

A STATE-WIDE SURVEY OF SOUTH AUSTRALIAN SECONDARY SCHOOLS TO DETERMINE THE CURRENT EMPHASIS ON ERGONOMICS AND COMPUTER USE

Janet Sawyer

*Business and Regional Enterprise Unit
Centre for Regional Engagement*

Joy Penman

*Nursing and Rural Health Unit
Centre for Regional Engagement*

(University of South Australia)

ABSTRACT

This study investigated the pattern of teaching of healthy computing skills to high school students in South Australia. A survey approach was used to collect data, specifically to determine the emphasis placed by schools on ergonomics that relate to computer use. Participating schools were recruited through the Department for Education and Child Development offices.

A 17-item questionnaire was administered to 15 regional and 15 city-based, public-sector high schools. The questionnaire covered areas including the awareness of the principles of ergonomics, existence of a written policy on procedures relating to ergonomics and computer use, inclusion of content in the curriculum relating to ergonomics, scale of priority placed on ergonomics and computer use, and reports of computer-related complaints of pain or discomfort.

Responses were received from ten (67%) regional and five (33%) city/metropolitan South Australian high schools. The highlights of the survey were: 93% of those surveyed were aware about ergonomics and computer use, 73% did not have a written policy on procedures related to ergonomics and computer use; 60% replied that their curriculum did include content in relation to ergonomics and computer use, 66% thought ergonomic principles relating to computer use were not being given sufficient priority in their school, and 73% received no reports of computer-related complaints of pain or discomfort. The implications of the study in relation to computer practice and educational preparation of school students will be discussed in the paper.

INTRODUCTION

Today's information and communication technologies (ICT) have been shown to enhance the quality of teaching and allow students greater accessibility to information, flexibility and interaction with other students. The use of computers has revolutionised how students learn and communicate. Society today has become computerised and all students are increasingly pressured to become computer literate and take up the technology to their advantage.

However, it is generally acknowledged that computer use for prolonged periods of time may result in visual, musculoskeletal and psychological problems. The application of principles of ergonomics to computer work can reduce these health risks and increase productivity. In a world of computerisation, the awareness, knowledge and priority given to this important technological consideration will prove advantageous for the schools and the students. The secondary students need to learn the principles of ergonomic early on to prevent future health problems. Current literature indicates that the application of the principles of ergonomics in the computer use of secondary students has not been given much emphasis in schools and that many high schools do not include healthy computing as a topic within their curriculum.

This study investigated the emphasis given to the application of principles of ergonomics to the use of computers by students within metropolitan and rural high schools in South Australia. The term rural has conjured many definitions. Rural suggests pastoral landscapes, unique demographic structures, isolation, remoteness, low population density and distinct sociocultural milieu (Hart, Larson & Lishner 2005). There is a substantial difference in composition of people: rural populations have on the average relatively more elderly people and children, higher unemployment and underemployment rates and higher percentages of poor, uninsured and underinsured residents. However, these stereotypes fail to completely define rurality within Australia because rural cultures may exist in urban places and hence the struggle in clarifying the term. Despite the absence of a definition, the concept is useful for the purpose of targeting resources to underserved rural populations. The majority of rural areas lack adequate services, including health promotion initiatives, such as those relating to the use of principles of ergonomics and computer use.

A survey using a 17-item questionnaire was sent to a selection of secondary schools (refer Appendix 1). The questionnaire covered the position of the survey participant in the school (Question 1), awareness of the principles of ergonomics (Question 2), written policy on procedures relating to ergonomics and computer use (Question 3), inclusion of content in relation to ergonomics (Question 4 and 5), time spent delivering the content (Question 6), position of person delivering the content (Question 7), year levels content is delivered to (Question 8), whether touch typing is taught (Question 9), person delegated the responsibility for ensuring recommendations are followed (Question 10), application of ergonomics in

computer pool (Question 11), use of ergonomic tools (Question 12), importance placed on ergonomics in relation to computer use for students (Question 13 and 14), reports of computer-related complaints (Question 15), how the school might be supported in providing information on ergonomics (Question 16), and interest in training on ergonomics and computer use (Question 17).

BACKGROUND

The use of computer technology by high school students continues to increase both at school and at home as students prepare their assignments and take advantage of the vast amount of information and social networking opportunities provided by the world-wide web. It is important that this use is optimised in terms of health and safety. The introduction of computers in schools and the promotion of the use of the internet in school environments should be given more careful consideration however. It is crucial, according to Saito, Sotoyama, Jonai, Akutsu, Yatani and Marumoto (2000) that guidelines for the ergonomic use of computers in schools be developed to address the prevailing physical and social needs.

It is generally acknowledged that frequent and prolonged periods of computer use can result in musculoskeletal discomfort, pain and visual problems. Improper posture at computer workstations is a widespread global problem, according to Epstein, Loye, Walsh, Colford and Epstein (2011) and Breen, Pyper, Rusk and Dockrell (2007). The repercussions of computer-related activities have been recently reported by various authors. For instance, Smith, Louw, Crous and Grimmer-Somers (2009) reported a high prevalence rate of headaches and neck pain among adolescents for sitting for lengthy periods in fixed postures like computer terminals. Their cross-sectional study collected data from 1,073 high-school students found a concerning association between neck pain and excessive hours of computing for school students. In a separate study, Siu, Tse, Yu and Griffiths (2009) investigated the pattern of computer related activities among Hong Kong adolescents and children and the prevalence of musculoskeletal discomfort. Their study of Year 1 to 7 students in six local high schools (N=3,191) revealed high prevalence (68.3%) of musculoskeletal discomfort related to using computer. Shoulder (37.7%) and neck (35.0%) were most frequently involved.

Moreover, a Scandinavian study was conducted linking computer use with neck and upper-extremity symptoms, headache, and eyestrain in upper secondary school students (Palm, Risberg, Mortimer, Pamerud, Toomingas & Tornqvist, 2007). Using a questionnaire, 1,575 female and 1,251 male students were surveyed. Results found computer use was reported to be 31 hours/week by the male students and 19 hours/week by the females. Most computer use took place outside school and used mainly for entertainment. Headache was reported by 51% and 24%, and neck or shoulder symptoms by 31% and 15%, of the females and males, respectively. More than 50% of the females with health complaints indicated that they experienced sleep disturbances and had to take painkillers. Between 10% and 43% linked their health complaints to computer use.

More recently, the use of laptop computers is increasing, but there is limited research on the physical consequences of laptop use by adults or children. Harris and Straker (2000) determined these issues by studying children aged 10 to 17 year at schools in Western Australia. Data collected included locations and postures adopted for laptop use; time on task and consequences of both using and carrying laptops. This study found 60% of students reported discomfort with laptop use and 61% of participants reported discomfort with carrying their laptop.

These discomforts raised legitimate concerns about the health of students and associated computer use exposure. Korkmaz and Sommerich (2010) attributed these discomforts in part due to lack of training from schools and/or lack of healthy computing habits. If schools are to prevent future health problems and improve the health of students, it is important to introduce and educate students to the concepts and principles of healthy computing (Smith et al., 2009).

However, it appears from the literature that many high schools do not include healthy computing in their curriculum. In fact, Sotoyama, Bergqvist, Jonai and Saito (2002) noted in their research that most schools are slow to develop instructive programs from the environmental or ergonomic point of view. This conclusion was drawn from their research involving elementary, junior high and high schools in Yokohama and Kawasaki cities regarding the use of personal computers by students. The survey included questions that asked how often and in what environment computers are used, whether instructions are given as to their use, children's posture, and the effect on health.

The above finding from Japan is supported by a recent study conducted within secondary schools in New Zealand to survey the extent to which they provide an ergonomic learning environment in ICT classrooms. Grant (2008) found a general lack of awareness of guidelines on ergonomics and computer use and cautioned on the resulting potential problems for students. Siu, Tse, Yu and Griffiths (2009) argued an urgent need in healthy computing environment for Hong Kong adolescents because despite their young age, the students were not protected from computer-related health complaints. Providing adolescents with information about proper computer ergonomics may help prevent such health problem, according to Palm et al. (2007).

An effective way to anticipate the problem is to provide young students with adequate knowledge of ergonomics and computer use and environmental design, and now there is an urgent need for specific guidelines to protect school students. A number of initiatives have been reported such as: the knowledge discovery process and participatory approach in facilitating student learning about ergonomics, the use of continuous posture feedback for the computer users, and assessing children's computing posture. These initiatives are briefly described below.

A strategy adopted by Korkmaz and Sommerich (2009, 2010) was to recruit a small group of students to learn, in a participatory fashion, about healthy computing and

then to assist them to develop means for effectively conveying their knowledge to other students. Sawyer and Penman (2011) conducted educational sessions with year 10 students that included information on disorders associated with computer use, the warning signs to look for, principles of ergonomics to apply, software available to remind, with demonstration and return demonstration. Their goal was to promote awareness of the principles of ergonomics relating to computer use and provide guidelines for healthy computing in an effort to improve comfort and efficiency. The use of the "Posture Pad", developed to provide continuous posture feedback to the user, has been shown to significantly improve posture 95% of the time (Epstein et al., 2011). There is also available the Rapid Upper Limb Assessment (RULA) that is used to assess posture amongst children while using computers (Dockrell, O'Grady, Bennett, Mullarkey, Mc Connell, Ruddy, Twomey & Flannery, 2012).

The learning environment is also a focus in the literature. The electronic classroom containing a computer-controlled system integrated in a room designed with strict attention given to ergonomics and environmental conditions was reported by Coppola and Thomas (2002). Zandvliet and Straker (2001) evaluated the physical and psychosocial environments in computerised school settings performed through a combination of questionnaires. Data were obtained from a series of physical evaluations of 43 settings in 24 school locations in British Columbia, Canada and Western Australia. The authors concluded that potential deficiencies in the physical environment of these locations included problems with individual workspaces, lighting and air quality, and that deficiencies in the psychosocial environment were confined to the dimension of autonomy. Their results underscored that guidelines on ergonomics used in the implementation of information technology in classrooms may impact positively on the learning environment.

METHODOLOGY

A 17-item survey instrument was prepared. It was designed to investigate whether principles of ergonomics related to computer use were being taught to secondary school students and the importance placed on healthy computer use within South Australian secondary schools. It also sought to determine how schools might be supported in providing information on ergonomics and computer use to students.

Regional and city-based secondary schools were recruited for the study. A list of government high schools in South Australia was printed from the list provided on the World Wide Web and a selection of 15 regional and 15 city/metropolitan schools made from this list. The selection criteria were that it was a public secondary school located within South Australia. Purposive sampling was used to select participants for the study to ensure coverage throughout South Australia. A sample of 30 secondary schools was deemed adequate for the study. Prior to commencing data collection approval was gained from the University of South Australia's Human Research Ethics Committee and from the Department for Education and Child Development (DECD)'s Research Unit. An email was sent to each selected school

requesting participation in the research. Attached to the email was a Letter of introduction, a Participant Information Sheet, a Consent Form, and the Questionnaire. The schools were assured that participation was voluntary and the information provided would remain confidential and only be used for the purpose of the study.

One completed questionnaire was received promptly. A further email forwarded to the other schools the following month yielded no other responses. Two months on a personal follow-up telephone call was made to each of the schools. In most cases the questionnaire was administered at that time over the telephone; if not, the documentation was emailed to the school's nominated person. A total of 15 responses were received, giving a response rate of 50%.

The data collected were summarised and analysed by sorting the data into files and tables and counting frequency of responses.

FINDINGS

Responses were received from ten (67%) regional and five (33%) city/metropolitan secondary schools. The profile of the respondents is given in Table 1.

Table 1 Number and Percentage of Respondents by Position within School

Position	N	Percentage
Year level coordinator	1	7
Senior Leader 2 Quality Assurance	1	7
IT Coordinator/Teacher	8	53
Deputy Principal	4	27
Business Manager	1	7

The respondents were asked if they were aware of the principles of ergonomics that relate to the use of computers. All except one said that they were (93%) which is very favourable. Next, they were asked whether their school had a written policy on procedures related to ergonomics and computer use. Most (73%) said their school did not; 20% of respondents were unsure (refer Table 2). The one respondent who answered that there was a policy added the comment that "the furniture supplied precludes full compliance with occupational health and safety principles".

Table 2 Number and Percentage of Respondents reporting whether the School has a Policy on Ergonomics and Computer Use

Response	N		Percentage		Total	
	Rural	Urban	Rural	Urban	N	Per Cent
Yes	0	1	0	7	1	7
No	8	3	53	20	11	73
Unsure	2	1	13	7	3	20
Total	10	5	66	34	15	100

As shown in Table 3, most schools (60%) replied that their curriculum did include content in relation to ergonomics and computer use.

Table 3 Number and Percentage of Respondents reporting whether the School curricula included content on Ergonomics and Computer Use

Response	N		Percentage		Total	
	Rural	Urban	Rural	Urban	N	Per Cent
Yes	6	3	40	20	9	60
No	4	2	27	13	6	40
Total	10	5	67	33	15	100

This content included “how to set up a work station”, “how best to sit at a computer”, and the need for rest breaks. In some schools it was covered as a “passing mention as part of other subjects”, “not a lot, just a bit of a topic”. One school, where all students use laptops, reported that material on ergonomics was used in each subject and reminders of “how to sit, heights, lighting etc.” was embedded in day to day routine. For many schools the content was included as part of a Certificate 1 or Certificate 2 course that had an occupational health, safety and welfare unit that was reported to cover “chairs and eye care”. In some schools a basic introduction was provided to year 8 level students, who were then required to design a poster on the topic which was displayed in the classroom. At higher year levels the students were required to undertake research into the problems associated with computer use and prepare a report. Responses relating to the time spent on delivering the material ranged from 30 minutes to one lesson “never to be spoken of again”, to two weeks and “ongoing as incorporated into all lessons”.

Most schools (80%) reported that they did not have a person who had been delegated the responsibility for ensuring that students followed recommended principles of ergonomics for their computer use (Table 4). However, one commented that they had an occupational health, safety and welfare officer who oversees all staff and student “safe use of anything”.

Table 4 Number and Percentage of Respondents reporting whether the School had a Person Delegated Responsibility for ensuring practice of Ergonomics

Response	N		Percentage		Total	
	Rural	Urban	Rural	Urban	N	Per Cent
Yes	1	2	7	13	3	20
No	9	3	60	20	12	80
Total	10	5	67	33	15	100

Table 5 indicates that 67% of respondents reported that principles of ergonomics were taken into consideration in their school’s computer pool set up.

Table 5 Number and Percentage of Respondents reporting whether Ergonomics taken into consideration in computer pool set up

Response	N		Percentage		Total	
	Rural	Urban	Rural	Urban	N	Per Cent
Yes	8	2	53	13	10	67
No	2	3	13	20	5	33
Total	10	5	66	33	15	100

Interestingly, for one school this question was considered no longer relevant as their students used laptops in their normal classroom. When asked to elaborate on how ergonomics was taken into consideration, the respondents mentioned the design and layout of the room with thought given to leg room when planning seating spaces and having height adjustable chairs that gave back support. Benches and chairs were planned around the heights of their students and glare reduction considered in the placement of computers in relation to windows. Consideration was also given to having chairs with wheels if used on carpet flooring or with a flat surface if to be used on a vinyl floor. Relevant posters reinforcing principles of ergonomics were displayed in the room. However, the provision of ergonomically styled chairs and table heights were not generally regarded as being consistent within a school. Limitations imposed by costs and existing infrastructure and window placement often meant it was not possible to have benches and screens at the ideal position and height for the students. Budget issues and the perceived lack of desire to spend money to support occupational health and safety were mentioned.

A separate question in the survey instrument asked whether tools such as document holders and adjustable chairs were provided. It was found that generally only adjustable chairs were available and that 33% of the schools did not provide either (Table 6).

Table 6 Number and Percentage of Respondents reporting whether the School provided ergonomic tools

Response	N		Percentage		Total	
	Rural	Urban	Rural	Urban	N	Per Cent
Yes	7	3	47	20	10	67
No	3	2	20	13	5	33
Total	10	5	67	33	15	100

While these schools may have used adjustable chairs in the past, often students “played with” and damaged gas-lift chairs so that they did not last. Gas-lift adjustable chairs were considered an expensive item that the schools could not afford to keep replacing. Plastic chairs were now provided due to vandalism. One respondent indicated that adjustable chairs were not required as the students were “only at the computer for short periods of time”. Document holders were seldom used and were generally regarded as no longer relevant because “the students do

not need them as they are looking at the screen". Also, students tended to break document holders. It was noted by one respondent that while adjustable chairs were provided for students in the computer labs, they were not available when the students used laptop computers.

A question in relation to whether touch typing was taught in secondary schools was specifically included in the survey instrument as in discussions at a recent Conference of the Human Factors and Ergonomics Society of Australia this was queried with the underlying perception that not being able to touch type was inconsistent with healthy computer use for students. As shown in Table 7, three schools taught 'touch typing' but most (80%) did not. Some schools "used to, but not anymore".

Table 7 Number and Percentage of Respondents reporting whether the School taught Touch Typing

Response	N		Percentage		Total	
	Rural	Urban	Rural	Urban	N	Per Cent
Yes	2	1	13	7	3	20
No	8	4	53	27	12	80
Total	10	5	63	34	15	100

When asked the level of priority they believed their school placed on the importance of ergonomics in relation to computer use for students, most respondents said it was given 'Low' priority. The responses are summarised in Table 8.

Table 8 Number and Percentage of Respondents reporting the Priority they Believe is placed on Ergonomics and Computer Use by the School

Response	N		Percentage		Total	
	Rural	Urban	Rural	Urban	N	Per Cent
High Priority	0	1	0	7	1	7
Medium Priority	2	2	13	13	4	27
Low Priority	8	2	53	13	10	66
Total	10	5	66	33	15	100

Most respondents (66%) thought ergonomic principles relating to computer use were not being given sufficient priority in their school (refer Table 9). An added comment was "but it competes with other priorities". One respondent said "it isn't much but is sufficient given students spend relatively small amounts of time in computer rooms and have regular breaks". One school reported that it does assess the situation regularly recognising that if the students are not comfortable they will be less productive.

Table 9 Number and Percentage of Respondents reporting whether they believe ergonomic principles relating to computer use are given sufficient priority in their School

Response	N		Percentage		Total	
	Rural	Urban	Rural	Urban	N	Per Cent
Yes	2	2	13	13	4	27
No	7	3	47	20	10	66
Unsure	1	0	7	0	1	7
Total	10	5	67	33	15	100

Few schools had received any reports of computer-related complaints of pain or discomfort from students (refer Table 10). Reports that had been received generally related to the chairs. Some students complained of “sore butts” as the chair seats were hard plastic. In other cases where the chairs were old and the seats “wobbly” the students’ sitting position was on an uncomfortable angle with the buttocks not level.

Table 10 Number and Percentage of Respondents having received reports of Computer-related complaints of Pain from Students

Response	N		Percentage		Total	
	Rural	Urban	Rural	Urban	N	Per Cent
Yes	2	1	13	7	3	20
No	7	4	47	27	11	73
Unsure	1	0	7	0	1	7
Total	10	5	67	34	15	100

The schools were asked how they might be supported in providing information on ergonomics and computer use to students. Resources in the form of “documentation prepared for our industry” were requested – interesting lesson material, worksheets, software, videos - using simple language at the student level. Appropriate posters that could be displayed in each computer room and referred to by teachers and an information pack as part of occupational health safety and welfare training were other suggestions. “Getting it into focus” by providing more emphasis on healthy computing, and reminding teachers, was mentioned. One respondent reported how everyone at their school was now “hunched over laptops”. All staff and students had a laptop computer leading to an additional problem for staff who needed to hunch over the laptops to review the students’ work as the limited viewing angles of the laptop computer together with reflections made it difficult for teachers to see and check screen work. The respondent commented that the tendency within the school to replace desktop computers with laptops was causing a “host of issues” for teachers.

The final question asked if training was available on ergonomics and computer use whether the school would be interested in taking advantage of it. While some said 'Yes', most were unsure or replied 'No' (60%) (Table 11).

Table 11 Number and Percentage of Respondents reporting whether School would be interested in training

Response	N		Percentage		Total	
	Rural	Urban	Rural	Urban	N	Per Cent
Yes	3	3	20	20	6	40
No	2	0	13	0	2	13
Unsure	5	2	33	13	7	47
Total	10	5	66	33	15	100

The reasons included that the training would be competing with other huge demands on staff time; depended upon the location of the training as would not travel to the city; that they were aware; the information was already included in the Certificate 1 and 2 courses covered with the students; and "we feel it isn't an area we would need specific training in, more the intent to ensure it is taught to students".

DISCUSSION AND CONCLUSION

The poor participation in the study is indicative of the low level of priority given by the schools to this topic. This is evidenced by the finding that 66% of respondents believed the application of principles of ergonomic to computer use was not given sufficient priority within their school. The majority of the interviewees were aware of the principles of ergonomics related to computer use and most schools included the topic in their curriculum, but there was lack of written policy on procedures, personnel delegated responsibility to monitor or follow through, and little interest in training should it be available. It appears that the serious repercussions of computer-related activities, including musculoskeletal discomfort, shoulder and neck pain, headaches, and visual problems as discussed by Epstein et al. (2011), Siu et al. (2009), Smith et al. (2009), Breen et al. (2007) and Palm et al. (2007), are not being given adequate attention and consideration by the schools.

Professionals working in the field of ergonomics would argue that specialist knowledge is required by people teaching material in this area. It is pleasing to find that many schools do include content in relation to ergonomics and computer use in their school's curriculum. While many pieces of information relating to ergonomics such as how to sit at the computer, allowing sufficient leg room, using back support, eye care, taking rests, placement of computers to avoid glare, were mentioned it is noted that other important factors were not specifically identified. Information such as:

- positioning of keyboard and arms;
- that hands and wrists should be kept level in a neutral position;
- elbows kept relaxed in at the sides of the body;

- how to adjust the chair backrest so that it fits into the small of the back to support the spine, yet gives clearance for the buttocks and the shoulder blades;
- the recommended viewing distance to the screen;
- the recommendation to keep the feet flat on the floor and avoid crossing the legs and ankles as this can inhibit circulation;
- how to safely use the mouse;
- the need for long-distance viewing to refocus and relax the eyes;
- to get up out of the seat and walk regularly to relieve the muscles in lower back from the added pressure caused by sitting;
- the recommendation to perform gentle stretches while sitting at the computer, during rest periods and after work, to counter potential strain of the neck, back and wrists, and reduce tension and fatigue; and
- the need to be aware of possible additional risk where out-of-school activities involve using the same muscles and tendons that are used during computer use.

A key point is the need for schools to take into consideration the anticipated overall computer use of students each day and therefore the importance for students to know and apply the principles of ergonomics. It may be that students do not use computers for extended times while at school, but many do so after school hours. Palm et al. (2007) estimated that approximately 90% of computer use was undertaken outside of school for entertainment purposes.

The overall low priority given to ensuring the application of ergonomics by students to their computer work appears to be due to a number of factors: Not recognising the importance of the matter and potential health problems that may arise, competing priorities, and resource limitations. The findings of this study indicate that occupational health and safety is often being compromised by lack of money and budget issues. These factors, however, are not sending the correct message to young students. In order for them to observe the principles of ergonomics in computer use, they must see the same from their role models. While there were minimal (20%) reports received of computer-related complaints of pain or discomfort, the problems that were highlighted must be addressed to protect the health of the students.

Two-thirds of the schools did take ergonomics into consideration in setting-up their computer pools - one-third did not. Interestingly, it appears that computer pools are being replaced by the issue of laptop computers to individual students with little consideration given to their safe use. There also appears to be a changing use of the computer technology leading to the reported redundancy of document holders as students work mainly on-screen as they prepare material on the computer.

When comparing responses on a rural/urban basis, it was shown that rural schools were more likely to include content on ergonomics and computer use within their curriculum and take principles of ergonomics into consideration in setting up their

computer pools. It can be assumed that because of this, they also had received fewer computer-related complaints of pain or discomfort from students than the urban schools. However, the rural schools were less likely to have a written policy related to ergonomics and computer use and to have a person delegated responsibility for ensuring the application of ergonomic principles by students. They generally did not teach touch typing. A greater percentage of rural schools believed ergonomics and computer use were given low and insufficient priority.

When asked how the schools might be supported in providing information on ergonomics and computer use to students, various suggestions were received: simple lesson material, worksheets, software, and videos, that used language the students could relate to. This research has highlighted a need for suitable material on ergonomics and computer use specifically prepared for use with school students.

This study, undertaken by two regional university staff, investigated the teaching of healthy computing skills to high school students in rural and urban South Australia. While the sample size was small, and there may be a need for more research in the regional context given there may be less health promotion in rural areas due to lack of availability of expertise and resources, this study promotes awareness of the issues related to safe computer use and may contribute to the greater application of ergonomics in schools and prevention of future injuries related to computer misuse.

REFERENCES

- Breen, R., Pyper, S., Rusk, Y., Dockrell, S. (2007). An investigation of children's posture and discomfort during computer use. *Ergonomics*, 50(10), 1582-1592.
- Coppola, J.F., Thomas, B.A. (2002). Does the integration of technology in a smart E-classroom support the acquisition of critical thinking skills? Proceedings - Frontiers in Education Conference,3, S1B/7.
- Dockrell, S., O'Grady, E., Bennett, K., Mullarkey, C., Mc Connell, R., Ruddy, R., Twomey, S., Flannery, C. (2012). An investigation of the reliability of Rapid Upper Limb Assessment (RULA) as a method of assessment of children's computing posture. *Applied Ergonomics*,43(3), 632-636.
- Grant, A.M. (2008). The ergonomic learning environment: deliberately planned or anything goes? *Computers in NZ Schools*, 28-38.
- Harris, C., Straker, L. (2000). Survey of physical ergonomics issues associated with school childrens' use of laptop computers. *International Journal of Industrial Ergonomics*, 26(3), 337-346.
- Hart, L.G., Larson, E.H., Lishner, D.M. (2005). Rural definitions for health policy and research. *American Journal of Public Health*, 95(7), 1149- 1155.
- Korkmaz, S.V., Sommerich, C.M. (2009). Facilitating student learning about ergonomics and healthy computing skills via participatory ergonomics. *Work*, 34(4),439-448.
- Korkmaz, S.V., Sommerich, C.M. (2010). Teaching healthy computing skills to high school students via participatory ergonomics. Proceedings of the Human Factors and Ergonomics Society, 1, 672-676.
- Palm, P., Risberg, E.H., Mortimer, M., Pamerud, G., Toomingas, A., Tornqvist, E.W. (2007). Computer use, neck and upper-extremity symptoms, eyestrain and headache among female and male upper secondary school students. *Scandinavian Journal of Work, Environment and Health, Supplement*, 33(3), 33-41.
- Saito, S., Sotoyama, M., Jonai, H., Akutsu, M., Yatani, M., Marumoto, T. (2000). Research activities on the Ergonomics of computers in schools in Japan, Proceedings of the XIVth Triennial Congress of the International Ergonomics Association and 44th Annual Meeting of the Human Factors and Ergonomics Association, 'Ergonomics for the New Millennium', 658.
- Sawyer, J., Penman, J. (2011). Ergonomics and computer use: Increasing the awareness of rural secondary school students, Human Factors and Ergonomics Society of Australia 47th Annual Conference, Synergy in Sydney ... creating and maintaining partnerships, Sydney, 7-9 November.
- Siu, D.C.H., Tse, L.A., Yu, I.T.S., Griffiths, S.M. (2009). Computer products usage and prevalence of computer related musculoskeletal discomfort among adolescents. *Work*, 34(4), 449-454.

- Smith, L., Louw, Q., Crous, L., Grimmer-Somers, K. (2009). Prevalence of neck pain and headaches: Impact of computer use and other associative factors. *Cephalalgia*, 29(2), 250-257.
- Sotoyama, M., Bergqvist, U., Jonai, H., Saito, S. (2002). An ergonomic questionnaire survey on the use of computers in schools. *Industrial Health*, 40(2), 135-141.
- Zandvliet, D.B., Straker, L.M. (2001). Physical and psychosocial aspects of the learning environment in information technology rich classrooms. *Ergonomics*, 44(9), 838-857.



A state-wide survey of South Australian secondary schools to determine the current emphasis on ergonomics and computer use

Please encircle your answer and/or provide your response in the space provided.

1 What is your position in the school?

.....

2 Are you aware of the principles of ergonomics that relate to the use of computers?

Yes No

3 Does your school have a written policy on procedures related to ergonomics and computer use?

Yes No

4 Does your school curriculum include content in relation to ergonomics and computer use?

Yes No

If yes, (If no, please go to question 9)

5 What content does your school curriculum include in relation to ergonomics and computer use?

.....
.....
.....
.....
.....
.....
.....
.....

6 How much time is spent on delivering this content?

.....

7 What is the position of the person delivering the content?

.....

8 What year level(s) it is delivered to?

.....

9 Does your school teach touch typing?

Yes No

10 Is there a person in your school who has been delegated the responsibility for ensuring that students follow recommended principles of ergonomics for their computer use?

Yes No

11 Are principles of ergonomics taken into consideration in your school's computer pool set up?

Yes No

Please elaborate:

.....
.....
.....
.....

12 Are tools such as document holders and adjustable chairs provided?

Yes No

Please elaborate:

.....
.....

13 On what scale of priority do you think your school places the importance of ergonomics in relation to computer use for students?

High Medium Low

14 Do you believe the principles of ergonomics relating to computer use are being given sufficient priority in your school?

Yes No

15 Have you or your staff received reports of computer-related complaints of pain or discomfort from students?

Yes No

If yes, please elaborate

.....
.....
.....

16 How might your school be supported in providing information on ergonomics and computer use to students?

.....
.....
.....

17 If training was available on ergonomics and computer use would your school be interested in taking advantage of it?

Yes No