

1) **Title: The role of pain-related anxiety in adolescents' disability, and social impairment: ALSPAC data**

2) *Running title:* Pain-related anxiety, disability, and social impairment

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8) *Conflicts of interest:* There are no conflicts of interest that may arise as a result of the research presented in this article.

9) *What is already known about this topic?*

- The fear-avoidance model explains the role of anxiety in maintaining pain-avoidance behaviour and disability.
- Although social functioning is of major importance for adolescents it is not incorporated within the fear-avoidance model.

What does this study add?

- **High** levels of pain-related anxiety are associated with more disability in **community-dwelling** adolescents reporting recurrent pain.
- Pain-related anxiety **has a role** in explaining perceived social impairment in girls with recurrent pain.

Abstract

Background: Anxiety, in particular pain-related anxiety, plays an important role in explaining the severity of pain complaints and pain-related disability in both adults and children with chronic pain. The Fear-Avoidance Model (FAM) describes how pain-related anxiety plays a critical role in the maintenance of pain-avoidance behaviour, which in turn influences pain-related disability. However, the FAM does not take into account broader aspects of adolescence, such as social functioning, which could be negatively impacted by anxiety. In addition, most studies examining the role of anxiety in pain have used small convenience or clinical samples. By using a large UK epidemiological database, this study investigated the associations between pain-related anxiety, disability and judgements of social impairment.

Methods: Participants ($N = 856$) with recurrent pain were selected from a larger epidemiological study (Avon Longitudinal Study of Parents and Children, ALSPAC) of adolescents attending a research clinic at the age of 17 ($N = 5170$). Adolescents completed a self-report questionnaire on pain-related anxiety, disability, and perceived social impairment.

Results: High levels of pain-related anxiety were associated with more disability. In girls, higher levels of pain-related anxiety were also related to the self-perception of greater impairment in social functioning compared to their peers. *Conclusions:* Pain-related anxiety was associated with greater pain-related disability and impaired social functioning. Social functioning should be explored as an integral part of fear-avoidance models of adolescent chronic pain.

1. Introduction

Pain is a common experience during adolescence, developmentally normal, and for most adolescents pain is short in duration and does not interrupt daily functioning. However, pain can persist for longer than three months (King et al., 2011), become disabling and distressing (Gauntlet-Gilbert & Eccleston, 2007; Logan & Scharff, 2005; Logan et al., 2008), and lead to **emotional problems, such as depression, anxiety, and** lowered self-esteem (Eccleston et al., 2004; Peterson & Palermo, 2004; Varni et al., 1996).

Anxiety variables have been found to influence the severity of pain complaints and pain-related disability in **paediatric** chronic pain patients (Cohen et al., 2010; Simons et al., 2012). **Compared** to a community sample, those with a clinical anxiety disorder report elevated pain-related anxiety and disability (Carleton et al., 2009). **The** Fear-Avoidance Model (FAM, **Vlaeyen & Linton, 2000**) has been used to interpret findings **because** it provides useful explanations of how anxiety can maintain avoidance behaviour **for both adult and paediatric samples** (Crombez et al. 2012; Simons & Kaczynski, 2012). **The** FAM postulates that a catastrophic interpretation of pain is a precursor for pain-related fear and pain-avoidance tendencies, which in turn **result** in poor functioning (Leeuw et al. 2007; Vlaeyen & Linton, 2000).

Although the FAM is useful in explaining avoidance behaviour, it has yet to be extended into broader areas of the adolescent experience, such as social functioning. Social, psychological, and physical maturation are important aspects of **an** adolescent's development (Steinberg & Morris, 2001), upon which anxiety can have deleterious effects. Highly anxious adolescents tend to perceive themselves as less competent relative to non-anxious adolescents in their social and physical functioning (Chansky & Kendall, 1997; Ekornås et al., 2010; La Greca & Lopez, 1998; Lewinsohn et al., 1998). In a study investigating self-perception of social functioning, adolescents with chronic pain judged themselves to be more delayed on

many important domains of their social functioning, including school progress, peer relationships, and independence. Furthermore, increased anxiety has been associated with adolescents judging themselves to be less independent compared to peers (Eccleston et al., 2008). However, to our knowledge no other study has investigated the association between pain-related anxiety and social functioning in adolescents with chronic or recurrent pain.

To date, studies examining emotional variables, such as anxiety in pain have made use of small convenience, opportunity, or clinical samples. Large epidemiological studies have traditionally paid little attention to emotional variables (Eccleston, 2008). The Avon Longitudinal Study of Parents and Children (ALSPAC) is a longitudinal population-based cohort study, which investigates a wide range of health outcomes, including pain, presenting an ideal opportunity to investigate the relationship between pain-related anxiety, disability, and judgements of social impairment. We hypothesised that high levels of pain-related anxiety in adolescents are positively associated with disability and with the belief that one is more socially impaired in comparison to peers. As daily and social impairment of adolescents can be influenced by their social environment (McElhaney, & Allen, 2001), we controlled for parental social status.

2. Methods

2.1 Study population

Data were taken from ALSPAC, a longitudinal population-based cohort study following children born between April 1991 and December 1992 (see www.alspac.bris.ac.uk for more information, which also contains details of all the data available through a fully searchable data dictionary: <http://www.bris.ac.uk/alspac/researchers/data-access/data-dictionary/>). A total of 14,541 pregnancies were enrolled, with 13,988 children surviving at 12 months. The current study is based on self-reported data from adolescents who returned a questionnaire inquiring about pain, pain-related anxiety, disability and social impairment

after being invited to attend a university research clinic at 17 years of age ($N_{\text{attending}} = 5170$; response rate = 76.86%). **At this annual visit to the** university research clinic participants **were** invited to complete several health assessments. **Biological samples and physiological, anthropometric, and psychological measures were collected.** All participants who attended the research clinic at 17 years of age received a questionnaire about pain and were requested to complete it during the clinic visit, or to return it by post. A total of 3974 adolescents (1651 boys (41.5%) and 2323 girls (58.5%), $M_{\text{age}} = 17.80$, $SD_{\text{age}} = .44$) completed the questionnaire, of **whom** 844 adolescents reported recurrent pain (291 boys (34.5%) and 553 girls (65.5%); $M_{\text{age}} = 17.78$, $SD_{\text{age}} = .42$). The sub-sample of adolescents reporting recurrent pain will be the sample used in this study (see Figure 1 for an overview of the recruitment process). Ethical approval was obtained from the ALSPAC Law and Ethics Committee and the Local Research Ethics Committees. Adolescent consent was obtained.

- Insert Figure 1 about here -

2.2 Materials and Methods

2.2.1 Adolescents' pain and disability

Pain complaints and disability were assessed by means of a structured pain questionnaire created for this particular study. The pain questionnaire was composed of scales and domains from questionnaires previously validated in UK populations, such as the von Korff Graded Chronic Pain Scale (Huguet & Miro, 2008; Von Korff et al., 1992). First, adolescents were asked whether they had any aches or pains lasting for one day or longer in the past month, and if so, whether these started within the last three months, or more than three months ago (Mallen et al., 2006). Second, adolescents were asked to indicate, using a manikin with front and back view, **the exact location of** pain(s). Third, adolescents reported their pain intensity in the past **six** months by means of the following question: "*In the past 6 months, on average, how intense was your pain rated on a 1 - 10 scale, where 1 is "no pain"*"

and 10 is "pain as bad as could be"?". Fourth, adolescents indicated how many days they were unable to perform their usual activities due to pain (0-6 days; 7-14 days, 15-30 days or 31 days or more). Finally, adolescents indicated on a scale of 1 to 10 how much their pain had interfered with their daily activities in the last six months (ranging from 1 = no interference to 10 = unable to carry on activities), and whether their pain had altered their ability to take part in recreational, social, and family activities in the last six months (ranging from 1 = no change to 10 = extreme change). A mean score of these two latter items, ranging from 1 to 10, was calculated to reflect the overall level of interference due to pain in a single score. The Cronbach's alpha of these two combined items was .82, indicating a good internal consistency.

2.2.2 Pain-related anxiety

Adolescents completed the Pain Specific Anxiety subscale of the Bath Adolescent Pain Questionnaire (BAPQ; Eccleston et al., 2005). All subscales of the BAPQ have shown a good internal consistency (.80 - .88), temporal stability, and construct validity in outpatient chronic pain and rheumatology samples (Eccleston et al., 2005). The Pain Specific Anxiety subscale consists of seven items regarding specific worries or concerns about pain (e.g., I worry about my pain problem, I am afraid to move due to pain, when I think about my pain, it makes me upset). Adolescents reported how often they encounter these worries or concerns (from 0 = 'Never' to 4 = 'Always') in the last three to six months. The scores on these seven items are summed to create a total score for Pain Specific Anxiety ranging from 0 to 28 with higher scores indicating more pain-related anxiety. The internal consistency in our sample was good ($\alpha = .87$).

2.2.3 Social impairment

The adolescents' perception of their social impairment in the last three to six months was measured by the Self-Perception of Development subscale of the BAPQ (Eccleston et al.,

2005). The Self-Perception of Development subscale consists of 11 items covering important domains in the development of adolescents with chronic or recurrent pain, such as emotional adjustment (e.g., How **I** deal with problems), identity formation (e.g., **My** plans for the future), and independence (e.g., How often I do things without my parents **around**). Adolescents are instructed to *'read each statement carefully and think of each one in relation to other people of your age'*. Answers range from **0-4** (**0** = 'Very behind' to **4** = 'Very ahead'). A total score for self-perception of social impairment is derived by reverse-scoring all items and summing the reversed item scores. The total score ranges from 0 to 44 with higher scores indicating that adolescents perceive themselves as being more socially impaired compared to their peers. The internal consistency in our sample was good ($\alpha = .87$).

2.2.4 Parental social status

Maternal and paternal social status was calculated based on their occupations by using the SOC1990 (Standard Occupational Classifications; Office of Population Censuses and Surveys, 1990). The SOC1990 differentiates four social **statuses** or skill levels. Each level is defined by taking into account the duration of training and/or work experience required to perform the activities related to the occupation in a competent and efficient way. **Higher skill or social level reflects a higher level of required education and /or work-related training or experience**. The levels range from one to four; level one refers to occupations **that require** competence associated with general education (e.g., cleaners and postal workers), whilst level four refers to occupations **that require** a degree or an equivalent period of relevant work experience (e.g., managers and health professionals) (Office of Population Censuses and Surveys, 1990).

2.3 Data-analysis

All hypotheses were investigated in the subsample of adolescents reporting recurrent pain (i.e., adolescents reporting pain in the last month which started more than three months

ago) at 17 years of age. The association between pain-related anxiety and 1) the level of disability (i.e., interference in daily activities due to pain and number of days unable to perform their usual activities) and 2) self-reported social impairment, were investigated by means of **hierarchical** linear regression analyses. Adolescent's sex, pain intensity and parental social status were entered in the first level, adolescent's level of pain-related anxiety in the second level. Furthermore, similar **hierarchical** linear regression analyses were performed separately for boys versus girls to investigate possible sex differences in the associations. **SPSS statistical software, version 21.0 (SPSS Inc., Chicago, IL) was used to perform all analyses.**

3. Results

3.1 Descriptive data

Of the 3974 adolescents who completed the questionnaire, 1824 adolescents reported an experience of pain in the past month (45.90%). For 844 adolescents, this pain started more than three months ago, (defined as recurrent pain; RP; 46.3%), **compared to 965 adolescents who reported that the pain started** less than three months ago (defined as recent or new pain; NP; 396 males; 569 females). Results indicated a higher prevalence of recurrent pain in girls ($N = 553$) compared to boys ($N = 291$). Compared to boys, girls also reported significantly higher levels of pain-related anxiety ($t(836) = -7.15$; $p < .0001$; $M_{girls} = 7.04$; $SD_{girls} = 5.52$; $M_{boys} = 4.39$; $SD_{boys} = 4.16$).

3.1.1 Descriptive data for recurrent pain sample

Table 1 reports the mean scores for pain-related anxiety, disability and social impairment for adolescents reporting recurrent pain. Compared to adolescents reporting recent **or new** pain (i.e., pain started less than 3 months ago), adolescents experiencing recurrent pain reported significantly more 1) pain-related anxiety ($t(1808) = -8.23$, $p < .001$, $M_{NP} = 4.27$, $SD_{NP} = 4.31$) and 2) interference due to pain ($t(1775) = -6.63$, $p < .001$, $M_{NP} =$

2.70, $SD_{NP} = 1.93$). Adolescents with recurrent pain also reported significantly higher pain intensity ($t(1792) = -8.49, p < .001, M_{NP} = 4.04, SD_{NP} = 2.11$). No significant difference was found in the level of perceived social impairment ($t(1807) = 1.76, p = .08, M_{RP} = 16.96, SD_{RP} = 6.50, M_{NP} = 17.49, SD_{NP} = 6.41$) between the recurrent and new pain sample.

Table 1 also presents the means, standard deviations, and ranges of all variables for males versus females within the sample of adolescents reporting recurrent pain. Independent sample t-tests indicated that for all variables girls reported increased pain intensity ($t(830) = 6.11, p < .001$), pain-related anxiety ($t(734) = 7.80, p < .001$), interference due to pain ($t(827) = 3.64, p < .001$), and social impairment ($t(834) = 4.42, p < .001$) compared to boys.

Table 2 reports the percentages of the sample with recurrent pain unable to perform their usual activities over four different durations. A greater proportion of adolescents with recurrent pain reported that they were unable to perform their usual activities for more than 15 days compared to adolescents reporting a new pain experience (3.0%; $\chi^2(2) = 36.02, p < .001$).

- Insert Tables 1 and 2 about here -

An overview of the pain locations indicated by the adolescents who reported recurrent pain can be found in figure 2. The most common pain location reported was back or spine pain ($N = 467, 55.3\%$), followed by pain in the calf, ankle or foot ($N = 296, 35.1\%$), knee pain ($N = 274, 32.5\%$) and shoulder pain ($N = 242, 28.7\%$). The number of pain locations per adolescent ranged from 1 to 11, with the majority of the adolescents reporting pain in two or more locations ($N = 611, 72.4\%$). Adolescents most commonly reported experiencing pain in two locations ($N = 227, 26.9\%$).

- Insert Figure 2 about here -

3.2 Correlations

Correlation analyses in the subsample of adolescents reporting recurrent pain indicated that pain-related anxiety was positively correlated with social impairment ($r_{(826)} = .13, p < .01$) and interference due to pain ($r_{(824)} = .53, p < .01$). Furthermore, the level of perceived social impairment was significantly correlated with paternal social status ($r_{(693)} = -.09, p < .05$), indicating that a higher level of paternal social status was associated with perceiving themselves less socially impaired compared to their peers. There were no significant correlations found with **maternal social status and adolescents' age** (all $r_{(649-842)} < .05, ns$)

3.3 The association between pain-related anxiety and disability

Hierarchical linear regression analysis, conducted in the subsample of adolescents reporting recurrent pain¹ revealed a significant positive contribution ($p < .001$) of both pain-related anxiety and average pain intensity, **respectively explaining 13.8% and 25.1% of the variance in the level of interference. Similar results were found for the number of days adolescents were unable to perform their usual activities, with pain-related anxiety explaining 7.5% variance ($p < .001$) and pain intensity 9.8% ($p < .001$). These results indicate that adolescents with higher levels of pain-related anxiety or pain intensity reported higher interference of daily activities, more change in the ability to take part in activities and a larger number of days in which adolescents are unable to perform their usual activities (see Table 3). Hierarchical linear regression analyses performed for boys versus girls separately revealed similar results for both sexes: pain-related anxiety and pain intensity both showed a significant positive contribution ($p < .001$; $p < .01$ respectively) in explaining the level of**

¹An alternative question to assess chronic or recurrent pain within the questionnaire asked adolescents over what period adolescents experienced the most troublesome pain (less than 7 days, 1-4 weeks, 1-3 months, over 3 months). Based on this question, 283 adolescents reported troublesome pain experienced over three months. The analyses using this sample of adolescents with troublesome chronic or recurrent pain revealed similar results as the selected sample for our analyses. However, we decided to use the sample of 844 adolescents reporting recurrent pain without taking into account how troublesome the pain is, as we wanted our sample to represent a general population of adolescents with recurrent pain and not only **pre-selected** adolescents who are troubled by their experience of pain.

variance in pain-related interference and the number of days adolescents were unable to perform their daily activities (see Table 4 & 5 for more details).

- Insert Table 2 about here -

3.4 The association between pain-related anxiety and social impairment

Results of a hierarchical linear regression showed that adolescents' level of pain-related anxiety was related to their self-perceived social impairment ($p < .001$). However, pain-related anxiety only explained 2.5% of the variance. This finding indicates that adolescents reporting high levels of pain-related anxiety perceive themselves, in comparison to their peers, as more impaired in their social functioning. Adolescents' sex and average pain intensity also contributed significantly ($p < .001$) in explaining perceived social impairment. Together both variables explained 4.7% variance in perceived social impairment (see Table 3). Adolescents with higher levels of pain intensity perceive themselves as more impaired than adolescents who report lower levels of pain intensity. Additional hierarchical linear regression analyses performed separately for boys versus girls revealed that pain-related anxiety and pain intensity only showed a association with social impairment in girls, respectively explaining 4.5% ($p < .001$) and 1.1% of variance ($p < .01$) in perceived social impairment (see Table 5). No associations were found for boys (all $t < 1.79$, *ns*, see Table 4).

- Insert Tables 4 & 5 about here -

4. Discussion

For adolescents reporting recurrent pain, pain-related anxiety was positively associated with their disability (i.e., reported interference due to pain in daily activities and the number of days unable to perform daily activities). Second, adolescents experiencing recurrent pain who reported high levels of pain-related anxiety perceived themselves as more socially impaired compared to their peers. However, separate analyses for boys versus girls

revealed that the association between pain-related anxiety and perceived social impairments was only significant for girls.

Of further interest, in line with previous research (King et al., 2011), half of our sample reported an experience of pain in the past six months and about half of those (i.e., a quarter of the entire sample) experienced recurrent pain. The most common pain locations in the sample of adolescents with recurrent pain were back or spine, lower leg and foot, then knee and shoulder. The majority of adolescents with recurrent pain also reported pain in multiple locations. Unsurprisingly, adolescents with recurrent pain reported higher levels of pain-related anxiety and were more disabled by their pain compared to adolescents experiencing recent pain episodes. Furthermore, higher levels of pain intensity were associated with less preferable outcomes (i.e., higher levels of pain-related anxiety, disability and perceived social impairment). The sample of adolescents experiencing recurrent pain was comprised of almost twice as many girls than boys. Moreover, girls with recurrent pain reported more pain intensity, pain-related anxiety and disability, and perceived themselves as more impaired in their social functioning, compared to adolescent boys with recurrent pain (Huguet & Miro, 2008; King et al., 2011; Lewinsohn et al., 1997).

To the best of our knowledge, this is the first study investigating the role of pain-related anxiety in explaining pain-related disability, (i.e., one of the main propositions of the fear-avoidance model) within a large community-based sample of adolescents. In accordance with recent findings by Simons & Kaczynski (2012), who investigated the FAM in highly disabled paediatric chronic pain patients, our results further attest to the applicability of the fear-avoidance model in a large paediatric population cohort. Specifically, the results indicate that pain-related anxiety not only contributes independently to disability in highly disabled adolescents, but can also account for various levels of disability found in community samples who are not seeking medical attention for their pain. The FAM was originally developed to

explain the development and maintenance of chronic musculoskeletal pain, in particular back pain in adults (Leeuw et al., 2007; Vlaeyen & Linton, 2000) and has recently been shown to be functional in understanding the level of disability in various paediatric pain samples (e.g., Simons & Kaczynski, 2012 and Cook, Brawer, Vowles, 2006). Furthermore, as most adolescents in this sample experienced pain in multiple locations, our findings provide support for the generalisation of the role of pain-related anxiety within a variety of pain conditions, including widespread pain. It is worth noting that the pattern of primary pain complaints differs in this sample from other community epidemiology studies. Our sample appears to under-represent headache and over-represent musculoskeletal pain. This variability between studies is not unusual and is probably due to method variance (King et al., 2011). Nonetheless, it will be important to test for replication of these findings in specific pain populations.

Additionally, although the results are preliminary and replication is important, our findings suggest that pain-related anxiety may also play a role in the adolescent's perceived social impairment. However, caution is needed when interpreting this finding as pain-related anxiety only explained a small percentage of the variance and this association was only prevalent in the subsample of girls. Adolescence is a period of childhood characterised by rapid social, psychological and physical maturation in which peers and social networks play a crucial role. Previous research has indicated that challenges, such as the experience of chronic or recurrent pain, can hamper this development by critically changing the social environment of adolescents (e.g., increased social isolation due to lower capability of participating in school, social and leisure activities; Eccleston et al., 2008; Gauntlett-Gilbert & Eccleston, 2007; Logan et al., 2008). In line with the FAM, our results suggest that this might be particularly the case for adolescents who are highly anxious with regard to their pain experience. Previous findings indicate that adolescent girls, compared to boys, tend to

worry more about having dyadic friendships, peer evaluation and social approval (Rose & Rudolph, 2006), **which** might explain why the association between pain-related anxiety and perceived social impairment is particularly prevalent in girls. As social functioning is an important aspect of adolescents' development, recognition of the role of pain-related anxiety on developmental processes might be a crucial extension when applying the fear-avoidance model to adolescents.

The treatment of pain-related anxiety may be more important than first thought. Specifically, pain-related anxiety plays **an independent** role in explaining the level of disability and, particularly for girls, social impairment perceived by the adolescent. Focusing only on reduction of adolescent pain intensity might not be sufficient to improve function (Simons et al., 2012). Furthermore, adolescents **with higher levels of both pain severity and maladaptive psychological characteristics, such as negative affect and catastrophic thinking,** are at risk of persistent pain and disability throughout adulthood (Walker et al., 2012). **The early detection of pain-related anxiety and early intervention of anxiety are likely to improve immediate pain-related outcomes and may be potentially protective of longer-term outcomes.**

This study is limited to an investigation of associations in this large cohort. Although a large community-based sample has the advantage of more accurately representing the target population, caution needs to be taken when interpreting significant findings. Our effect sizes are moderate to small, **in particular with respect to explaining social impairment,** thereby potentially limiting the clinical significance of the results and indicating that other factors are likely to play a role in how adolescents perceive their social **functioning (e.g., depression; Eccleston et al., 2008, attachment; Bohlin et al., 2000, family environment; O'Brien et al., 2006, and peer relations; Kashikar-Zuck et al., 2007).** In addition, a previous article using the clinic data at 17 of the ALSPAC study showed that obesity was associated with severe musculoskeletal pain (Deere et al., 2012), **highlighting the importance of obesity in**

explaining the level of pain-related disability. Furthermore, the overall reported level of pain-related anxiety was low and our sample consisted predominantly of girls of 17-18 years of age. Second, the associations are based on cross-sectional data only, because there were no earlier measures on these concepts included in ALSPAC. Therefore the data do not allow us to make any conclusion regarding causality, for which a longitudinal approach is required. Third, no data on adolescent's objective social impairment were available. Although adolescents' perceived pain-related social impairment might have crucial implications on their functioning, future research is needed to investigate and replicate our findings with other measures of development, such as educational attainment, social competence, social emotional development, etc. Finally, although our sample was drawn from a community population and not from a clinic population, we did not ask the adolescents whether they were currently seeking medical attention for their pain and therefore cannot be sure whether or not they were enrolled in treatment.

In conclusion, in accordance with the assumptions of the fear-avoidance model, this large cohort study of adolescents with recurrent pain revealed that pain-related anxiety is important in understanding the level of disability. Moreover, the findings suggest that for girls, pain-related anxiety is also important in explaining judgments these adolescents make about their social functioning compared to their peers.

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Author Contributions

All authors discussed the results and commented on the manuscript. Specifically, Dr. Line Caes, first author, took the lead in formulation the hypotheses, performing the analyses and drafting the manuscript. Emma Fisher contributed to the formulation of the hypotheses and performing the analyses and discussing the results. She also provided considerable feedback on the manuscript. Dr. Jacqui Clinch and Dr. Jonathan Tobias were involved by discussing the results and providing considerable feedback on the manuscript. Dr. Christopher Eccleston was involved with the formulation of the hypotheses, discussing the results and providing considerable feedback and comments on the manuscript.

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Legend for illustrations and tables

Figure 1. Overview of recruitment process

Figure 2. Percentages of reported pain locations in adolescents with recurrent pain.

Table 1 Means, (*M*) standard deviations (*SD*) and range statistics of pain intensity, pain-related anxiety, disability and social impairment in adolescents reporting recurrent pain (*N* = 844; 291 boys and 553 girls).

Table 2. Percentages of the sample with recurrent pain reporting the number of days they were 'unable to perform usual activities' (*N* = 844; 291 boys and 553 girls).

Table 3. Hierarchical regression analysis of factors associated with adolescent level of interference, number of days unable to perform usual activities, and perceived social impairment.

Table 4. Hierarchical regression analysis of factors associated with adolescent level of interference, number of days unable to perform usual activities, and perceived social impairment for boys only (*N* = 291).

Table 5. Hierarchical regression analysis of factors associated with adolescent level of interference, number of days unable to perform usual activities, and perceived social impairment for girls only (*N* = 553).

Table 1

Means, (*M*) standard deviations (*SD*) and range statistics of pain intensity, pain-related anxiety, disability and social impairment in adolescents reporting recurrent pain (*N* = 844; 291 boys and 553 girls).

	M	SD	range
Pain intensity	4.90	2.14	1-10
Male	4.29	2.01	1-10
Female	5.22	2.13	1-10
Pain-related anxiety	6.13	5.25	0-27
Male	4.39	4.16	0-19
Female	7.04	5.52	0-27
Interference due to pain	3.37	2.31	1-10
Male	2.96	2.18	1-10
Female	3.58	2.35	1-10
Social impairment	16.96	6.52	0-41
Male	15.60	6.46	0-41
Female	17.68	6.44	1-36

Table 2

Percentages of the sample with recurrent pain reporting the number of days they were 'unable to perform usual activities' ($N = 844$; 291 boys and 553 girls).

	< 6 days	7-14 days	15-30 days	> 31 days
Total	81.1	9.4	4.9	4.6
Male	88.8	4.6	2.5	4.2
Female	77.1	11.9	6.2	4.8

Table 3

Hierarchical regression analysis of factors associated with adolescent level of interference, number of days unable to perform usual activities, and perceived social impairment.

Standardized beta coefficients from the last step in the analyses are displayed.

Criterion variable	Step	Predictor	Beta	ΔR^2	Adj. R
Level of interference	1	Adolescents' sex	-.037		
		Maternal social status	-.029		
		Paternal social status	-.053		
		Average intensity of pain	.349***	.251**	.246**
Number of days unable to perform usual activities	2	Pain-related anxiety	.411***	.138***	.385***
	1	Adolescents' sex	-.028		
Maternal social status		.004			
Paternal social status		.030			
Average intensity of pain		.193***	.098***	.092***	
Perceived pain-related social impairment	2	Pain-related anxiety	.302***	.075***	.166***
	1	Adolescents' sex	.170***		
Maternal social status		-.001			
Paternal social status		-.065 [†]			
Average intensity of pain		-.165***	.047***	.041***	
	2	Pain-related anxiety	.175***	.025**	.065**

** $p < .01$; *** $p < .001$. Acceptable range of VIF scores (1.07-1.24).

Table 4

Hierarchical regression analysis of factors associated with adolescent level of interference, number of days unable to perform usual activities, and perceived social impairment for boys only ($N = 291$).

Standardized beta coefficients from the last step in the analyses are displayed.

Criterion variable	Step	Predictor	Beta	ΔR^2	Adj. R	
Level of interference	1	Maternal social status	.077			
		Paternal social status	-.069			
		Average intensity of pain	.328***	.221***	.210***	
Number of days unable to perform usual activities	2	Pain-related anxiety	.357***	.111***	.319***	
		1	Maternal social status	.111		
			Paternal social status	-.023		
Average intensity of pain	.228**		.116***	.104***		
Perceived pain-related social impairment	2	Pain-related anxiety	.235***	.048***	.148***	
		1	Maternal social status	-.009		
			Paternal social status	-.122 [†]		
Average intensity of pain	-.128		.032	.019		
	2	Pain-related anxiety	.047	.002	.017	

[†] $p = .08$; ** $p < .01$; *** $p < .001$. Acceptable range of VIF scores (1.10-1.18).

Table 5

Hierarchical regression analysis of factors associated with adolescent level of interference, number of days unable to perform usual activities, and perceived social impairment for girls only ($N = 553$).

Standardized beta coefficients from the last step in the analyses are displayed.

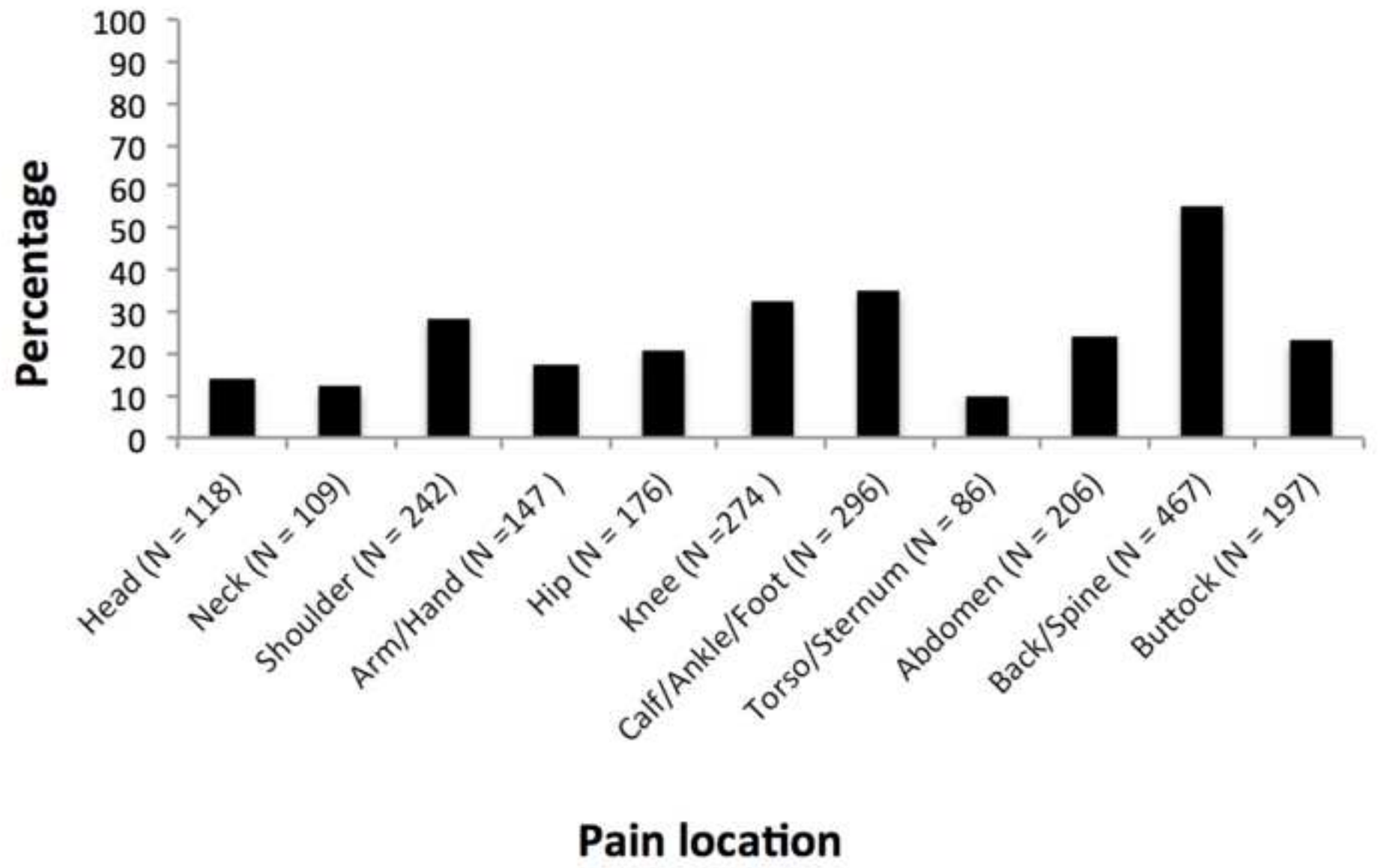
Criterion variable	Step	Predictor	Beta	ΔR^2	Adj. R	
Level of interference	1	Maternal social status	-.083*			
		Paternal social status	-.043			
		Average intensity of pain	.355***	.256***	.250***	
Number of days unable to perform usual activities	2	Pain-related anxiety	.426***	.156***	.406***	
		1	Maternal social status	-.050		
			Paternal social status	.059		
Average intensity of pain	.172**		.089***	.082***		
Perceived pain-related social impairment	2	Pain-related anxiety	.324***	.090***	.171***	
		1	Maternal social status	.000		
			Paternal social status	-.037		
Average intensity of pain	-.180**		.011	.004		
	2	Pain-related anxiety	.228***	.045	.046	

* $p < .05$; ** $p < .01$; *** $p < .001$. Acceptable range of VIF scores (1.13-1.20).

Figure 1
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Figure 2
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