Health & Safety Issues

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Health Risks with Computer Use in New Zealand Schools

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Abstract

With the increased use of computers, and particularly with the increasing use of the Internet in schools, health and education professionals have suggested the need for teachers and students to be ergonomically conscious when using computers. A project was conducted in 1999 to investigate the extent of awareness of health risks associated with computer use in schools of principals, teachers, and administrators of all the primary and secondary schools in Otago and Southland, New Zealand. Results in this study show that although a high proportion of the respondents were aware of these issues, few people took any active preventive measures or participated in any professional development to reduce these health risks. It is also found that nearly two-third of the school administrators, more than half of the teachers, and nearly 30% of the principals in this study had experienced some kind of health problems related to computer use. Strategies to deal with these issues such as the need for professional development are also discussed in this paper.

Keywords: **Health Risks, Social Implications**

Introduction
Research Questions
- Participants

1 Introduction

With the increased use of computers, and particularly since the advent of the Internet in schools in recent years [1], health and education professionals have suggested the need for teachers and students to be ergonomically conscious when using computers [2,3,4,5]. They are concerned about a number of health risks involved with computer use which range from discomfort such as eyestrain, wrist and shoulder pain, and overuse syndrome, to musculoskeletal injuries [6,7]. According to some reports (eg refer [7]), the most widespread health risk of computer use is eyestrain. One common problem experienced by frequent computer users is visual fatigue and eyestrain leading to sore and burning eyes, headaches, double vision, and even to nausea [8]. Computer users need to understand that reading text from a computer screen is significantly different from reading print-based materials. Unlike print-based materials which reflect light, the computer monitor (the visual display unit, VDU) is a self-illuminated object. Looking directly at the computer screen is somewhat like looking into a light source. Less surrounding light may be needed or the VDU may create discomfort to the eyes [9]. Poorly designed work environments may thus accentuate the development of Computer Vision Syndrome, defined by the American Optometric Association as "the complex of eye and vision problems related to near work which are experienced during or related to computer use" [10]. This is poised as a big problem for children.

Maintaining a good posture is another example of importance if the computer is to be used for an extended period of time. Poor body posture, as well as poor design of the workstation, may lead to muscle pain, particularly in the shoulders, neck, lower arms and wrists, which, if not attended to, may develop into what are commonly called Repetitive Strain Injuries (RSI). No doubt ergonomically designed furniture and workstation could mitigate some of the 'at risk' postures when teachers and students using computers [6,11]. As teachers and students increasingly have to use the computer for instructional and administrative purposes, they need to understand these issues and to form good work habits as early as possible since bad habits, once formed, are usually difficult to unlearn later.

There is a need for teachers and school administrators to be more ergonomically conscious. The

use of laptop computers in schools, for example, where students are expected to use a small keyboard, trackball, or some pointing device for extended periods of time, has already posed a greater risk of developing occupational overuse syndrome (OOS) [12]. A recent study surveying 314 children in three Australian schools shows that 60% of the participants suffered some kind of back, neck, head and shoulder pain when using and carrying laptop computers [13]. At present very little research has been conducted on health and safety issues associated with computer use in schools, although ergonomic research in the workplace in other settings has been undertaken by organizations such as the International Labour Office [14]. In New Zealand, no systematic research on these issues has been conducted in schools. To fill this gap, a research project was undertaken in 1999 surveying the awareness of principals, teachers, and administrators of all Otago and Southland schools in New Zealand on ergonomic issues and health risks with computer use. Data collected in this study was used for designing training programmes as well as for policy recommendation and formulation.

2 Research questions

The following research questions were investigated in this study:

1. To what extent were Otago and Southland school principals, teachers, and administrators aware of and understood the potential health risks associated with computer use?

2. To what extent have Otago and Southland school principals, teachers, and administrators experienced health problems associated with computer use?

3. To what extent did primary and secondary schools in the Otago and Southland regions have a health and safety policy with regard to computer use by staff, teachers, as well as students?

4. What were the strategies and practices adopted by schools to deal with health issues with computer use?

2.1 Participants

As a regional study, three sets of questionnaires were administered to the (a) principals; (b) school administrators (secretaries); and (c) computing teachers/computer coordinators of all the schools in the Otago and Southland regions of New Zealand. A total of 852 questionnaires were posted to 284 schools (246 primary and 38 secondary schools). 362 questionnaires (43%) from 207 schools (73%) were returned. The overall response rates for principals, teachers, and administrators were 56%, 30%, and 41%, respectively. As can be seen from Table 1, the response

rates for primary school principals and secondary school teachers were particularly high.

Table 1: Response rates of principals, teachers, and administrators

	Primary Schools		Secondary Schools		Overall Responses	
	Number	%	Number	%	Number	%
Principals	145	59	4	37	159	56
Teachers	59	24	27	71	86	30
Administrators	102	41	15	39	117	41

3 Awareness of health risks with computer use

3.1 Time spent using computers

Principals, teachers, and administrators in this study were asked the length of time they spent using computers at school. Table 2 shows that school administrators (secretaries, managers), particularly of those in secondary schools, spent much more time (5.1 hours on average per day) on the computer than principals and teachers. Secondary school teachers also spent twice the amount of time on the computer than their primary school counterparts (see Table 2).

Table 2: Average hours spent on the computer per day by principals, teachers, and administrators

	Primary Schools	Secondary Schools
Principals	1.5	1.6
Teachers	1.1	1.9
Administrators	2.9	5.1

3.2 How often did they have breaks?

It is important to have frequent short breaks if users spend an extended period of time on the computer. In this study when asked how often they took breaks when working on their computer, only 5% of the respondents reported having breaks regularly and 1.4% of the respondents reported they rarely had breaks. It is interesting to note that nearly one-quarter (24%) of the respondents could not provide a specific answer to this question and 20% of the respondents did

not provide any answer at all. It seems that quite a large proportion of the respondents (44%) have not yet formed a habit of having regular breaks when using computers, as reflected in the following comments:

"Whenever I feel I need to"
"When finished an item & before starting another"
"usually work until task is completed"

For some teachers, taking breaks was never a big issue because they were "frequently interrupted" anyway. But others seldom took breaks:

"When working for extended periods (30 mins +) I very rarely take breaks."
"may have break after working more than 2 hrs."

About half of the respondents have provided a more specific answer to this question. Within this group, principals took breaks most often (on average every 37 minutes), followed by teachers (on average every 43 minutes). However, administrators who indicated they spent far more time on the computer, took breaks least often (on average every 46 minutes).

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3.3 Were respondents aware of the health issues related to computer use?

In the questionnaires the respondents were asked whether they were aware of the following health risks associated with computer use: (a) back pain; (b) lower arm pain; (c) neck pain; (d) shoulder pain; (e) wrist pain; (f) headaches; and (g) eyestrain. Overall, between 69% and 91% of the respondents were aware of a number of these health risks, as can be seen from Table 3.

Table 3: Percentages of school principals, teachers, and administrators who were aware of health risks associated with computer use

	Administrators	Teachers	Principals
Back Pain	92	85	86
Lower Arm Pain	86	79	71
Neck Pain	91	85	79
Shoulder Pain	85	69	71
Wrist Pain	91	92	82
Headaches	91	83	81
Eyestrain	91	90	90

High level of awareness, however, did not result in high level of active preventive measures undertaken to reduce these health risks. For example, when principals and teachers were asked specifically whether they paid any attention to their own postures, as well as to the lighting in their work environment, only 54% of the teachers reported that they did watch their posture and 60% of them paid attention to the lighting of their rooms. As for principals, they paid even less attention to their postures (49%) and lighting (57%).

The majority of the respondents did not have any purpose-built furniture either. Table 4 shows that although 95% of the administrators surveyed in this study had an adjustable chair to use, less than half of them (42%) had an accompanying adjustable computer desk. Very few of the teachers and principals had other ergonomically designed furniture to use. The school administrators were also asked whether they have requested any specific items which would make their use of the computer safer. 49% of the administrators in primary schools and only 33% in secondary schools have requested such items.

Table 4: Percentages of respondents having purpose-built furniture

	Administrators	Teachers	Principals
Adjustable Computer Desk	42	8	22
Adjustable Chair	95	35	75
Foot Support	24	4	3
Screen Filter	41	2	13
Paper Holder	54	27	23

The situation was far worse for students. As can be seen from Table 5, very few students used ergonomically designed furniture at school, particularly primary students (although they only spent on average approximately an hour per week on the computer). The situation for secondary students was a little better, but they spent a lot more time on the computer than their primary counterparts (on average 3.7 hours per week).

Table 5: Percentages of students using purpose-built furniture

	Primary	Secondary
Adjustable Computer Desk	5	5
Adjustable Chair	7	70

Foot Support	2	10
Screen Filter	4	15
Paper Holder	13	57

3.4 Health problems with the respondents

When asked whether they had experienced any health problems related to computer use, overall nearly half (47%) of the respondents had experienced some kind of problems themselves. School administrators were affected most (61%) and this was more significant in secondary schools (73%) than in primary schools (57%).

As school administrators worked much longer hours on the computer than the other two groups, it is not surprising that they reported having more health problems. Of the 117 administrators who have returned their questionnaires, seventy-one (61%) reported they had experienced some kind of health problems associated with computer use. Five of these respondents have already had RSI. Thirty-three (28%) administrators had experienced eyestrain, and nine of them reported a deterioration of their eyesight, and as a result had to wear prescription eye glasses. Other health problems included hand and wrist pain (37%), neck pain (30%), shoulder and lower arm pain (41%), and back pain (13%). A third major problem was headaches (27%). The following comments show the importance of having an ergonomically designed work environment:

"I have OOS in hands, wrists, arms, shoulder tension and neck tension leading to headaches. This was originally due to poor equipment. I now have the proper desk etc and have to monitor how much I use the computer."
"Chronic neck pain prior to purchase of a copy holder. Eye sight deteriorating - glare is a problem."

As for teachers, forty-five (52%) of the respondents reported having health problems related to the use of computers at work. The two most widespread problems were wrist pain (49%) and eyestrain (44%). The following are some of the teachers' comments:

"Wristwhen doing a lot of mousing & editing a school magazine - kept me awake at nights. Also lifted some chairs & a computer monitor during room refurbishment. Lifted badly & was off work two and a half weeks with pinched nerve. Could not sit at computer for 4-5 weeks." (A male high school HOD, Computing)
"Back - too tense when working against clock. Arm & wrists - pain after stretches at keyboard. Headaches - at end of every working day. Eye strain - tired, burning eyes." (A female high school HOD, Information Technology)

Forty-five (28%) principals reported having experienced similar health problems related to

computer use as teachers, with wrist pain (45%), eyestrain (33%), and neck pain (31%) being the most common ones.

"Eye - using old b/w screen - very sore. Health nurse advised me to minimise my use of that particular computer. Shoulder/neck pain - more evident when programme fails to function properly at a crucial time." (A male primary school principal).

3.5 Dealing with health risks

3.5.1 The lack of information

Having information about ergonomic issues is the first step towards minimizing health risks. In this study the respondents were asked if they had knowledge of ergonomically designed equipment or furniture. They were also asked to give one or two examples as well. Table 6 shows that apparently the respondents' level of knowledge of ergonomic products was very high. Overall, staff in secondary schools knew more about ergonomic furniture and equipment than their counterparts in primary schools.

Table 6: Percentages of respondents who had knowledge of ergonomic products

	Primary Schools	Secondary Schools
Principals	84	93
Teachers	76	96
Administrators	72	93

However, when asked whether they knew any computer software which would help them reduce the health risks of computer use the percentages were much lower, as can be seen from Table 7.

Table 7: Percentages of respondents who had knowledge of software programmes

	Primary Schools	Secondary Schools
Principals	11	14
Teachers	9	26
Administrators	6	7

The principals were asked whether they were aware that the government had developed some guidelines related to health and safety issues in school computer use. Although a package which includes guidelines on safety issues in ICT use was sent out by the Ministry of Education in 1998 to all schools, only 17% of the primary schools and 14% of the secondary school principals were aware of these guidelines.

When asked what specific information they needed, some suggested:

"Information re harmful properties in the air from this electronic gear. How close to sit to monitor screen to avoid exposure."
"Furniture/equipment at the Primary end of education - what's a good height for screen? Are chairs available for 'wee ones'?"

Some requested very detailed information:

"How much time I should sit at the computer before having a break, what exercises I should do and what other equipment would help to counteract some of the problems"

The respondents were also interested in legal issues related to the health risks of computer use. As suggested by Cameron (cited in Bell, 1999), the public liability health insurance risks have not yet been clearly calculated and could be a major concern for school management in the near future. The following is some of the legal information requested by the respondents:

"Legal advice on possibility of students claiming against schools in later life."
"What are the legal requirement of our employer to provide for this. Strategies for combating to [sic] problem"

3.5.2 The lack of policy guidance

Surprisingly, not a single secondary school in this study had a policy on health and safety issues associated with computer use. While primary schools fared better, only about 6% of them had a standing policy. However, 85% of the primary and 86% of the secondary school principals felt the need for some kind of policy and guidelines. A number of them preferred that policies be developed by the Ministry of Education as 'it would be easier for one organization to carry this out rather than every school or institution reinventing the wheel by producing their own". Some principals felt that since "computer use is being imposed upon schools" and the "new curriculum initiatives require that schools be equipped with computers", the Ministry of Education therefore should be responsible for developing and disseminating guidelines for computer use in schools. These guidelines should be:

"Concise, clear suggestions that are practical for implementation in schools/classrooms..." (A

primary school principal)
"Ministry driven not left up to individuals to decide and Ministry funded workshops easily available especially to rural people." (A rural school principal)

Principals preferred practical and systematic information, provided by experts, and enforced by an outside body such as the Ministry of Education.

From the comments of the principals it is clear that they have a huge concern about how ergonomically designed equipment and furniture should be funded as "the Ministry of Education [is] very good at generating guidelines but very reluctant to resource them". According to one principal, the Ministry of Education should:

"provide the funding and staffing for proper management of computer systems, computer trainingeducation anddevelopment rather than stating 'funding is available in the operations grant." (A secondary school principal)

From another principal,

"so that there is a set of national standards, information and guidelines for schools to make use of. This resource would have to be accompanied by efficient funding to enable aspects to be put into practice." (A primary school principal)

3.5.3 The lack of professional development

Only 10% of the primary and 21% of the secondary schools in this study had organized professional development related to health issues with computer use for their staff. When organized, they were considered as part of the overall professional development, "included intraining for staff on computer skills" and they usually involved some form of inspection from the Occupational Safety and Health Authority (OSH):

"Administrative secretaries have been given reading material regarding the health and safety issues. OSH visits make us aware and keep us up to speed regarding 'good employer' aspects of ensuring staff are aware of H & S [Health and Safety] issues within the responsibilities and rates of their positions".
"Visit to inspect computer facilities by OSH expertreport and recommendations to Board [of Trustees] by OSH expertaddress to staff by OSH expert replacement/purchase of computer equipment to reflect above recommendations"

Professional development for the respondents meant gaining knowledge of ergonomic products or measures to prevent OOS. Topics such as psychological stress related to computer use, as well as the feeling of incompetence when using computers with their students due to inadequate training and professional development were seldom included.

Some principals did not know what to include if a professional development programme was to be organized:

"I would need to seek expert advice on this."
"I have no idea"

Some principals even doubted the need for professional development in this area:

"Our teachers are not using computers during school hours but children are."
"Very few school personnel use computers for extensive periods so I'm not sure how great the need is."
"Not interested at this timeIt is not a concern to me. I know of problems. But until it affects me I sail on without concern."

It is clear that health and safety issues were not emphasised in professional development in most schools. The following comment summarized well the feelings of many principals,

"Time has to be spent on training for teaching and computer use. Health and safety is important but not the driving force for in-service training".

The lack of professional development in this area may explain why health issues associated with computer use were seldom discussed with students. In the survey, it is reported that only 34% of the primary teachers and 59% of the secondary teachers have discussed these issues with their students. This is rather unfortunate as, increasingly, students will spend more time using computers in school as well as at home. In this present study 12% of the primary and 11% of the secondary schools have already indicated that their students were using laptop or notebook computer at school. Students need to be aware of these health risks and preventive measures need to be instigated urgently if a safe work environment is to be provided for them.

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4 Concluding remarks

Although computer use in the classroom or in the school office is usually very different from an office setting where people can spend all day working on a computer, this study documents a rather widespread health problem in the school setting, particularly with school administrators. This study documents the lack of depth in the understanding of these health risks as well as the inability to come up with some strategies to deal with them, which was at least partly due to the lack of efficient dissemination of information and national guidelines from the Ministry of Education to individual teachers. It was also due to the lack of professional development and discussion of these issues in schools. From the study, we come up with the following recommendations:

1. The need to consider the health risks as a matter of priority. It should be noted that parents and educators are not wilfully ignoring the health risks of having poorly designed computing furniture or the importance of professional development. What they are more preoccupied with is the educational opportunities of the burgeoning technology, and the computer hardware and software needed to meet the educational needs. As commented by a couple of respondents,

"The issues of health & safety were discussed as our school invested in computer technology. However, the cost of complying with health & safety issues in an old school building was expensive. The priority is to provide hardware at this stage. Our 'typing room' has adjustable chairs, but 'computer room' & IT room have 'ordinary' chairs & desks."
"How does the school get the money to buy chairs/desks needed when the IT gear is demanding every dollar of hard-won fundraising?"

Ergonomically designed furniture is not a priority compared to hardware and software purchase as 'by the time a school purchases hardware and software [it] seems little [is] left over in [the] budget for ergonomic furniture". Schools simply cannot afford to provide the money. It is a national issue, rather than a local issue. As for professional development, the focus is on how to use the computer to teach and "as part of ICT inservicethese issues are easily overlooked while dealing with the actual understanding of programmes, technical knowledge, etc." It is now high time to treat this as a priority.

2. The need for resourcing. This brings us to our second point: the need for adequate funding to resource ergonomically designed equipment as well as professional development for teachers and school administrators. As commented by one primary school teacher in this study,

"Computers & chairs at my school are extremely old, damaged beyond repair. Poor choices been made & no funding available to rectify situation. I am unable to work in such conditions & will bring in own personal equipment as not prepared to work with 'dangerous' equipment."

There was a general feeling that funding should come from the national level:

"This a large issue for education as all available funds targeted into computers & software. Problems of seating at computers & general furniture that has been provided for children an issue that needs lot more attention at national level as unless funds were provided the cost would be out of most schools ability to provide."
"Teachers within TIM [Text and Information Management] & computer curriculum fully aware of potential health risks associated with computers. Until money is forthcoming for implementation of ergonomically designed computer rooms then professional development is simply **just more talk**. If, in this age of technology where supposedly all schools will march down the urge/rush to have schools & students embrace the wonders computers, where is the finance to ensure health & safety of these same students? You **cannot** have one without the other, but schools do because there is no requirement to do otherwise."

3. The need to consider the school-home link. The school-home link cannot be ignored when discussing issues related to health risks with computer use, as home and after hours use is the most likely time for health issues to arise. A principal from an Intermediate school commented:

"As a lead school in ICT it is an area we should consider. In most cases staff and pupils sit for only a short period of time at the computers but even so it is important that health and safety issues are addressed. I suspect that this should also be stressed in the home as often children and adults spend long periods of time in front of their computer."

As it is increasingly common for students to have computers at home and typically students spend a lot more time playing computer games and chatting on the Web than using computers at school, it is important to promote healthy computer work habits not only at school but at home as well. Unfortunately, many parents are more concerned about how fast their kids can search the Internet than forming good work habits.

4. The need to take up a broader perspective. In this study we have only looked at the physical health risks associated with computer use. However, the lack of professional development in ICT has created huge psychological stress for many teachers. As commented by one respondent:

"A great anxiety whenever I have to use it as my inadequacies are likely to be exposed"

The inadequacies referred to by this respondent had to do both with the lack of training on computer use as well as how it is to be used as a teaching and learning tool. Heath risks teachers should be aware of ought also to include the anxiety and psychological stress they have to deal with in using computers in their classrooms.

In the final analysis, the computer users themselves have to take responsibility of looking after their own well-being. Providing teachers and students with ergonomically designed furniture as well as professional development will certainly help. However, I suspect it is only when they have an in-depth understanding of the issues and an ergonomically conscious work culture, created, and supported by the school as well as the wider community both locally and at the national level, that health risks associated with computer use in schools could be greatly reduced.

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Acknowledgements

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Additional Information

A website has been developed as a result of this research project. Its URL is http://education.otago.ac.nz/NZLNet/safety/health_and_safety.html. This website is developed specifically for teachers and it consists of some very useful resources and links on health and safety issues associated with computer use.