

# **Students' Musculoskeletal and Visual Concerns**

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## **INTRODUCTION**

Musculoskeletal and visual concerns among children and adolescents are common. The World Health Organization [1] found in their cross-national research study that backache, at least once a week, is reported by 30% of 11 year olds, 33% and 30% of 13 year old girls and boy's respectively and 43% and 33% of 15 year old girls and boys respectively in the United States. Epidemiological studies conducted in the last 15 years, mostly in Europe, reveal that neck, shoulder and especially back pains are as common in children and adolescents as in adults [2-4]. The American Public Health Association [5] states that 25% of children between K-6<sup>th</sup> grades have vision problems many of which can be corrected if detected early enough. Recognizing not only the presence but also the intensity and frequency of these musculoskeletal and visual concerns and defining their risk factors could improve our understanding of the origin of musculoskeletal and visual concerns in adults [6, 7]. This insight could also help us develop better strategies to prevent risk factors from having an impact already at a young age [8-11].

## **EPIDEMIOLOGICAL DATA**

The prevalence data in epidemiological studies varies greatly [2, 12] due to:

- Differences in type of incidence<sup>1</sup> and prevalence<sup>2</sup> measures used
- If they are cross sectional, cohort, or longitudinal studies
- Type of questionnaire administered and phrasing of the questions
- Use of physical examination in addition to a questionnaire
- Use of control groups
- Definitions of back pain.

Reports of lifetime prevalence of back pain in 9–17 year olds range between 30–59% [13-24]. Longitudinal studies show that a rapid increase in back pain occurs in early adolescence between the ages 12–16 [7, 25, 26]. Burton [21] found that the annual incidence of low back pain almost doubled between the ages 11-15. At around 20 years of age the incidence rate levels off and remains fairly constant into the 40s [26].

There are fewer epidemiological studies of children's and adolescents' neck and shoulder pain [4, 27-29]. Six percent of third and fifth graders had experienced neck pain in the previous 3 months

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<sup>1</sup> Incidence is the proportion of a population that develop pain in a defined area for the first time during a given time period

<sup>2</sup> Lifetime prevalence is the proportion of a population that have experienced pain by the age the study is conducted; point prevalence is the proportion of a population who are experiencing symptoms within a well defined time period

[29]. Among adolescents, 12-16 years of age, the cumulative annual incidence is 28.4% [28] and among 12-18 years olds 50% report occasional symptoms of neck and upper limb pain with 20% of girls and 10% of boys having recurrent chronic pain [4]. Epidemiological studies of children's and adolescents' arm, wrist, and hands have not been found.

The prevalence rates of visual concerns in children include several visual disorders that all are critical to detect early. In this paper only prevalence of myopia is addressed due to space constraints. Epidemiological studies from Japan [30], Greece [31] China [32] and Taiwan [33] find prevalence rates of 20% for 7 years olds, 43-61% in 12 year olds, 36% - 84% in 15-18 year olds. One study [30] found an increase in incidence rates between 1984 and 1996.

## **RISK FACTORS**

There are indications that back, neck and shoulder pain in childhood and adolescence are important risk factors for the development of musculoskeletal disorders in adulthood [7, 26, 34-38]. The risk factors for children's and adolescents' back, neck, and shoulder pain, reported in the cited studies, are presented in Table 1. Each risk factor is associated with back pain and a few also with neck and shoulder pain. The risk factors listed are very similar to those reported for adults [3].

Carrying a heavy back pack should also be added to this list of risk factors since it has recently been found to contribute to children's and adolescents' back pain [40-46].

Risk factors associated with the development of myopia are both hereditary and extended time performing short viewing distance work such as reading and writing and other near work.

## **MUSCULOSKELETAL AND VISUAL CONCERNS DURING COMPUTER USE**

One important risk factor for adults not included in child and adolescent epidemiological studies is students' computer use. Since the introduction of computers in homes, schools, and colleges there has been a growing concern that extended computer work will place young computer users at risk for developing cumulative musculoskeletal disorders and computer vision syndrome. Studies conducted in elementary and middle schools, and in colleges, have discovered that students do experience musculoskeletal and visual discomfort during computer use similar to that reported by adults [47-52]. Table 2 summarizes the methodology used, type of questions asked and percent of students reporting discomfort in various areas of the body. Jacobs [47], Harris [49], and Williams [50] also found that discomfort was associated with time of continuous computer work and use of workstations that do not meet students postural and visual needs. These conditions are two of the well established risk factors for musculoskeletal and vision concerns in adults [3, 53-55].

**Table 1. Risk factors for back, neck and shoulder pain in childhood and adolescence (adapted from material presented in Balague 1999)**

<b>Risk Factors</b>	<b>Type of risk</b>
<b>Individual Factors:</b>	
Age	Sharpest increase in pain between 12-15 years of age
Gender	Females report more frequent and more severe pain in most studies
Anthropometric parameters such as weight, height, body mass index (BMI)	Growth rate (i.e. growth spurts) BMI > 25kg /m <sup>2</sup> (not a risk factors in all studies)
Mobility and flexibility of the spine	Decrease mobility of hips and knees Decreased extension of lumbar spine Decreased flexibility of the posterior muscles of the thigh Tight hamstring Decreased flexibility of the quadriceps (not a risk factors in all studies)
Disc degeneration	Disc degeneration soon after rapid physical growth
<b>Activity level factors</b>	
Posture	More studies need to define postures association with back pain, possible factors are: Thoracic kyphosis Hyperlordosis Weakness of abdominal muscles Sitting on the edge of a chair
Physical activity level	Low physical activity < 2 days a week High competitive sports activity
Television viewing	> 1 hour / day ; >2 hours / day
Video game playing	> 2 hours / day
Instrument playing	Intense piano, violin playing /practicing ( not a risk factor in all studies all studies)
After school work	Physically demanding after school work tasks
<b>Psychosocial factors:</b>	
Family history and heredity	Parents coping with musculoskeletal symptoms Parents physical predisposition
Psychological factors	Low mental health score Depression Sleeplessness Hyperactivity Aggressiveness Stress
<b>Health behaviors:</b>	
Smoking	Smoking

## DISCUSSION AND/OR CONCLUSIONS

Students' musculoskeletal and visual concerns are similar to adults'. The prevalence rates are comparable and the underlying risk factors are nearly alike. Only the presence of these concerns has been addressed here. How intense the pain is and how often it occurs should also be explored to fully comprehend the consequences it has on students' quality of life. In addition, since unresolved visual concerns can affect postures [56] visions role in the development of musculoskeletal concerns in children and adolescents needs to be better understood.

**Table 2. Student population studied, methodology, question asked, percent reported discomfort per body area**

Reference	Population	Methodology	Type of question	Area of body and percent
Jacobs (2002)	N=152 6 <sup>th</sup> grade	Musculoskeletal Disorder Questionnaire to students	Discomfort experienced in the last year and intensity mild, moderate, severe (data in parenthesis show only if pain was present). Did computer use make that discomfort worse	Neck (33%) 11 % Shoulders (16%) 3% Back (25%) 8% Elbow (9%) 4% Wrist/Hand (20%) 10%
Williams et al (2000)	N=218 Elementary school teachers K - 6	Questionnaire to elementary school teachers	Have you ever heard a student complain about discomfort in any of the areas listed below during any of the years you have worked with students using computers? Do you have special concerns (data in parenthesis)	Eyes 19% (56%) Neck 8% (47%) Shoulders 5% Back 7% Arms 9% (40%) Hands/wrists 18%
Harris and Straker (2000)	N= 314 Ages 10-17  (laptop computers)	Questionnaire to students  Body Map	Discomfort during use of laptop	Head 10-20% Neck >38% Shoulder 10-20% Back 20-38% Forearms 5-10% Hands 20-38%
Ladrigan et al (1999)	N=191 Undergraduates	Questionnaire to students	Have you experienced discomfort while using a computer in any of the areas listed below	Eyes 60% Upper extremities: 72%
Katz et al (2000)	N=1544 Senior undergraduates	Questionnaire to students	Do you experience pain, numbness, tingling or other discomfort in your hands, wrists or arms when you use a computer? Response alternatives: Never Yes if I use the computer for several hours Yes if I use the computer for an hour or so Yes even if I just use the computer for a few minutes Yes with virtually all activities	Hands, wrists, arms  Responses, % of students: 47%  41%  6.9%  3.2%  2.5%

Since childhood back, neck and shoulder pain is a predictor of adulthood back, neck, and shoulder pain we need to address the risk factors at an early age in order to reduce the probability that pain and risk behaviors become permanent. Similarly, visual concerns must be addressed at an early age to prevent damage to the visual system. All risk factors cannot be eliminated or prevented. However, awareness of the effects of a few might make a difference.

If musculoskeletal discomfort during computer use is a predictor of adults' computer related musculoskeletal disorders then students need to learn how to protect themselves from injury as they start using a computer. Also, if a common risk behavior in adults: poor seated postures for extended periods of time, becomes a well-established habit at an early age, it is difficult to break it in adulthood. A seated posture does not only depend on workstation and task design but also on an individual's sitting habits.

Work performance are seriously affected by musculoskeletal and visual concerns in adults, we do not know their effect on students' school performance. How children and adolescents cope with discomfort and pain might be very different from adults coping behaviors.

Cardon [10] have shown that a back prevention program in elementary school is effective in teaching back care principles. We need similar programs educating students in ergonomic principles also. We could start such an approach already when students are using computers. Hopefully, such a program would result in students reflexively adjusting their workstations, not necessarily with expensive equipment, to fit them well to ensure they can use healthy postures and sound work habits.

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