fluctuation in catastrophizing. It can be speculated that activities or exercises in a controlled environment alter the patients' perceptions of pain (Harts et al. 2008). Various studies showed that catastrophizing may be an important factor affecting the results of treatment for lumbopelvic back pain (den Hollander et al. 2010; Spinhoven et al. 2004). A recent study conducted by den Hollander et al. suggested that there may be significant positive effects of education and information on pain- related fear and catastrophizing (den Hollander et al. 2010). However, more clinical investigations are needed to confirm this proposal.

Consequently, this prospective study has reached the primary goal of monitoring fluctuations in catastrophizing over time during pregnancy. The outcomes may enhance the clinical implementations of physicians and their monitoring of pregnant women. Based on these findings, it is suggested that measuring catastrophizing levels may guide treatment decisions for both obstetricians and psychiatrists.

The present study has some limitations. First, these findings are based on a limited geographical area, hence the generalizability of the outcomes remains unknown. Second, the SF-36 questionnaire was used to assess the physical ability of the subjects, which is an indirect method and lacks objective measurements. However, the objective methods such as accelerometers would be difficult to use in this kind of population. Third, the scale for evaluating catastrophizing is a self-rated questionnaire, which required a better understanding and cooperation by the participants. Therefore, the researcher has to administer and later verbally confirm the scale for minimizing this event. Fourth, the study design is cross-sectional and did not follow the women over time during pregnancy which may have a higher consistency in PCS and VAS values. A longitudinal study would be needed to investigate whether catastrophizing predicts levels of lumbopelvic pain, depression, anxiety, and quality of life over the course of pregnancy.

In conclusion, the present study revealed that catastrophizing levels change over time during the pregnancy period, and the variation in catastrophizing shows an approximately similar course with pain intensity, depression and anxiety. The

findings are clearly demonstrated that catastrophizing during pregnancy is associated with lumbopelvic pain and physical ability. It can be speculated that one or more of these factors may impair the quality of life in women with pregnancy. The underlying mechanisms in this relationship require further research.

Acknowledgements The authors wish to acknowledge the assistance of Selim Gulucu and Ismail Sag for their help in obtaining data.

Compliance with Ethical Standards

Conflict interest None of the authors has any conflict of interest to declare.

References

Arnow, B. A., Blasey, C. M., Constantino, M. J., Robinson, R., Hunkeler, E., Lee, J., et al. (2011). Catastrophizing, depression and pain related disability. *General Hospital Psychiatry, 33*(2), 150–156.

Atlantis, E., Chow, C. M., Kirby, A., & Singh, M. F. (2004). An effective exercise-based intervention for improving mental health and quality of life measures: A randomized controlled trial. *Preventive Medicine, 39*(2), 424–434.

Beck, A. T., Epstein, N., Brown, G., & Steer, R. A. (1988). An inventory for measuring clinical anxiety: Psychometric properties. *Journal of Consulting and Clinical Psychology, 56*(6), 893–897.

Beck, A. T., Steer, R. A., Ball, R., & Ranieri, W. (1996). Comparison of Beck depression inventories-IA and -II in psychiatric outpatients. *Journal of Personality Assessment, 67*(3), 588–597.

Benza, S., & Liamputtong, P. (2014). Pregnancy, childbirth and motherhood: A meta-synthesis of the lived experiences of immigrant women. *Midwifery, 30*(6), 575–584.

Bishop, A., Ogollah, R., Bartlam, B., Barlas, P., Holden, M. A., Ismail, K. M., et al. (2016). Evaluating acupuncture and standard care for pregnant women with back pain: The EASE Back pilot randomised controlled trial (ISRCTN49955124). *Pilot and Feasibility Studies, 2,* 72.

Bize, R., Johnson, J. A., & Plotnikoff, R. C. (2007). Physical activity level and health-related quality of life in the general adult population: A systematic review. *Preventive Medicine, 45*(6), 401–415.

Bower, S., Campbell, S., Vyas, S., & McGirr, C. (1991). Braxton–Hicks contractions can alter uteroplacental perfusion. *Ultrasound in Obstetrics and Gynecology, 1*(1), 46–49.

Campbell, C. M., Kronfli, T., Buenaver, L. F., Smith, M. T., Berna, C., Haythornthwaite, J. A., et al. (2010). Situational versus dispositional measurement of catastrophizing: Associations with pain responses in multiple samples. *Journal of Pain, 11*(5), 443–453.

Carr, E. C., Nicky Thomas, V., & Wilson-Barnet, J. (2005). Patient experiences of anxiety, depression and acute pain after surgery: A longitudinal perspective. *International Journal of Nursing Studies, 42*(5), 521–530.

Carriere, J. S., Thibault, P., Milioto, M., & Sullivan, M. J. (2015). Expectancies mediate the relations among pain catastrophizing, fear of movement, and return to work outcomes after whiplash injury. *Journal of Pain, 16*(2), 1280–1287.

Chaves, J. F., & Brown, J. M. (1987). Spontaneous cognitive strategies for the control of clinical pain and stress. *Journal of Behavioral Medicine, 10*(3), 263–276.

Cohen, J. (1992). A power primer. *Psychological Bulletin, 112*(1), 119–155.

den Hollander, M., de Jong, J. R., Volders, S., Goossens, M. E., Smeets, R. J., & Vlaeyen, J. W. (2010). Fear reduction in patients with chronic pain: A learning theory perspective. *Expert Review of Neurotherapeutics, 10*(11), 1733–1745.

Edwards, R. R., Cahalan, C., Mensing, G., Smith, M., & Haythornwaite, J. A. (2011). Pain, catastrophizing, and depression in rheumatic diseases. *Nature Reviews Rheumatology, 7*(4), 216–224.

Ellis, A. (1962). *Reason and emotion in psychotherapy*. Secaucus, NJ: Lyle Stuart.

Emmons, C. A., Fetting, J. H., & Zonderman, A. B. (1987). A comparison of the symptoms of medical and psychiatric patients matched on the Beck depression inventory. *General Hospital Psychiatry, 9*(6), 398–404.

Fairbrother, N., Young, A. H., Janssen, P., Antony, M. M., & Tucker, E. (2015). Depression and anxiety during the perinatal period. *BMC Psychiatry, 15,* 206.

Glinkowski, W. M., Tomasik, P., Walesiak, K., Głuszak, M., Krawczak, K., Michoński, J., et al. (2016). Posture and low back pain during pregnancy—3D study. *Ginekologia Polska, 87*(8), 575–580.

Gorman, L. L., O'Hara, M. W., Figueiredo, B., Hayes, S., Jacquemain, F., Kammerer, M. H., et al. (2004). Adaptation of the structured clinical interview for DSM-IV disorders for assessing depression in women during pregnancy and post-partum across countries and cultures. *The British Journal of Psychiatry, 46,* s17–s23.

Gutke, A., Lundberg, M., Östgaard, H. C., & Öberg, B. (2011). Impact of postpartum lumbopelvic pain on disability, pain intensity, health-related quality of life, activity level, kinesiophobia, and depressive symptoms. *European Spine Journal, 20*(3), 440–448.

Haas, J. S., Jackson, R. A., Fuentes-Afflick, E., Stewart, A. L., Dean, M. L., Brawarsky, P., et al. (2005). Changes in the health status of women during and after pregnancy. *Journal of General Internal Medicine, 20*(1), 45–51.

Hansen, A., Jensen, D. V., Larsen, E. C., Wilken-Jensen, C., Kaae, B. E., Frølich, S., et al. (2005). Postpartum pelvic pain–the "pelvic joint syndrome": A follow-up study with special reference to diagnostic methods. *Acta Obstetricia et Gynecologica Scandinavica, 84*(2), 170–176.

Harts, C. C., Helmhout, P. H., de Bie, R. A., & Staal, J. B. (2008). A high-intensity lumbar extensor strengthening program is little better than a low-intensity program or a waiting list control group for chronic low back pain: A randomised clinical trial. *Australian Journal of Physiotherapy, 54*(1), 23–31.

Hawker, G. A., Mian, S., Kendzerska, T., & French, M. (2011). Measures of adult pain: Visual Analog Scale for Pain (VAS Pain), Numeric Rating Scale for Pain (NRS Pain), McGill Pain Questionnaire (MPQ), Short-Form McGill Pain Questionnaire (SF-MPQ), Chronic Pain Grade Scale (CPGS), Short Form-36 Bodily Pain Scale (SF-36 BPS), and Measure of Intermittent and Constant Osteoarthritis Pain (ICOAP). *Arthritis Care & Research, 63*(11), 240–252.

Herbert, M. S., Goodin, B. R., Pero, S. T., Scmidt, J. K., Sotolongo, A., Bulls, H. W., et al. (2014). Pain hypervigilance is associated with greater clinical pain severity and enhanced experimental pain sensitivity among adults with symptomatic knee osteoarthritis. *Annals of Behavioral Medicine, 48*(1), 50–60.

Hisli, N. (1989). Beck depresyon envanterinin üniversite öğrencileri için geçerliği, güvenirliği. *Psikoloji Dergisi, 7*(23), 8–13.

Ip, H. Y., Abrishami, A., Peng, P. W., Wong, J., & Chung, F. (2009). Predictors of postoperative pain and analgesic consumption: A qualitative systematic review. *Anesthesiology, 111*(3), 657–777.

Kapçı, E. G., Uslu, R., Türkçapar, H., & Karaoğlan, A. (2008). Beck depression inventory. Its psychometric evaluation in turkish adults. *Depression and Anxiety, 25*(10), 104–110.

Katonis, P., Kampouroglou, A., Aggelopoulos, A., Kakavelakis, K., Lykoudis, S., Makrigiannakis, A., et al. (2011). Pregnancy-related low back pain. *Hippokratia, 15*(3), 205–210.

Katz, J., Poleshuck, E. L., Andrus, C. H., Hogan, L. A., Jung, B. F., Kulick, D. I., et al. (2005). Risk factors for acute pain and its persistence following breast cancer surgery. *Pain, 119*(1–3), 16–25.

Leung, L. (2012). Pain catastrophizing: An updated review. *Indian Journal of Psychological Medicine, 34*(3), 204–217.

Madhavanprabhakaran, G. K., D'Souza, M. S., & Subrahmanya, K. (2015). Prevalence of pregnancy anxiety and associated factors. *International Journal of Africa Nursing Sciences, 3,* 1–7.

Moseley, G. L. (2004). Evidence for a direct relationship between cognitive and physical change during an education intervention in people with chronic low back pain. *European Journal of Pain, 8*(1), 39–45.

Ogunlana, M. O., Odole, A. C., Adejumo, A., & Odunaiya, N. (2015). Catastrophizing, pain, and disability in patients with nonspesific low back pain. *Hong Kong Physiotherapy Journal, 33*(2), 73–79.

Olsson, C., Buer, N., Holm, K., & Nilsson-Wikmar, L. (2009). Lumbopelvic pain associated with catastrophizing and fear-avoidance beliefs in early pregnancy. *Acta Obstetricia et Gynecologica Scandinavica, 88*(4), 378–385.

Olsson, C. B., Grooten, W. J., Nilsson-Wikmar, L., Harms-Ringdahl, K., & Lundberg, M. (2012a). Catastrophizing during and after pregnancy: Associations with lumbopelvic pain and postpartum physical ability. *Physical Therapy, 92*(1), 49–57.

Olsson, C. B., Nilsson-Wikmar, L., & Grooten, W. J. (2012b). Determinants for lumbopelvic pain 6 months postpartum. *Disability and Rehabilitation, 34*(5), 416–422.

Ozalp, G., Sarioglu, R., Tuncel, G., Aslan, K., & Kadiogullari, N. (2003). Preoperative emotional states in patients with breast cancer and postoperative pain. *Acta Anaesthesiologica Scandinavica, 47*(1), 26–29.

Robleda, G., Sillero-Sillero, A., Puig, T., Gich, I., & Baños, J.-E. (2014). Influence of preoperative emotional state on postoperative pain following orthopedic and trauma surgery. *Revista Latino-Americana de Enfermagem, 22*(5), 785–791.

Ronchetti, I., Vleeming, A., & van Wingerden, J. P. (2008). Physical characteristics of women with severe pelvic girdle pain after pregnancy: A descriptive cohort study. *Spine, 33*(5), E145–E151.

Smeets, R. J., Vlaeyen, J. W., Kester, A. D., & Knottnerus, J. A. (2006). Reduction of pain catastrophizing mediates the outcome of both physical and cognitive-behavioral treatment in chronic low back pain. *The Journal of Pain, 7*(4), 261–271.

Spanos, N. P., Radtke-Bodorik, H. L., Ferguson, J. D., & Jones, B. (1979). The effects of hypnotic susceptibility, suggestions for analgesia, and the utilization of cognitive strategies on the reduction of pain. *Journal of Abnormal Psychology, 88*(3), 282–292.

Spinhoven, P., Ter Kuile, M., Kole-Snijders, A. M., Hutten Mansfeld, M., Den Ouden, D. J., & Vlaeyen, J. W. (2004). Catastrophizing and internal pain control as mediators of outcome in the multidisciplinary treatment of chronic low back pain. *European Journal of Pain, 8*(3), 211–219.

Sullivan, M. J., Adams, H., Rhodenizer, T., & Stanish, W. D. (2006). A psychosocial risk factor-targeted intervention for the prevention of chronic pain and disability following whiplash injury. *Physical Therapy, 86*(1), 8–18.

Sullivan, M. J. L., Bishop, S. R., & Pivik, J. (1995). The Pain Catastrophizing Scale: Development and validation. *Psychological Assessment, 7*(4), 524–532.

Sullivan, M. J., Stanish, W., Sullivan, M. E., & Tripp, D. (2002). Differential predictors of pain and disability in patients with whiplash injuries. *Pain Research & Management, 7*(2), 68–74.

Suren, M., Kaya, Z., Gokbakan, M., Okan, I., Arici, S., Karaman, S., et al. (2014). The role of pain catastrophizing score in the prediction of venipuncture pain severity. *Pain Practice, 14*(3), 245–251.

Taylor, A. M., Harris, A. D., Varnava, A., Phillips, R., Taylor, J. O., Hughes, O., et al. (2015). A Functional Magnetic Resonance Imaging Study to investigate the utility of a picture imagination task in investigating neural responses in patients with chronic musculoskeletal pain to daily physical activity photographs. *PLoS ONE, 10*(10), e0141133.

Tendais, I., Figueiredo, B., Mota, J., & Conde, A. (2011). Physical activity, health-related quality of life and depression during pregnancy. *Cadernos de Saúde Pública, 27*(2), 219–228.

Thibault, P., Loisel, P., Durand, M. J., Catchlove, R., & Sullivan, M. J. (2008). Psychological predictors of pain expression and activity intolerance in chronic pain patients. *Pain, 139*(1), 47–54.

Thorn, B. E., Pence, L. B., Ward, L. C., Kilgo, G., Clements, K. L., Cross, T. H., et al. (2007). A randomized clinical trial of targeted cognitive behavioral treatment to reduce catastrophizing in chronic headache sufferers. *The Journal of Pain, 8*(12), 938–949.

Tiemann, L., Heitmann, H., Shultz, E., Baumkötter, J., & Ploner, M. (2014). Dopamine precursor depletion influences pain affect rather than pain sensation. *PLoS ONE, 9*(4), e96167.

Turk, D. C., & Wilson, H. D. (2010). Fear of pain as a prognostic factor in chronic pain: Conceptual models, assessment, and treatment implications. *Current Pain and Headache Reports, 14*(2), 88–95.

Ulusoy, M., Sahin, N. H., & Erkmen, H. (1998). Turkish version of the Beck anxiety inventory: Psychometric properties. *Journal of Cognitive Psychotherapy, 12*(2), 163–172.

Vaughn, F., Wichowski, H., & Bosworth, G. (2007). Does preoperative anxiety level predict postoperative pain? *AORN Journal, 85*(3), 589–604.

Vincent, H. K., George, S. Z., Seay, A. N., Vincent, K. R., & Hurley, R. W. (2014). Resistance exercise, disability, and pain catastrophizing in obese adults with back pain. *Medicine and Science in Sports and Exercise, 46*(9), 1693–1701.

Vinturache, A., Stephenson, N., McDonald, S., Wu, M., Bayrampour, H., & Tough, S. (2015). Health-related quality of life in pregnancy and postpartum among women with assisted conception in Canada. *Fertility and Sterility, 104*(1), 188–195.

Ware, J., Kosinski, M., Bjorner, J. B., Turner-Bowker, D. M., Gandek, B., & Maruish, M. E. (2007). *Determining important differences in scores. User's Manual for the SF-36v2 Health Survey*. Lincoln, RI: Quality Metric Inc.

Woby, S. R., Watson, P. J., Roach, N. K., & Urmston, M. (2004a). Are changes in fear-avoidance beliefs, catastrophizing, and appraisals of control, predictive of changes in chronic low back pain and disability? *European Journal of Pain, 8*(3), 201–210.

Woby, S. R., Watson, P. J., Roach, N. K., & Urmston, M. (2004b). Adjustment to chronic low back pain—The relative influence of fear-avoidance beliefs, catastrophizing, and appraisals of control. *Behaviour Research and Therapy, 42*(7), 761–774.