BACK PAIN AMONGST SCHOOLCHILDREN AND ASSOCIATED RISK FACTORS

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This study set out to identify the role of ergonomic and other factors in new episodes of disabling back pain in schoolchildren and to develop methods to access potential risk factors of schoolchildren and evaluate their relationship with subsequent symptomology. It has been shown that a strong predictor of having future back pain is a previous history of such symptoms. The self-report questionnaire ascertained demographic characteristics, back pain history, school and leisure activities, school bag and furniture details, common childhood complaints and psychological factors. The prevalence of back pain was ascertained using a body map. Descriptive results are presented then the results of a multivariate analysis are presented and discussed.

Introduction

This study set out to identify the role of ergonomic and other factors in episodes of disabling back pain in schoolchildren and to access potential risk factors of schoolchildren and evaluate their relationship with subsequent symptomology. It has been shown that a strong predictor of having future back pain is a previous history of such symptoms (Troup et al 1987). A large portion of adults suffers report a first onset of back pain in their early teenage years or in their twenties (Papageorgiou et al 1996). Recent studies have highlighted the high prevalence of back pain that exists among schoolchildren (Burton et al 1996; Mikkelsson et al 1997; Watson et al 2002; Murphy 2003). Several authors have reported a relationship between back pain and school bag weight (Viry et al 1999; Grimmer & Williams, 2000; Whittfield et al 2001). A greater understanding of the risk factors associated with the onset of spinal pain is important before well targeted preventative action can be taken with the aim of controlling and/or reducing back pain amongst children.

Methods

Twelve schools in Surrey, England took part in a cross-sectional survey. A self-report questionnaire (Watson et al 2002; Murphy 2003) ascertained demographic characteristics, back pain history, school and leisure activities, school bag and furniture, common childhood complaints and psychological factors. The prevalence of back pain in the last seven days and last month was established using a body map (Kuorinka et al 1987). Children were measured for height and weight. The weight of the school bag was also measured. Details regarding school furniture were ascertained by the Chair Feature Checklist (Shackel et al 1969), which provided information about furniture suitability and comfort. The checklist had previously been modified for use of children age 11-14 years (Murphy 2003). Common childhood complaints were considered by asking children how many days in the last month they had suffered from headache, stomachache and sore throats. Psychosocial factors were assessed using the Strengths and Difficulties Questionnaire (SDQ) (Goodman 1997), which provided coverage of young people's behaviours, emotions and relationships. The SDQ questions provided scores on hyperactivity, emotional symptoms, conduct problems, peer problems and pro-social scales. Recoding of the posture of children (sub-sample of n=66). in real time in the classroom was made using the Portable Ergonomic Observation method (Fransson-Hall et al 1995) and developed for use in the classroom by Murphy et al (2003).

Results

Six hundred and seventy nine responded (response rate 97%) with 343 males and 336 females. The mean age was 12.8 (SD 0.9). The mean body mass index was 19 (SD 3.38).

Neck, upper back and low back pain (see table 1). Most of those with neck pain rated the pain as medium, 24% with 13% of children in a lot of pain when at it's worst. Almost 30% of children had upper back pain in the last month and 17 % had upper back pain in the last week. Just over 30% of children had low back pain in the last month and 20% had low back pain in the last week. Approximately 22% reported low back pain for 1 day or more in the last month (table 1). Almost 12% reported medium pain and 8% reported a lot of pain when at it's worst.

Table 1. Spinal pain

Neck pain	N	%
Last month	311	49
Last week	153	23
1 day or more	181	27
Upper back pain	**N**	**%**
Last month	201	30
Last week	115	17
1 day or more	119	18
Low back pain	**N**	**%**
Last month	247	36
Last week	135	20
1 day or more	149	22
Ever	372	55

History of low back pain. Sixty percent of children had a family member who suffered from low back pain Mother 20%, Father 21% and Mother and Father 9%. Twenty three percent reported experiencing a previous injury to their lower back. More than half of the children reported having low back pain at some stage prior to the study.

PEO observations. A sub-sample of children (n=66) had their sitting postures monitored in real time in normal lessons. The results of the PEO observations are reported in detail elsewhere (Murphy et al 2003). To summarise the following variables were found to be significantly associated with musculoskeletal pain in the last week and month. Static posture was significantly associated with neck pain in the last week and upper back pain in the last week and month. Long lesson length was significantly associated with low back pain reported in the last month. Flexed trunk posture and flexed neck posture were both significantly associated with low back pain in the last week. A high percentage of time spent working at the desk, which, occurred when the trunk was flexed, was also significantly associated with low back pain in the last week.

Statistical analysis. The outcome definition used for multivariate analysis was low back pain (in a specific area identified on a pain drawing) lasting one day or more. This definition was also used for neck and upper back pain. The definition of a back pain "case" was that used by the University of Manchester (Papageorgiou et al 1995 and Watson et al 2002) to examine existing pain. Finally children were asked if they had ever experienced low back pain. Variables that achieved significance levels of ($p<0.05$) in univariate analysis (controlling for age and gender) were entered into each of the multivariate models to establish factors that were independently associated with each area of pain. Logistic regression was used to access the relationship between one dependent variable and several independent variables. The study was cross-sectional and therefore may identify associations but not causality between exposure and disease

Neck pain. Chair height too low was associated with double the reporting of neck pain. Headache 1 – 2 days in the last month was associated with more than double the reporting and headache 3 – 31 days in the last month was associated with more than a threefold increase in reporting. Having a family member with low back pain was associated with an increased reporting of approximately 60% and having had treatment for a musculoskeletal disorder was associated with double reporting of neck pain (table 3).

Table 3. Neck pain and associated factors

Variable	P – value	OR	CI (95%)
Chair height			
Correct	Reference:		
Don't know	0.09	1.47	0.94 – 2.32
Too low	0.004**	2.02	1.26 – 3.26
Too high	0.12	2.04	0.82 – 5.08
Headache			
0 days	Reference:		
1 – 2 days	0.001**	2.4	1.44 – 4.02
3 – 31 days	0.000**	3.4	2.05 – 5.64
Family with LBP	0.01**	1.65	1.13 – 2.41
Treatment	0.000**	2.07	1.41 – 3.04

Upper back pain. A bag weight of between 3.4 and 4.45 kg on the day of the study was associated with double the reporting of upper back pain. Sometimes experiencing difficulties with homework more than a threefold increase in reporting and those who did experience difficulties had more than a fivefold increase in reporting upper back pain. Twisting the back for more than 10 minutes during the lesson was associated with double the reporting. Chair high too low was associated with double the reporting. Headache 1 – 2 days in the last month was associated with approximately a threefold increase in the reporting and headache 3 – 31 days in the last month was associated with approximately a fivefold increase in the reporting. Having previous treatment for a musculoskeletal disorder was associated with more than double the reporting of upper back pain (table 4).

Table 4. Upper back pain

Variable	P – value	OR	CI (95%)
Bag weight kg			
0 – 1.8	Reference:		
1.9 – 2.5	0.9	1.04	0.5 – 2.1
2.56 – 3.3	0.42	0.74	0.4 – 1.5
3.4 – 4.45	0.02*	2.23	1.2 – 4.3
4.46 – 9.35	0.65	1.18	0.6 – 2.3

Homework dif			
No	Reference:		
Sometimes	0.003**	3.48	1.5 – 8.0
Yes	0.008**	4.28	1.5 – 12.5
Twist back			
No	Reference:		
0 – 10 minutes	0.01	1.56	0.9 – 2.6
10 minutes +	0.005**	2.2	1.3 – 3.8
Chair height			
Correct	Reference:		
Don't know	0.08	1.63	0.95 – 2.8
Too low	0.01*	1.99	1.12 – 3.5
Too high	0.55	0.66	0.17 – 2.5
Headache			
0 days	Reference:		
1 – 2 days	0.004**	2.92	1.42 – 6.0
3 – 31 days	0.000**	5.24	2.6 – 10.5
Treatment (MSDs)	0.000**	2.38	1.5 – 3.7

Low back pain. Twisting the back for more than 10 minutes during the lesson was associated with an increased reporting of low back pain of approximately 90%. Chair height too low was associated with double the reporting. Backrest too high was associated with a fivefold increase in reporting. Headache 3 – 31 days in the last month was associated with approximately a threefold increase in the reporting. Having stomach ache 1 – 2 days in the last month associated with an increased reporting of 80% and having stomach ache 3 – 31 days in the last month was associated with double the reporting. Having a previous accident involving any body part was associated with double the reporting of low back pain (table 5).

Table 5. Low back pain

Variable	P – value	OR	CI (95%)
Twist back			
No	Reference:		
0-10 minutes	0.96	0.99	0.61-1.59
10 minutes +	0.01*	1.86	1.15-3.0
Chair height			
Correct	Reference:		
Don't know	0.14	1.48	0.88-2.5
Too low	0.005**	2.18	1.26-3.77
Too high	0.53	0.7	0.22-2.17
Backrest position			
Correct	Reference:		
Don't know	0.38	1.26	0.67-2.14
Too low	0.25	1.35	0.81-2.26
Too high	0.000**	5.06	2.06-12.41
Headache			
0 days	Reference:		
1-2 days	0.03*	1.8	1.07-3.02
3-31 days	0.01*	2.03	1.17-3.52
Accident	0.006**	2.05	1.23-3.42

Low back pain ever. Twisting the back for 0-10 minutes during the lesson was associated with an increased reporting of approximately 60% and twisting the back for more than 10 minutes during the lesson was associated with an increased reporting of low back pain of approximately 90%. Backrest position too low, headache 1-2 days in the last month an abnormal score on the Emotion questions were all associated with an increased reporting of 70% and headache 3-31 days in the last month was associated with approximately a threefold increase in the reporting. Sore throat 1-2 days in the last month was associated with double the reporting and sore throat 3-31 days in the last month was associated with an increased reporting of approximately 80%. Again older children had an increased reporting of 50% and having a family member with low back pain was associated with an increased reporting of approximately 60%. Having a low back injury was associated with more than double the reporting of low back pain (table 6).

Table 6. Low back pain ever

Variable	P – value	OR	CI (95%)
Twist back			
No	Reference:		
0-10 minutes	0.03*	1.56	1.01-2.31
10 minutes +	0.006**	1.89	1.2-2.98
Backrest position			
Correct	Reference:		
Don't know	0.89	1.03	0.68-1.57
Too low	0.01*	1.73	1.12-2.69
Too high	0.09	2.22	0.88-5.57
Emotion			
Normal	Reference:		
Borderline	0.76	1.07	0.7-1.64
Abnormal	0.02*	1.65	1.09-2.52
Headache			
0 days	Reference:		
1-2 days	0.01*	1.72	1.12-2.65
3-31 days	0.000**	2.81	1.76-4.5
Sore throat			
0 days	Reference:		
1-2 days	0.001**	2.11	1.35-3.3
3-31 days	0.01*	1.77	1.13-2.76
Age	0.000**	1.51	1.24-1.83
Family with LBP	0.01*	1.57	1.1-2.22
Low back injury	0.000**	2.34	1.53-3.59

Discussion

The strongest association in this cross-sectional survey was observed between neck, upper back and low back pain and common childhood complaints, namely headaches and sore throat. Jones et al (2003) recently concluded that the reporting of back symptoms was related to childhood somatic symptoms. Mikkelsson et al (1997) found that 30.5% of children in their study reported headache at least once a week compared with 54% of children who also reported musculoskeletal pain, while Brattberg & Wickman (1992) found pupils with back pain and headache reported more stomach ache than those who had no such symptoms. This suggests that factors influencing the reporting of pain symptoms among children needs to be thoroughly understood when interpreting the issues surrounding back pain. The present study found that further relationships existed between back pain and emotional symptoms. Balague et al (1995) found psychological factors to be significantly associated with reported non-specific low back pain and the medical care sought for it. Psychological variables were strongly associated with low back pain in the last week and month (Murphy 2003) suggesting that psychological variables may have an influence at the onset of pain.

Of the physical factors assessed in this study, characteristics of the school furniture were found to have the strongest relationship with pain. Chair height, backrest height and backrest position were all associated with pain. Children may have to adopt flexed or static postures for prolonged periods increasing muscular fatigue in the neck and back. Chair height was significantly associated with pain at all three spinal areas suggesting that children have problems with the height of school chairs. Salminen et al (1992) reported similar findings and surmised that a low school desk placed the back into a forward leaning position and thus under load, which could be a possible contributing factor to low back pain. Parcells et al (1999) made the observation that the variability that exists among pre-adolescent aged children means it is very unlikely that furniture of fixed dimension will fit the majority of students. In addition to the potential anthropometric mismatch, it is possible that children do not use the furniture in the way it was designed to be used. The observations of children using PEO showed that they rarely used the backrest of the chair (Murphy et al 2003). Storr-Paulsen and Aagaard-Henson (1994) found that children spent only half of their time spent sitting making use of the backrest. It is possible that the chair design encourages the adoption of compromised posture or else behavioural issues influence the way in which the chair is used.

While several authors have reported a relationship between back pain and school bag weight (Viry et al 1999; Grimmer & Williams, 2000) the findings in this study were inconclusive. There was a significant relationship between having a medium weight school bag and upper back pain. Interestingly, it is worth noting that most of the children carrying the heaviest bags went to schools that performed well in Government performance league tables. There was no significant relationship between activity and pain although other studies have found such relationships. While the benefits of exercise are clear the literature recommends exercising some caution to prevent the growing spine from being over exposed to excessive loads. Children who had a family with low back pain reported significantly more neck pain and low back pain ever. Children who had had treatment for musculoskeletal pain regardless of the area treated reported more neck and upper back pain.

Future research must attempt to better understand psychological and familial risk factors, and interactions that may exist between them to ascertain their relative importance and predictive ability. While it may be possible to influence physical risk factors in the school environment, it is important that psychological factors are also included in a preventative strategy aimed at reducing the occurrence of back pain amongst school children. There are also serious implications for the future workforce with many young adults entering the workplace with neck and back pain already present.

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