The Prevalence of Childhood Abuse, Trauma and Neglect in Adult Icelandic Patients with Fibromyalgia, and its Relation to the Severity of Fibromyalgia Symptoms
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Foreword

Submitted in partial fulfillment of the requirements of the BSc Psychology degree, Reykjavik University, this thesis is presented in the style of an article for submission to a peer-reviewed journal.
Abstract
This study was conducted to examine the relationship between childhood abuse, neglect and trauma in childhood and fibromyalgia syndrome (FMS) in adulthood. This study is a data based research using medical records from Þraut ehf. A sample of 180 subjects (M<sub>age</sub> 41.0) answered questionnaires in their diagnostic process of FMS. There was not a significant difference between history of abuse, neglect and/or trauma on FMS symptoms, when controlled for anxiety, depression, resilience, self-esteem and pain anxiety (p = 0.52, Partial η<sup>2</sup> = .01). Individuals who reported traumatic events in childhood did not show more severe FMS symptoms than those who reported no traumatic events. There was a significant difference between those who suffered sexual abuse in childhood as compared to serious injury (e.g. car accident, aircraft accident, accident at sea or workplace accident) on FMS symptoms. Individuals that experienced traumatic events and were diagnosed with post-traumatic stress disorder (PTSD) were more likely to report more severe FMS symptoms than non-diagnosed individuals. This study indicates that childhood abuse has greater effect on FMS symptoms than other traumatic events and that PTSD is an important influencing factor on FMS symptoms. Furthermore, that risk- and protective factors affect the former relationship.

Keywords: childhood abuse, neglect, trauma, post-traumatic stress disorder, risk- and protective factors, fibromyalgia

Útdrátur
Algengi ofbeldis, áfalla og vanrækslu í æsku var kannað hjá fullorðnum einstaklingum með veðjagigt auk tengsla þessara þátta við alvarleika veðjagigtareinkenna. Rannsóknin er gagnarannsókn þar sem unnið var með gögn úr sjúkraskrá Þrautar ehf. Sóttar voru upplýsingar úr hluta þíra spurringalista sem 180 skjólstæðingar (M<sub>age</sub> 41.0) fylltu út þegar þeir gengust undir veðjagigtargreiningu árið 2016. Ekki var marktækur munur á milli ofbeldis, áfalla og vanrækslu á einkenni veðjagigtar, þegar stýrt var fyrir kviða, þunglyndi, seiglu, sjálfstrauti og verkjakviða (p = 0.52, Partial η<sup>2</sup> = .01). Einstaklingar sem greindu frá áföllum í æsku syndu ekki alvarlegri einkenni veðjagigtar en þeir sem greindu ekki frá áföllum. Það var marktækur munur á kynferðislegum ofbeldi í æsku og alvarlegra slysa (t.d. bílslys, flugslys, sjóslys eða vinnuslys) á einkenni veðjagigtar. Einstaklingar sem greindu frá áföllum og voru greindir með áfallastreituröskun voru líklegri til að greina frá alvarlegri einkennum veðjagigtar en einstaklingar ágreiningu. Þessi rannsókn gefur til kynna að kynferðislegt ofbeldi skýri umfram áhrif á einkenni veðjagigtar en önnur áfóll, og að áfallastreituröskun sé mögulegur áhrifafáttur veðjagigtar. Að auki að áhættu- og verndandi þættir hafa áhrif á fyrnefnt samband.
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The Prevalence of Childhood Abuse, Trauma and Neglect in Adult Icelandic Patients with Fibromyalgia, and its Relation to the Severity of Fibromyalgia Symptoms

Chronic musculoskeletal pain is a common problem with a population-estimated prevalence of 19.9% in the Icelandic adult population (Björnsdóttir et al, 2013). Chronic pain can markedly affect the quality of life of individuals suffering from it (Merskey, Bogduk, & International Association for the Study of Pain, 1994). Although the pain is limited to a specific anatomic region in a substantial proportion of patients, (often in relation to tissue damage such as osteoarthritis), in about half of these individuals, the pain is widespread, chronic, and present for most days of the last three months (Butler S. et al, 2016; Mundal I, 2014b; Wolfe et al., 1990). A subgroup of patients with chronic widespread pain has fibromyalgia syndrome (FMS), a syndrome of chronic musculoskeletal pain involving the axial skeleton and all four quadrants of the body, and in most instances, FMS is associated with fatigue, cognitive dysfunction, and non-enduring sleep (T. M. Palermo, 2000; Wolfe f et al, 1990; Wolfe et al, 2010).

Individuals with chronic widespread pain or FMS in general do not have an underlying organic, objectively identifiable cause for their symptoms. Such medical conditions have, in the past, been considered as medically unexplained symptoms (MUS) or placed in a poorly understood category (Borsook & Becerra, 2006; Li, Su, Hsieh, & Ho, 2013). MUS include FMS, chronic fatigue syndrome, irritable bowel syndrome, somatic symptoms in mood disorders, and various other disorders (Li et al., 2013). However, in the past 15 years, major advances have been made in objectively explaining non-organic chronic pain. Thus, FMS is now considered a pain disorder which is at least partially caused by central pain sensitization (Sluka, K. A., & Clauw, D. J., 2016), in which processing of pain within the central nervous system is abnormal. Quantitative sensory testing (Smith et al, 2008) and functional brain imaging such as an MRI, can document the central pain
sensitization (Lopez-Solá et al, 2016).

FMS is a common disorder with prevalence in the general population of 1-6%, depending on the diagnostic criteria used (Jones et al, 2015). FMS is a major health problem in Western societies, often resulting in debilitating symptoms of pain, fatigue, unrefreshing sleep, and cognitive dysfunction which significantly impacts quality of life and ability to work (Sicras-Mainar et al, 2009; Schaefer et al, 2016). In Iceland, FMS is the primary or secondary cause for premature work retirement and disability compensation in 21.6% of women (Snorradóttir Á, 2008). Therefore, understanding chronic pain and factors that contribute to the cause, progression and/or severity of chronic pain disorders such as FMS is of substantial importance, both for the individual involved and for society. Pain is a complex experience that is not only influenced by biological factors but also psychosocial factors, sociocultural background, beliefs and attitudes, and the meaning of pain to the person suffering from it (Turk and Okifuji, 2002). In the late 1960’s psychologists attempted to find possible causes and treatment for chronic pain (Molton et al., 2009). With time, chronic pain began to be considered as a biological and psychological disorder (Flor & Turk, 2011; Gatchel et al, 2007). Many psychological models have been applied to understand the causes of chronic pain (Jensen & Turk, 2014). The operant conditioning model, for example, which Wilbert Fordyce linked to chronic pain, theorizes that behavior is sensitive to environmental responses that are connected to that specific behavior (Fordyce et al., 1973). Commonly revealed risk factors for developing musculoskeletal pain include depression, anxiety, sleep disturbance, female gender and lifestyle factors (Cimmino et al., 2011; Elliott et al., 1999; Mundal et al., 2014a; Ramiro et al, 2014). Protective factors for chronic pain have not been studied as thoroughly as risk factors, but few studies have highlighted the specificity of personality in fibromyalgia patients and showed that personality traits like high neuroticism and high impulsivity are associated with high level of chronic pain (Bucourt et al., 2017;
Gonzalez, Baptista, Branco, & Novo, 2015). Given those results, it is possible that positive personality traits like high self-esteem and resilience can have a protective effect on fibromyalgia symptoms - but that has not been studied in this literature.

One area of on-going research is the potential relationship between psychological maltreatment and traumatic events in youth and subsequent chronic pain in adulthood. Numerous studies have reported significant association between childhood maltreatment, traumatic events and abuse and subsequent development of fibromyalgia in adulthood (Goldberg, Pachasoe, & Keith, 1999; Haviland, Morton, Oda, & Fraser, 2010; Lee, 2010). However, most of these studies are cross-sectional in nature and therefore liable to recall bias (Afari et al, 2014). Also, there can be numerous variables that can mediate this relationship which are not controlled in those studies. Risk factors for FMS, like depression and anxiety, and possible protective factors like resilience, pain anxiety, and self-esteem, have not been controlled. Previous studies on the topic have increased scientific awareness of the impact of psychological maltreatment on chronic pain, but future studies should have greater control over external variables that can mediate the relationship. A recently conducted meta-analysis systemic review identified low socioeconomic status in childhood as the only definite risk factor and negative emotional symptoms in childhood as a probable risk factor for future chronic pain (Huguet et al, 2016). Thus the issue of whether sexual abuse, physical abuse and/or neglect in childhood are causative factors in the development of chronic pain is still to be determined.

Irrespective of whether childhood maltreatment is a causative factor in the development of chronic pain, it may influence the adjustment to chronic pain and adversely affect the functional outcome of the patients. Surprisingly, in the systematic review of Huguet et al (2016), the 36 studies that met the criteria for inclusion only investigated causative factors, but did not include prognostic factors for musculoskeletal pain-related disability.
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Other studies have suggested that depression in childhood and, in particular, post-traumatic stress disorder symptoms, influence the severity of chronic musculoskeletal pain in adulthood (Noel et al, 2016; Raphael et al, 2011). Another study showed that PTSD was more prevalent in the FMS group than in other groups (Ciccone, Elliott, Chandler, Nayak, & Raphael, 2005). Häuser et al (2013) also found that PTSD was a potential risk factor of FMS symptoms and vice versa (Häuser et al., 2013). In an unpublished pilot study conducted at the health center Þraut ehf in 2012, significant positive correlation was observed between the severity of FMS measured by the Fibromyalgia Impact Questionnaire and the number of lifetime adverse events (Birgisson, personal communication, March 8, 2017). This observation has not been analyzed further.

Þraut ehf provides a diagnoses process for fibromyalgia and similar conditions and offers counseling, rehabilitation treatment, and follow-up for patients. The medical records at Þraut provide a unique opportunity to investigate, cross-sectionally, the possible effects of childhood maltreatment on the severity of FMS. As a part of routine clinical evaluation of every patient, information is gathered regarding childhood maltreatment (physical, mental or sexual abuse and neglect), lifetime psychiatric diagnoses and current status of the patient in regard to the severity of the FMS and in particular the severity of pain, symptoms of depression, anxiety and pain-related anxiety.

The current experiment was conducted to examine the possible association between childhood abuse, neglect, trauma and PTSD, and severity of FMS symptoms in adulthood. Based on the above literature it was hypothesized that: 1) Individuals with history of neglect, trauma and physical and mental abuse show more FMS symptoms than subjects who report less history or no history whatsoever, when controlled for anxiety, depression, resilience, self-esteem and pain anxiety; 2) Individuals who report one or more traumatic events in childhood show more severe FMS symptoms than those who report no traumatic events; 3)
Individuals that reported sexual abuse in childhood are more likely to report more severe FMS symptoms than those who reported accidents (e.g. car accident, aircraft accident, accident at sea or workplace accident); 4) Individuals that have experienced one or more traumatic events and are diagnosed with post-traumatic stress disorder (PTSD) are more likely to report more severe FMS symptoms than people that have experienced one or more traumatic events but not met the criteria for PTSD.

Method

Subjects

Subjects in this particular research were clients that had gone through diagnostic process for fibromyalgia syndrome within Þraut ehf. Information was sought from a total of 180 Icelandic subjects that went through FMS analytical process from January to September in the year of 2016. In all instances a doctor referred subjects to Þraut in order to go under analysis and valuation owing to prolonged pain problems. Thus all subjects had prolonged pain problems and over 90% of them received a FMS diagnosis. The group of subjects included 167 women and 13 men between the ages of 18 and 70 (M = 41, SD =14.18).

Measures

Subject’s answers to the following questionnaires and psychiatric interview were retrieved from their medical records at Þraut:

Fibromyalgia Impact Questionnaire (FIQ). FIQ is a self-administered instrument that measures the severity of FMS symptoms and total spectrum of FMS related symptoms (Bennett, 2005). FIQ is composed of 10 questions. The first part contains questions related to the ability to perform large muscle tasks (Where you able to prepare meals?), as questions are rated on a 4-point Likert-type scale (0 = always, 1 = most, 2 = occasionally, 3 = never). Subjects are also asked questions regarding wellbeing, ability to work, stiffness, anxiety and depression. The scale has shown good internal consistency (Buskila & Neumann, 1996;
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Sarmer et al., 2000) and test-retest reliability, both in its original form (Bennett, 2005) and in some translated forms (Buskila & Neumann, 1996; Sarmer, Ergin, & Yavuzer, 2000). The questionnaire has been translated to Icelandic but it is unknown if psychometric properties have been studied in the Icelandic version.

**Child Abuse and Trauma Scale (CATS).** CATS is a 38 item self-report questionnaire that measures various types of negative experiences in childhood and adolescence such as the experience of sexual, physical or mental mistreatment, punishment and negative home environment (Sanders & Becker-Lausen, 1995). Respondents answer questions on a 5-point scale (0 = never, 1 = rarely, 2 = sometimes, 3 = very often, 4 = always). An example of a question from the CAT scale is: “Did your parents verbally abuse each other?” The CATS includes three distinctive, intercorrelated factors, which reflect negative home environment/neglect, punishment and sexual abuse. Scores are calculated for each subscale as overall CAT scores. The scale is mainly used in research context but can be used in clinical assessment (Sanders & Becker-Lausen, 1995). The scale has adequate psychometric abilities, and is a useful measure to assess stress or trauma produced by types of negative experiences in childhood (Sanders and Becker-Lausen, 1995). Psychometric properties have not been tested in the Icelandic version of the scale.

**The Pain Anxiety Symptoms Scale (PASS).** McCracken et al (1992) developed PASS, to assess the fear of pain. The scale is a self-report measure where subjects indicate how often they feel anxiety relating to their pain experiences. The answers are on a 6-point Likert-type scale (0= never, 5=always). PASS has four subscales indexing; cognitive anxiety symptoms, escape and avoidance related to reducing pain, fearful appraisals of pain, and physiological anxiety symptoms related to pain. The scale has shown good psychometric properties (Brandt, Zvolensky, Daumas, Grover, & Gonzalez, 2016; Burns et al, 2000).
Psychometric properties of the PASS have not been studied in the Icelandic version of the questionnaire.

**The Posttraumatic Diagnostic Scale (PDS).** The PDS assesses criteria for PTSD according to DSM-IV and gives information about the severity of PTSD symptoms (Foa, Cashman, Jaycox, & Perry, 1997). The PDS starts with a checklist of 12 traumatic events where individuals are asked to mark number of experienced traumatic events. Subjects are also asked to mark the traumatic event that has had the most effect on them at that given time, and state the time of the occurrence. Subsequent sections are questions regarding that particular event. Following questions regard how the individual felt at the time of the event, symptoms of PTSD and impairment in different life areas. Internal consistency of the measurement has been good for total symptom severity, and reliability has been satisfactory (Foa et al, 1997; Powers, Gillihan, Rosenfield, Jerud, & Foa, 2012). These studies show that the PDS scale is robust and has strong psychometric properties, and therefore utilized for assessing PTSD diagnosis and severity. Georgia M. Kristmundsdóttir and Berglind Guðmundsdóttir translated the scale to Icelandic. Dry run on the scale on Icelandic University students showed that PDS distinguished well between trauma and no trauma and PTSD symptoms and no symptoms (Ragnarsdóttir and Guðmundsdóttir, 2008).

**Self-Concept Questionnaire (SCQ).** The SCQ is a self-report scale that measures self-esteem (Ghaderi, 2005; Robson, 1989). The scale consists of 30 items that are based on seven components of self-esteem according to empirical information from Robson (1989). The scale measures three factors; self-deprecation, attractiveness, and self-respect/self-confidence (Addeo, Greene, & Geisser, 1994). Example of item from the questionnaire is: “I have control over my life”. SCQ is an eight-point scale, where answers range from completely disagree to completely agree. The scale has good reliability, validity, construct validity and convergent validity (Ghaderi, 2005; Robson, 1989). Given its psychometric
properties, SCQ seems to be a valuable instrument in measuring self-esteem and resilience both in studies and clinical samples (Ghaderi, 2005). Sóley D. Davíðsdóttir translated the scale to Icelandic but psychometric properties have not been tested in the Icelandic version of the scale.

The Mini International Neuropsychiatric Interview (MINI). MINI is a short standardized psychiatric interview that explores 17 disorders according to the Diagnostic and Statistical Manual (DSM)-IV and ICD-10 diagnostic criteria (Lecrubier et al., 1997; Sheehan et al., 2010). Inter-rated reliability and test-retest reliability has found to be high in the English version of the MINI (Amorim, 2000; Lecrubier et al, 1997; D. V. Sheehan et al., 1998). Mini has been translated to numerous languages and psychometric properties sustain strong in translated versions (de Azevedo Marques & Zuardi, 2008; Kadri et al., 2005; Mordal, Gundersen, & Bramness, 2010). Psychometric properties have been thoroughly studied of the Icelandic version of the MINI and show strong results (Sigurðsson, 2008). Another study gives some support the validity of the Icelandic MINI (Kristjánsdóttir et al., 2015).

Procedure

Data was collected from questionnaires that are a part of medical-records Þrautar ehf, regarding six self-report questionnaires (CATS, FIQ, PASS, PDS and SCQ), and one diagnosis interview (MINI). Following background variables were also collected: gender, age, education, present position and employment radio. Answers to these scales were collected from 180 people who went through analytical procedure for FMS within Þraut, from January to September in the year of 2016. This study is a data based research and subjects were not notified about process on their information, as the data was solely non-personally identifiable. Data entry and processing took place within Þraut and researcher was given temporary access to a copy of medical records data.
DATA PROCESSING AND STATISTICAL ANALYSIS

Data processing was conducted in the program Statistical Package for the Social Science (SPSS). An analysis of covariance (ANCOVA) was used for testing the primary hypothesis (hypothesis 1), with four covariates: anxiety, depression, self-esteem and resilience and pain anxiety. One-way ANOVA was also used to assess the independence of the covariates and independent variable. The Kolmogorov-Smirnov test was used to test the assumption of normality and the Levene’s test to test the assumption of homogeneity of variance. To run the ANCOVA the continuous variable of CATS score was divided into four groups of different score. The first group consisted of subjects who had minimal symptoms on the CATS (M = 57.88, SD = 13.09). The second group included subjects with low symptoms (M = 59.36, SD = 15.34). The third group included subjects with high scores (M = 63.71, SD = 15.49) and the last group included subjects with severe scores (M = 69.29, SD = 11.06).

To test for the second hypothesis of the study ANCOVA was also conducted, with the same four covariates as in hypothesis 1. New variables were formed depending on whether individuals experienced trauma or not: no traumatic event (M = 58.43, SD = 16.15) and one or more traumatic events (M = 63.76, SD = 13.81). ANOVA was conducted afterwards to see what the covariates added to the model.

An independent sample t-test was used to compare the effect of sexual abuse and accidents on FMS symptoms. Two new variables were formed regarding the traumatic events in the PDS scale: sexual abuse (M = 68.45, SD = 10.90), and accidents (M = 58.85, SD = 15.56).

Independent sample t-test was also used for the fourth and last hypothesis. The total PTSD score variable was recoded into variable that indicated positive diagnosed PTSD and variable that did not indicate PTSD. New variables were formed depending on PTSD and
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traumatic events, resulting in these two variables: traumatic events and positive PTSD ($M = 67.54$, $SD = 11.65$), and traumatic events and negative PTSD ($M = 60.28$, $SD = 14.69$).

**Results**

**Descriptive Statistics**

Figure 1 below illustrates the distribution of the total score on the Child Abuse and Trauma scale (CATS), where higher scores indicate more severe child abuse and trauma. The average of CATS symptoms was 36.51 ($SD = 25.94$) and all 180 subjects had valid answers. Positive values of skewness were calculated on CATS score and the value of skewness was 1.154 ($SE = 0.18$). The distribution did differ significantly from normal, according to Kolmogorov-Smirnov tests, $D(178) = 0.19$, $p < 0.001$.

![Figure 1. Distribution of subject’s total score on the Child Abuse and Trauma Scale.](image)

FMS symptoms were measured with the FIQ questionnaire, on a scale from 0-100 where FMS symptoms got more severe with higher scoring. The average of FMS symptoms was 62.48 ($SD = 14.41$) and 179 subject of 180 had valid answers. Z-scores were used to see important limits and one outlier was defined. The outlier was marked as missing data and the mean of scores represent data not including the outlier. Negative values of skewness were on FMS symptoms and the value of skewness was -0.364 ($SE = 0.18$), which is beyond values of...
normal distribution 0.0. The distribution did differ significantly from normal, according to Kolmogorov-Smirnov tests, $D(180) = 0.10, p < 0.001$. But the sample of the study was greater than 30 (central limit theorem) (Field, 2013) so it was preceded as if data was normally distributed.

Differences in the severity of CATS score on mean scores of fibromyalgia symptoms, depression, anxiety and resilience and self-esteem is outlined in Table 1. Comparison of means shows that higher score on the CATS indicate higher fibromyalgia symptoms (FIQ). With more increasing score on the CATS, the scores in depression, anxiety and pain anxiety got more severe, and score in resilience and self-esteem got lower with more increasing score in CATS.

Table 1

*Differences in the severity of CATS score on mean scores of dependent variable and covariates*

<table>
<thead>
<tr>
<th>CATS</th>
<th>FIQ</th>
<th>Depression</th>
<th>Anxiety</th>
<th>Resilience/Self-esteem</th>
<th>Pain anxiety</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
</tr>
<tr>
<td>Minimal</td>
<td>57.88</td>
<td>13.09</td>
<td>6.64</td>
<td>0.63</td>
<td>7.48</td>
</tr>
<tr>
<td>Low</td>
<td>59.36</td>
<td>15.34</td>
<td>7.78</td>
<td>0.60</td>
<td>8.19</td>
</tr>
<tr>
<td>High</td>
<td>63.71</td>
<td>15.49</td>
<td>7.69</td>
<td>0.61</td>
<td>9.96</td>
</tr>
<tr>
<td>Severe</td>
<td>69.29</td>
<td>11.06</td>
<td>10.25</td>
<td>0.61</td>
<td>11.18</td>
</tr>
</tbody>
</table>

Direct Effects of Childhood Abuse and Neglect on Fibromyalgia Symptoms

ANCOVA was used to test the first hypothesis. While controlling for subject’s anxiety, depression, self-esteem, resilience and pain anxiety in the relationship between CATS score and FIQ score, there was not a statistically significant differences, $F(3, 166) = 0.76, p = 0.52$, Partial $\eta^2 = .01$. The covariate, anxiety, was significantly related to subjects FIQ score, $F(1, 166) = 15.15, p < 0.001$, Partial $\eta^2 = .08$. There was also a significant
relation of depression on FIQ score, $F(1, 166) = 12.23$, $p = 0.001$, Partial $\eta^2 = .07$. The covariate, pain anxiety, was also significantly related to FIQ score, $F(1, 166) = 4.60$, $p = 0.03$, Partial $\eta^2 = .03$. The last covariate, self-esteem and resilience was not significantly related to FIQ score, $F(1, 166) = 0.76$, $p = 0.62$, Partial $\eta^2 = .002$. Analysis using one-way ANOVA indicated that the covariates were not independent of the childhood and abuse variable, there was a significant effect of CATS score on subjects FIQ score, $F(3, 173) = 5.86$, $p = 0.001$, Partial $\eta^2 = .09$.

The necessary assumptions for ANCOVA were tested and all were met except the assumption of homogeneity of regression slopes. There was a significant main effect of CATS and covariates on FIQ scores, $F(4, 169) = 13.99$, $p < 0.001$. The relationship between depression and CATS was slightly different in the low score group than the other three groups ($R^2$ Linear = 0.391) but standardized regression slopes did not differ by more than .4 in any of the four conditions of CATS score and covariates. Therefore the findings did not raise major concern about the main analysis.

**Direct Effects of Trauma on Fibromyalgia Symptoms**

Analysis using one-way ANCOVA was used to test the second hypothesis. There was not a statistically significant difference between trauma and FIQ score while controlling for subjects anxiety, depression, self-esteem, resilience and pain anxiety, $F(1, 170) = 1.88$, $p = 0.17$, Partial $\eta^2 = .01$. The covariate anxiety was significantly related to FIQ score, $F(1, 170) = 16.85$, $p < 0.001$, Partial $\eta^2 = .09$. The covariate depression was also significantly related to FIQ score, $F(1, 170) = 12.93$, $p < 0.001$, Partial $\eta^2 = .07$. Pain anxiety was significantly related to FIQ score, $F(1, 170) = 5.60$, $p = 0.02$, Partial $\eta^2 = .03$. The last covariate, self-esteem and resilience was not significantly related to FIQ score, $F(1, 170) = 0.08$, $p = 0.78$, Partial $\eta^2 = .00$. Analysis using one-way ANOVA indicated that the covariates were not
independent of trauma or no trauma variables, there was a significant effect of trauma and no trauma on subjects FIQ score, \( F(1, 177) = 4.34, p = 0.04 \), Partial \( \eta^2 = .02 \).

Assumptions were tested for the ANCOVA for the second hypothesis and all were met except following: The normality assumption, no trauma score, \( D(40) = 0.12, p = 0.21 \) did deviate significantly from normal, however, trauma score, \( D(139) = 0.1, p = 0.037 \) was significantly non-normal. But ANCOVA is robust and the sample is greater than 30 (central limit theorem) (Field, 2013) so it was preceded as if data was normally distributed. The assumption of homogeneity of regression slopes was not met, there was a significant main effect of trauma and covariates on FIQ scores, \( F(2, 173) = 25.47, p < 0.001 \). But standardized regression slopes did not differ by more than .4 in the conditions of trauma score and covariates (all R^2 Linear < 0.211). Therefore the findings did not raise concern about the main analysis. The assumption of homogeneity of variance was not met, for the FIQ score, the variance were unequal for trauma and no trauma, \( F(1, 177) = 5.51, p = 0.02 \).

**Relation between Sexual Abuse and Accidents and Fibromyalgia Symptoms**

For the third hypothesis independent samples t-test was run. On average, subjects who reported sexual abuse reported more severe FMS symptoms (\( M = 68.45, SE =1.93 \)), than those who reported accidents (\( M = 58.85, SE = 3.40 \)). This difference was significant \( t(32.73) = 2.46, p = 0.02 \). All necessary assumptions for the independent t-test were tested and all were met except following: The assumption of homogeneity of variance was not met, for the FIQ score, the variance were unequal for sexual abuse and incidents, \( F(1, 51) = 4.47, p = .04 \). In reporting data from the independent t-test equal variance was not assumed.

**Relation between Trauma and PTSD and Fibromyalgia Symptoms**

Analysis using independent samples t-test was also used to test the last hypothesis. On average, subjects who reported trauma and were diagnosed with PTSD reported more severe FMS symptoms (\( M = 67.54, SE = 1.45 \)), than those who reported trauma but were not
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diagnosed with PTSD ($M = 60.28$, $SE = 1.71$). This difference was significant $t(137) = -3.25$, $p = 0.001$. All necessary assumptions for the Independent t-test were tested and all were met except following: The assumption of homogeneity of variance was not met, for the FIQ score, the variance was unequal for trauma and PTSD and trauma and not PTSD, $F(1, 37) = 5.1$, $p = 0.03$. In reporting data from the independent t-test equal variance was not assumed.

**Discussion**

The results of the current study did not support the primary hypothesis. Subjects who experienced a more negative home environment/neglect, punishment, and/or sexual abuse, did not show significantly more severe FMS symptoms than subjects with less experience of abuse, when controlled for depression, anxiety, pain anxiety, self-esteem and resilience. Partial $\eta^2$ was calculated at .01 and represents a small effect size. The second hypothesis was not supported either. Individuals who reported one or more traumatic event in childhood did not show more severe FMS symptoms than those who reported no traumatic events when controlled for the same covariates. Partial $\eta^2$ was calculated at .01, indicating a very small effect size. The last two hypotheses were supported: Individuals that experienced sexual abuse in childhood were more likely to report more severe FMS symptoms than those who reported accidents; and individuals who experienced trauma and were diagnosed with PTSD were more likely to report more severe FMS symptoms than non-diagnosed individuals were.

The outcomes of the first two hypotheses of the study do not support previous studies in the literature (Goldberg et al., 1999; Haviland et al., 2010; Lee, 2010). Those studies have shown significant association between traumatic experiences of sexual and physical abuse in childhood and fibromyalgia symptoms. The plausible reason for the discrepancy in results of this study and previous studies in the literature is the control for possible risk- and protective factors in this particular study. Studies have shown that symptoms of depression and anxiety are significantly higher in FMS patients than non-diagnosed criteria (Ramiro et al., 2014).
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Also, personality traits in fibromyalgia patients have been associated with chronic pain (Bucourt et al., 2017; Gonzalez, Baptista, Branco, & Novo, 2015). Positive personality traits like resilience and high self-esteem have not been studied in relation to child abuse and trauma and fibromyalgia symptoms, thus thought to be an important addition to the model of this study. There seems to be a complex interaction between childhood abuse, trauma, depression and anxiety, and fibromyalgia symptoms. Hence, this study decided to control for various risk- and protective factors that can mediate the complex relationship between childhood abuse and trauma and fibromyalgia. Interestingly, when the covariates, the risk- and protective factors, were taken out of the model, there was a significant effect of childhood abuse and traumatic events on fibromyalgia symptoms, like previous studies in the literature have pointed out. That underlies the importance those mediating factors can have on the complex interaction of abuse and trauma and chronic pain.

The outcomes of the last two hypotheses of the study are in line with the literature supporting the effect of traumatic events, PTSD and sexual abuse, on fibromyalgia symptoms. Individuals that have experienced sexual abuse have reported more health problems compared to those without that history (Sachs-Ericsson, Kendall-Tackett, & Hernandez, 2007), and childhood sexual abuse has shown significant associations to FMS symptoms (Lee, 2010). Additionally, studies have shown that accidents like motor vehicle accidents, physical trauma, fracture, surgery et cetera can be associated with FMS symptoms (Al-Allaf et al., 2002; McLean, Clauw, Abelson, & Libezon, 2005). In light of those results, it was thought to be interesting, in this particular study, to measure the differences of different traumatic events whereas little evidence is behind whether sexual abuse can be a stronger mediating factor for fibromyalgia symptoms than other traumatic events, like accidents. Hence, this hypothesis was important to measure, because these results are an essential addition to the growing research literature in this area.
Individuals, in this particular study, that were diagnosed with PTSD and experienced traumatic events, were more likely to have more severe fibromyalgia symptoms than non-diagnosed PTSD individuals that had experienced traumatic events. That is in line with results of other studies in this area. Studies have shown that trauma in childhood and PTSD can be a predictor of FMS (Noel et al, 2016; Raphael et al, 2011; Weissbecker, Floyd, Dedert, Salmon, & Sephton, 2006). PTSD has shown to be more prevalent in FMS groups of subjects than in non-diagnosed groups (Ciccone et al., 2005), but studies have not observed the difference of PTSD in fibromyalgia patients in relation to traumatic events. It is interesting to think about the reason for this difference. Why do some individuals who report traumatic events develop PTSD while others don’t? There may be numerous reasons for that. Individuals who were diagnosed with PTSD could have experienced more traumatic events, more symptoms of depression and anxiety, could be less resilient, or have lower self-esteem and so on. Traumatic events that include violation of trust could also be more related to high frequency of PTSD than other traumatic events.

The study had some limitations and important strengths. The study was conducted within the natural setting of routine clinical care. Information was gathered from validated questionnaires and a structured interview, thus minimizing the effect of recall bias. FMS subjects can tend to report high levels of both somatic and psychological symptoms (Frederick Wolfe, Rasker, & Häuser, 2012). In light of that, some FMS patients are likely to overestimate the prevalence of mental disorders based on self-report questionnaires that can cause an overlap between FMS and PTSD diagnoses. (Cohen et al., 2002; Häuser, Zimmer, Felde, & Köllner, 2008; Wolfe et al., 2011). An overlap can occur due to the similarity of symptoms in the criteria of PTSD and symptoms in the criteria for FMS. The assumption of homogeneity of regression slope was broken in the ANCOVA. Consequently the Type 1 error rate of the test is inflated and the power to detect effects is not maximized. But the
standardized regression slopes did not differ by more than .4; therefore it was assumed that the F-statistics had corresponding F-distribution. It would be interesting to reanalyze the data with a multilevel model and see whether the results from the multilevel model would be consistent with the results from the ANCOVA, and if Type 1 error would be inflated or not.

In conclusion, these results confirm the importance of the association between childhood abuse, traumatic events and PTSD, and the occurrence of fibromyalgia symptoms in adulthood. While trying to understand this complex relationship, it is fundamental to pay attention to the interplay of psychosocial variables that can mediate this association. This study found that anxiety, depression, self-esteem, resilience and pain anxiety might play an important role in the relationship between childhood abuse and trauma and FMS. Also that PTSD and sexual abuse are potential risk factors for FMS. As interest in FMS and possible causal factors continuous to grow (Sachs-Ericsson et al., 2007; Wu, Chang, Lee, Fang, & Tsai, 2017; Huguet et al, 2016), possible risk- and protective factors should be studied further. In a way, this particular study treads an unbeaten path, as prior studies in this area have not examined the effect of risk- and protective factors in forenamed relationship. This study projects a new light of the relationship of negative upbringing situations and fibromyalgia symptoms in adulthood. Future studies in this area should investigate these complex interactions in population with fibromyalgia and different pain syndromes and test for further risk- and protective factors. Additionally, future studied should investigate further causal factors for FMS, as fibromyalgia is currently one of the biggest health problems in western societies today.
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