Exploring pain characteristics in nulliparous women; a precursor to developing support for women in the latent phase of labour.

Abstract

Background: Admission to hospital in the latent phase of labour is associated with a cascade of unnecessary intervention. Women who seek early hospital admission may have heightened fear and anxiety in relation to pain routed in their pre-pregnancy experiences.

Objective:

To determine the prevalence of pain catastrophising in a healthy non-pregnant population and explore previous pain experiences and fear of childbirth as characteristics that might predict pain catastrophising.

Design:

 Prospective observational study across two higher education institutions in Scotland and England using a semi-structured survey administered through Bristol Online Surveys. Four validated questionnaires were used to identify the prevalence of pain catastrophising and fear of childbirth in nulliparous women of reproductive age.

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Results: The survey was completed by 122 women undertaking an undergraduate degree and aged between 18 and 23 years. A high prevalence of pain catastrophising was found: a cut-off score of 20 and above = 47.5% (58/122 participants), a cut-off score of 30 and above = 21.3% (26/122). Fear of pain (β = 0.14, t = 4.21, p <0 .001) and pain-related anxiety (β = 0.40, t = 11.39, p <0 .001)

were significant predictors of pain catastrophisation. However, there was no correlation between fear of childbirth and pain catastrophisation.

Conclusions and implications for practice: It is reasonable to hypothesise that the pain catastrophising scale may be a good tool to predict those women likely to require additional support in the latent phase of labour; however further work is needed to explore this with a group of pregnant women.

[252 words]

Highlights

This is the first study to examine the prevalence of pain catastrophising in women of reproductive age.

High prevalence of pain catastrophising among young healthy women

Pain catastrophising correlated with fear of pain and pain related anxiety

No correlation between pain catastrophising and fear of childbirth among women who have not experienced pregnancy or birth

Further studies are needed to explore pain catastrophising in pregnancy and its relationship towards attitudes to labour

1. Introduction

Admission to hospital in the latent phase of labour is associated with a cascade of unnecessary interventions (Klein et al 2004; Lundgren et al 2013; Rota et al 2018) and as a consequence the World Health Organization recommends that healthy pregnant women in spontaneous labour should not be admitted to hospital until their labour becomes active (World Health Organisation 2018). However, discouraging women from entering hospital in early labour is not woman-centred (Nolan and Smith 2010) and has been shown to be ineffective in reducing interventions, resulting in what can be argued to be a revolving door of repeated admission and discharge (Cheyne et al 2008; Hundley et al 2017). Research suggests that women seek early admission as a result of fear, anxiety and pain (Barnett et al 2008) but to date the relationship between these factors has been poorly examined and we are unable to predict which women are likely to experience excessive fear/pain in early labour and target care accordingly. Pain in labour provides an important function with the gradual onset of pain in the latent phase associated with physiological changes that are part of the birthing process (Leap et al 2010). However, for some women fear of pain and pain catastrophising are characteristics that are embedded in their pre-labour experiences of pain perception, and are likely to lead to negative birth outcomes. If we are able to predict women most likely to have pain catastrophizing before labour we will have an opportunity to put in place targeted interventions that support pain management in early labour and delay admissions.

Background

The way in which anxiety and fear may be portrayed has been described as catastrophising (Craig and Fashler 2014). In the context of long term, chronic pain

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catastrophising occurs when an individual experiences negative thoughts associated with pain, for example they fear that pain may cause tissue damage. In relation to childbirth, this may manifest for some women as experiencing levels of fear of pain and anxiety that may be severe enough for them to request early admission leading to additional clinical interventions. Pain catastrophising has been found to be associated with a fear of being overwhelmed by pain and a tendency to avoid pain in those considering pain relief for childbirth (Van den Bussche et al 2007). Women with high catastrophising scores are significantly more likely to request pain relief in both the latent and active phases of labour (Van den Bussche et al 2007) and these fears may contribute to inhibiting movement (Sullivan et al 2001) and for example progression of labour.

A number of authors have suggested that fear in childbirth and pain catastrophising are associated with rising rates or preferences for operative birth (Laursen et al 2009; Veringa et al 2011; Deghani et al 2014). Two large, national cohort studies have explored the association between fear and operative birth. In Denmark Laursen et al (2009) found that nulliparous women who expressed fear during pregnancy were more likely to experience dystocia during labour and require an emergency caesarean section (Veringa et al 2011). In a population study of 788,317 singleton births in Finland, researchers found that women who experience fear in childbirth, as defined by the International Classification of Diseases (ICD), have a higher rate of caesarean section; 3.3-fold for nulliparous women and 4.5-fold for multiparous women (Raisanen et al 2014). Childbirth fear manifests during pregnancy, continues in delivery and may persist postpartum (Rouhe et al 2013; Nieminen et al 2017).

Pain catastrophising is associated with negative orientations toward pain comprising of elements of contemplative magnification of symptoms and subsequent

helplessness (Leung 2012) leading to avoidance behaviour (Buer and Linton 2002). Childbirth fear and pain catastrophising may be conceptualised using the pre-described fear-avoidance models which were designed to explain chronic pain (McNeil and Rainwater 1998; Norton and Admundson 2003). Women may perceive the situation (childbirth) as a serious threat to their well-being, they are influenced by internal (negative thoughts) and/or external (media) factors which contribute to a spiral of self-perpetuating fear and increasing pain perception (Waddell et al 1993; Vlaeyen and Linton 2000; Norton and Admundson 2003; Luce et al 2016). It is hypothesised that identifying individual characteristics that contribute to pain catastrophising in women in pregnancy and childbirth will enable the design of strategies to support them to self-manage pain in labour and in particular in the latent phase. Empowering women to self-manage their pain and delay hospital admission is likely to reduce the subsequent cascade of interventions. The impact of this change may contribute to cost reductions and improvements in health and well-being of mothers and babies. The size of the problem is unknown as to the authors' knowledge the prevalence of pain catastrophising has not been explored in a healthy population. In addition the predictive nature of the pain catastrophising tool and its relationship with fear of pain, pain anxiety, previous pain experiences and fear of childbirth has also not been explored. These elements need exploring in a healthy population prior to exploring pain catastrophising in pregnant women. Therefore the aim of this study is to determine the prevalence of pain catastrophising in a healthy non-pregnant population and to identify if this correlates with previous pain experiences and fear if childbirth. It is hypothesised that these characteristics might predict which women are more likely to report pain catastrophising prior to pregnancy.

Methods

This was a prospective observational study across two higher education institutions in Scotland and England using a semi-structured survey administered through Bristol Online Surveys (BOS). Four validated questionnaires, additional questions and demographic information were given to identify the prevalence of pain catastrophising and childbirth fear in nulliparous women of reproductive age. Additionally, relationships between variables and their predictive powers were analysed using various comparative analyses, such as t-tests, Pearson's correlations, and multiple linear regression.

Sample

In total, 122 women aged between 18 and 48 (mean age 22.55 years) were recruited via online forums and email at the two universities. A sample of students was chosen as a purposive sample the researchers had access to and who were likely to fulfil the inclusion criteria. Information about the survey also appeared on the student portal and research centre website for direct access to the survey. Convenience sampling and the following inclusion criteria were used: no previous pregnancy, of reproductive age and over 18, English-speaking. Sample size was not pre-determined as there were no previous studies to support the calculation.

Ethical approval was obtained from Bournemouth University Research Ethics Committee (BUREC) 16203 and from Stirling General University Ethics Panel (GUEP) 417, and permission to contact students was granted by the Deputy Dean for Education. Consent to participate in the survey was obtained on the landing page where information was provided and individuals were requested to consent by clicking either 'agree to participate' or 'don't want to participate'. Participation was

voluntary, and those who did not consent were directed away from the survey to a page thanking them for their time. Participants could withdraw from the survey at any time and their data would not be used if they withdrew prior to the analysis. Confidentiality was protected by ensuring the survey did not contain personal identification or information that would identify participants, such as names, email or IP addresses.

Measures

Participants were asked their age and education level. Contextual questions relating to pain included previous pain experiences using Visual Analogue Scale (VAS) for intensity ratings and experiences of period pains (dysmenorrhea), for instance how painful they are, and about pain relief.

The survey contained four scales from questionnaires exploring the following: prevalence of pain catastrophising and the constructs of pain anxiety, fear of pain and fear of childbirth.

The *Pain Catastrophising Scale (PCS)* was created by Sullivan et al (1995) is a self-report measure of exaggerated negative attitudes towards painful or distressing stimuli. The scale was developed both for clinical and non-clinical use, and it measures rumination, helplessness, and magnification of pain-related thoughts. The thirteen-item instrument requires participants to reflect on their past experiences which are recorded on a five point scale zero (not at all) - four (all the time), scores can range from 0-52 and the scores are computed by adding the responses of all 13 items. The scale has a high test-retest correlation of $r=0.75$ across 6 weeks and internal consistency of three subscales with total PCS Cronbach's alpha $=0.87$. The

PCS subscales provide satisfactory reliability in predicting several pain indicators in a non-clinical student population (Osman et al 1997). The cut-off identified for pain catastrophisers is a total score of 30 and more, according to the scale's developers (Sullivan et al 1995).

The short version of *Pain Anxiety Symptoms Scale (PASS-20)* was developed and validated to study the relations between fear of pain and avoidance of pain (McCracken and Dhingra 2002). It was previously found that pain-related anxiety responses might result in more intensely experienced painful sensations. A self-perpetuating cycle of pain, avoidance, and feeling anxious impairs patient's problem solving and distracts them from effective coping strategies with pain. The shortened scale includes four subscales measuring cognitive anxiety responses, escape and avoidance, fearful thinking, and physiological anxiety responses. High internal consistency of short PASS-20 version was demonstrated with mean Cronbach's alpha =0.81. Correlations of both original and shortened scale version with pain, depression, and disability measures were high (r=0.95) and showed construct validity of the short PASS-20 version (McCracken and Dhingra 2002). The total scores range from 0 to 100 but no cut-offs for the total score were identified, thus the score range was used.

The *Fear of Pain Questionnaire (FPQ)* was developed and validated initially by McNeil and Rainwater (1998) and has been used widely in pain research. Fear of pain relates to concerns around increased perception of pain which may be influenced by internal or external factors leading to emotional behaviours (Meulders et al 2012). The FPQ was developed for use in both clinical and nonclinical populations and consists of three subscales; fear of severe pain, minor pain and medical pain. Internal consistency for the subscales was demonstrated with

Cronbach's alpha >0.87. Construct validity was demonstrated with the questionnaire in populations with different pain conditions (McNeil and Rainwater 1998). The scores can range from 30 to 150, no cut-offs were identified, hence the whole score range was used for analyses.

The *Childbirth Fear-Prior to Pregnancy (CFPP)* scale was recently developed and validated as a new measure (Stoll et al 2016). Childbirth fear relates to the attitudes and fears that young adults who plan to have children in the future have. The scale includes characteristics which might be indicative of a predisposition to fear of childbirth. The validity and reliability of the CFPP scale has been reported in groups of young adults from six countries. High internal consistency across the groups was demonstrated with Cronbach's alpha of >0.86. Construct validity was recorded against a two item analogue scale of fear of birth with a correlation of r> 0.6. Weaker correlations of the CFPP were found with constructs relating separately to anxiety, depression and stress (Stoll et al 2016). The CFPP scale was used because it is the only publicly available validated tool to assess fear of childbirth in a non-pregnant population. The scale is relatively new; thus, no cut-offs were identified, but the total scores range from 10 to 60. It should be noted that last question from the scale was not answered by anyone from our current sample.

Participants were invited to express comments about previous pain experiences and how these experiences impact their lives. Information was collected relating to chronic pain (experienced for more than three months) and the location of the pain. Previous pain experiences were explored in relation to attitudes towards pain in general as assessed by pain catastrophising scale and PASS-20 questionnaires (Sullivan et al 1995; McCracken and Dhingra 2002). Additionally, participants were asked about their menstrual cycles and period pains, as according to the literature,

women with severely painful periods show enhanced pain perception (Granot et al 2001). Hence, we aimed to explore the link of painful periods (dysmenorrhea) and taking pain relief medicine on pain catastrophising. Open-ended questions and simple rating scales assessed regularity, continuity, painfulness and its relief methods, and impact on daily activities.

Lastly, subscales of PCS were used to analyse links of pain relief with helplessness by running a t-test and pain-related anxiety with rumination. This was done in order to explore possible associations between specific features of pain catastrophising and attitudes, experiences, and perception of pain.

Data Analysis

Data from BOS were collated and organised in Microsoft Excel and analysed using the Statistical Package for Social Sciences (SPSS v.26). Descriptive statistics were produced and the normality of predictor variables was checked by making histograms of their score range. All variables were normally distributed, except age which was skewed towards the left, as the majority of our sample was early to mid-twenties. Two participants did not report their age, thus they were excluded only from analyses involving age, but as age was not significantly correlated with the PCS, PASS and CFPP; and there was only a weak significant correlation with the FPQ-III ($r = 02$, $p<0.05$ we made a decision to include all participants in the data analysis.

Correlations between FPQ-III and PASS-20 scores on PCS were explored, as well as age and previous pain experiences. Analysis of pain catastrophising was carried out using two different cut-off scores; (1) a score of 20 and above, as suggested by Flink et al (2009); (2) a score of 30 and above, as suggested by Sullivan et al (1995).

Forced-entry multiple linear regression was employed to explore the predictive factors that significantly correlated with pain catastrophising. This method was chosen using only variables that had a significant correlation > 0.39 and from the data an assumption was made that there was no first order auto-correlation. These assumptions were checked and it was found that predictors and outcome variables were interval data and the relationships between variables were linear. There was no multicollinearity between predictors because no correlations between predictor scores were higher than .80. Homoscedasticity was also checked, and data was found to be heteroscedastic. Additional analyses (t-tests, chi-square) explored previous pain experiences and dysmenorrhea.

Results

A total of 122 women completed the survey. The majority were aged between 18 and 23 years (n=87 [71%]) and undertaking an undergraduate degree.

{table 1 about here}

Previous experiences of pain for more than three months including locations of the pain and additional diagnoses of participants can be seen in table 2 below. Reports ranged in severity of pain from light tingling and dull aching, to sharp stabbing sensations and tightness. Some participants mentioned that an experience seems worse and scarier when the cause of pain is unknown, or if it happens unexpectedly. For example one participant sited a diagnosis of cancer as an example.

The prevalence of pain catastrophising with a cut-off score of 20 and above was 47.5% (58/122 participants). Prevalence of pain catastrophising with a cut-off score of 30 and above was 21.3% (26/122). The sample average score was 20.36 (SD=9.95) and the scores ranged from 16 to 49 overall (table 2).

Pain catastrophising was significantly correlated with both fear of pain and pain-related anxiety. Fear of pain (FPQ score) was significantly correlated with pain catastrophising (PCS score) (r (122) = 0.52, $p < 0.001$) and with pain-related anxiety (PASS-20) (r(122) = 0.39, $p < 0.001$). Pain-related anxiety was also significantly correlated with pain catastrophising (r (122) = 0.77, $p < 0.001$). It should be noted that one question was missing from PASS-20 survey.

There was no correlation between age and pain catastrophising (r (120) = -0.11, $p = 0.252$), pain anxiety or fear of childbirth. However, fear of pain was significantly correlated with age (r (120) = 0.20, $p = 0.025$), with younger students being more fearful. Scores from CFPP scale did not significantly correlate with age, pain catastrophizing, pain anxiety or fear of pain. All r values can be seen in table 3.

A forced-entry model was chosen as the most appropriate method and the variables that significantly correlated to pain catastrophising were used (fear of pain and pain-related anxiety). The multiple regression model was able to explain 65% of the variance ($R^2 = 0.81$), and significantly predicted the outcome ($F_{(2,119)} = 110.39$, $p < 0.001$).

Both predictors had significant contributions to the model (see table 4). Fear of pain was significantly associated with pain catastrophising ($\beta = 0.14$, $t = 4.21$, $p < 0.001$). Pain-anxiety symptoms score were also a significant predictor of pain

catastrophising (β = 0.40, t = 11.39, p <0 .001). The equation of the model is: pain catastrophising = (.14*fear of pain +.40* pain-related anxiety) – 5.76.

{table 4 about here}

There were no significant differences or correlations between previous painful experiences, or length and severity of these experiences, and pain catastrophising. So these factors were not included in the multiple regression, but additional tests comparing those who had experienced pain for more than three months or not were run. Differences in PCS scores between those who had experienced pain for more than 3 months (N=59, M=21.49, SD=10.36) and those who had not (N=63, M=19.30, SD=9.53) were not significant, (t(120) = -1.22, p = 0.226). Participants who reported having dysmenorrhea (N=87, M=19.74, SD=9.29) had lower PCS scores than those who had not (N=35, M=21.91, SD=11.45) but the differences were not statistically significant (t(120) = 1.1, p = 0.276).

{table 5 about here}

There was no association found between those who catastrophise about pain (using PCS cut-off scores of 20 or 30) and whether or not they would take pain relief for dysmenorrhea. Chi square analysis with cut-off of 20: χ(1, N=120) = 0.222, p = .637, cut-off of 30: χ(1, N=120) = 0.571, p = 0.450

Discussion

The purpose of this study was to explore the prevalence of pain catastrophising in a healthy population of young nulliparous women and to identify factors that might predict pain catastrophising. The results of this study indicate a high prevalence of pain catastrophising affecting more than half the sample, and to the authors'

knowledge this is the first time the prevalence of pain catastrophising has been explored in a healthy population. The prevalence is slightly higher than previously reported (46%) in a small group (n=82) of pregnant, nulliparous women (Fink et al 2009).

One might have thought the high level of pain catastrophisation reflected a growing fear of childbirth among students, which has been seen in other countries (Stoll et al 2013) however, we found no correlation between pain catastrophisation and fear of childbirth. There was also no significant relationship between pain catastrophising and age. Data relating to pain catastrophising and age is limited but it has been reported that young adults (aged 20-40 years), were more likely to catastrophise if they reported an emotional response to pain (Ruscheweyh et al 2011)

In contrast Rondung et al (2019) found that fear of child birth measured using the fear of birth scale (FOBS) did correlate with pain catastrophising (PCS). The discrepancy in this finding may be related to the different scales used. Although it is more likely to be because in this current study women were not pregnant and therefore fear of childbirth was not as 'real' to them as those described in the study by Rondung et al (2019) who were either pregnant or who had previously been through childbirth. In their group of 499 pregnant women, mean age 30 years- 45% were nulliparous. The nulliparous population were significantly more likely to report higher FOB scores than multiparous, however, there was no significant difference in PCS scores between nulliparous and multiparous women.

Women who have higher pain catastrophising scores in pregnancy report higher rates of anticipated pain in childbirth (Flink et al 2009) and pain catastrophising has been found to mediate between fear of pain and preference for elective caesarean

(Dehgani et al 2014) which might indicate these women are more likely to request a cascade of interventions associated with their pain perceptions. If we are to support these women to better manage their pain in labour we need to identify those most likely to have pain catastrophising using a predictive tool so that this cohort of women can receive a timely targeted intervention. Pain catastrophising specifically focuses on negative thoughts relating to pain, magnification of those thoughts coupled with a sense of helplessness (Leung 2012). These are factors which contribute to self-perpetuating fear and anxiety around pain which may also be influenced by previous pain experiences.

A secondary aim of the study was to identify those factors that predict a high pain catastrophising score prior to pregnancy. It is acknowledged that anxiety plays a role in pain behaviour profiles of people with chronic pain and correlates with fear of pain and (Turk and Wilson 2010; Hatamleh et al 2019). Correlational analyses revealed three significant high correlations between; 1) pain catastrophising and fear of pain, 2) pain-related anxiety and pain catastrophising, and 3) fear of pain and pain-related anxiety. The PASS-20 scale had the highest correlation value indicating that even low level pain-related anxiety symptoms correlate with pain catastrophising. Forced-entry multiple linear regression revealed significant contribution of fear of pain and PASS-20 scores on predicting pain catastrophising in a healthy population with no recognised anxiety disorders. More than half of the variance was explained by the regression model where other variables had no significant increase in predictive power, except FPQ and PASS-20. Our findings support previous literature relating to pain catastrophising and how it links with anxiety symptoms and fear of pain (Burri et al 2018).

It was hypothesised that women with a history of dysmenorrhea would be more likely to report pain catastrophising; however, we found no relationship between those with pain catastrophising and dysmenorrhea. Similarly there was no link between those with pain catastrophising who reported needing to take pain relief for dysmenorrhea. It is possible that women who have dysmenorrhea do not necessarily have negative thoughts about this pain because they recognise the cause, feel in control and can successfully self-manage this pain. The link between pain catastrophizing and dysmenorrhea (and pain relief requirements) may be mediated only in women who also report having chronic pain (Payne et al 2016) however, in this study although the PCS scores of those with chronic pain were slightly higher than those without this was not a statistically significant finding.

Strengths and limitations

The primary limitation of the study relates to the small sample size. In addition all participants were university students with the majority in their early twenties, all attending health related programs which may bias the population. The participants might have been self-selecting and drawn to answering the questionnaire because they had pain, however, at a cut-off score of 20 the prevalence is similar to that reported in a study of 82 Nulliparous women (Flink et al 2009). In addition an error in the questionnaire meant that the researchers failed to collect data on the final question for both the PASS-20 and FCPP.

One of the strengths of this current study has been identifying prevalence levels of catastrophic thinking about painful situations in a young healthy population. We believe this finding provides us with an opportunity to explore this phenomenon in pregnant women to identify predictors of pain catastrophising with a view to

introducing targeted approaches to support improved pain management in this group of women in the latent phase of labour.

Conclusion

In summary this study has identified that healthy young women show levels of pain catastrophising which are highly correlated to anxiety and fear of pain. The literature suggests pain catastrophising has an impact on pain coping behaviours for women during and after childbirth (Van den Bussche et al 2007; Flink et al 2009), requests for pain relief in latent labour (Veringa et al 2011) and preference for operative births (Dehgani et al 2014). It is reasonable to hypothesise that the pain catastrophising scale may be a good tool to predict those women likely to require additional support in the latent phase of labour to self-manage their pain; however further work is needed to explore this with a group of pregnant women.

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Table 1: Demographic characteristics of sample.

Characteristics (mean)	Percentage (n)
Age (years), 18-48 (22.6)	
18-23	71.3 (87)
23-48	27 (33)
University	
HEI in England	23.8 (29)
HEI in Scotland	76.2 (93)
Studies level	
Undergraduate	76.2 (93)
Postgraduate	18.9 (23)
Other	4.9 (6)
Previous pain experienced > 3 months	
Yes	48.4 (59)
No	51.6 (63)
Reported dysmenorrhea	71.3 (87)
Use of pain medication	61.5 (75)

Table 2: Pain Catastrophising Scale

Pain Catastrophising Scale sections	Mean (SD)	Range
Total PCS score	20.36 (9.95)	16-49
Rumination	7.92 (3.93)	0-16
Magnification	4.56 (2.46)	0-12
Helplessness	7.89 (4.92)	0-23
Prevalence of pain catastrophising	Percentage	
*Cut-off point of 20	47.5 (58)	
**Cut-off point of 30	21.3 (26)	

*.Flink et al (2009)

**.Sullivan (2001)

Table 3: Summary of correlations between the Fear of Pain Questionnaire (FPQ), Pain anxiety symptoms scale (PASS-20), Childbirth Fear Prior Pregnancy (CFPP) and age with Pain catastrophising (PCS).

Variables	PCS	FPQ	PASS-20	CFPP	Age
PCS	1				
FPQ	.52**	1			
PASS-20	.77**	.39**	1		
CFPP	.37	-.28	-.05	1	
Age	-.11	.20*	-.11	.10	1

Note. Coefficients represent correlations for total sample (N=122), except for age N=120.

**. Correlation is significant at the 0.01 level (two-tailed).

*. Correlation is significant at the 0.05 level (two-tailed).

Table 4: Values of predictors from forced-entry multiple linear regression.

edictor	R^2	Adj. R^2	F	p	β	Constant	t	p(t)
PQ total	.806	.644	110.39	<.001	.14	-5.76	4.21	<.001
ASS-20 total	.806	.644	110.39	<.001	.40	-5.76	11.39	<.001

Note. Score from CFPP scale was not used in the multiple regression because no significant correlations were found with pain catastrophizing. The total sample score was used (N=122).

Table 5: Comparison of the mean pain catastrophising scores for those with or without previous pain for more than three months and with or without dysmenorrhea.

	Mean (SD)	Difference between the means	95% CI	p (two-tailed)
Pain for >3 months (N=59)	21.49 (10.36)	2.19	1.37 - 5.75	.226
No previous pain (N=63)	19.3 (9.53)			
Dysmenorrhea (N=87)	19.74 (9.29)	2.17	1.76 – 6.12	.276
No dysmenorrhea (N=35)	21.91 (11.45)			