

POTENTIAL HEALTH PROBLEMS FACED BY AN ASIAN YOUTH POPULATION WITH INCREASING TRENDS FOR COMPUTER USE

Grace PY Szeto

Department of Rehabilitation Sciences, Hong Kong Polytechnic University, Hong Kong
rsgszeto@polyu.edu.hk

Computers have become a very powerful tool in our everyday lives, and is becoming a very important educational medium. This paper discusses the computer use patterns of secondary school students in Hong Kong and compare these to the figures reported in western countries. Results of two questionnaire surveys showed the growing trends of daily computer use by students, and there are also high prevalence rates of musculoskeletal discomforts related to computer use. The issues of computer use at school and at home are discussed, especially in relation to the problem of space and resources. These problems are reflected in the lack of ergonomic considerations in the design and layout of computer workstations both at schools and at home. These issues need to be addressed urgently as they may have profound implications on the children's health.

INTRODUCTION

Computers are increasingly used in all aspects of life by people of all ages. To our younger generations, learning to use computers will be as essential as learning the languages or mathematics. Hong Kong is at the crossroads of the East and the West, and we have the two extremes of the most advanced technology and the deeply-rooted traditional Chinese cultural values co-existing. These characteristics may contribute towards a unique blend of "*Hi-Tech Culture: Asian style*".

The computer usage patterns among teenagers in Hong Kong result from a mixed influence of the education system, the local environmental factors and the influence of both western and Chinese cultures. Huge variations in the extent and habits of computer use exist both in the school system and in the home environment. In Hong Kong, a big problem is the over-crowding and the lack of space. This may also be a problem in many Asian metropolitan cities. Both in school and at home, the young adolescents may have to work with their computers in very confined spaces using furniture that are not designed for the job. In many schools, non-adjustable furniture are used which make it even more difficult to match the students (who can be in all sizes) to the computer workstations. There needs to be a greater awareness of the need for ergonomic interventions for our growing youth who are likely to use computers in their daily activities for the rest of their lives.

With the over-crowded population, computer workstations have to be installed in very limited space while accommodating large numbers of

students in school. Students also face the problem of limited space at home. As a result, the working environment with computers may be quite different from those in developed countries and the impact of computer use on the young adolescents in Hong Kong may be different. Furthermore, young adolescents may have large variations in body size during their growing years. However, most of the computer hardware and devices are designed for adult use. Thus, these adolescents may develop poor postures and negative physical health effects from working with computers, which may have long-term implications on their musculoskeletal growth and health in their adult lives.

Computer use in the Local Education System

Whilst our education system strives to keep in stride with the most advanced western technology and knowledge base; our traditional cultural values still rule us with achievement and competition as the driving force. The local government has been encouraging all schools to develop the use of computer technology for teaching. Nearly all schools have a subject called "computer study". The younger generation has started to be exposed to computer right from kindergartens, and they will continue to have computer lessons (usually 1 session a week) all the way to secondary school. Most schools have computer laboratories where the computer lessons are conducted. Depending on the language used as the teaching medium some schools will teach computer skills in Chinese while others teach in English. However, most students are well accustomed to switching between the two languages when they "surf" on the internet, and they become bilingual where computer language is concerned. Some schools have scheduled times for students to use

computers after school to search for information for their homework or projects. Most students may also use the computer at home for this purpose.

The aim of this discussion paper is to examine the patterns of computer usage among secondary school students in Hong Kong and how these uses are related to musculoskeletal discomforts. The results of questionnaire surveys conducted on Form 1-7 students will be discussed, and the common workstation settings both in school and at home will be compared.

RESULTS ON QUESTIONNAIRE SURVEYS AND FIELD VISITS

Computer Usage Patterns in Schools

Over a period of two years, 2 surveys were conducted in 4 local secondary schools. One was done on Form 1-3 students in two schools with 615 respondents and the other was done on Form 4-7 students with 655 respondents. The age distribution ranged from 12-13 years old in Form 1 to 17-18 years old in Form 7. The number of male and female students were about the same in both samples.

The results showed that most students used the computer for an average of 0-2 hours per week, as most forms had a "computer subject" that was held in the computer laboratory at each school only once a week. 40% of Form 1-3 respondents and over 52% of Form 4-7 students also used computers within school after classes, mainly for information searching and completing on-line assignments set by the schools.

This pattern of computer usage in schools would be quite different from that of the western countries. In Australia, some schools have provided each student with a laptop computer and they may be using the computer for a lot of interactive learning during classtime in schools (Harris and Straker, 2000).

This new mode of learning has a lot of resource implications and it may not be adopted in Hong Kong in the foreseeable future, especially in the public school system. However, it is possible that the private schools may embrace this type of interactive learning, and "electronic learning" may replace traditional teaching from a printed textbook in future.

Computer Usage Patterns Outside School

Among all the respondents in Form 1-7, over 94% have computers at home and majority of these are desktop computers. Less than 2% of home computers used by the students were laptops, and this reflects the common situation in most households in Hong Kong. Most commonly the display screens are the Cathode Ray Tube (CRT) monitors, but the LCD monitors are gradually becoming more popular.

Among these teenagers, the most popular activities for using the computer at home include: (1) word-processing and data entry, (2) computer games, (3) email communications, internet surfing and online chat (ICQ), (4) graphic and web-page design, (5) downloading songs and movies from the internet. About 60% of Form 1-3 students used computer at home for 0-2 hours per day, and 76.5% of Form 4-7 students spent 1-7 hours per week at home on computers. However, among the Form 4-7 students, about 11% used computer for 8-14 hours at home per week and 6% for 15-28 hours per week. This trend is likely to increase even more in the future.

In recent years, there has also been a popular trend for public places such as libraries, restaurants, coffee shops, bookstores and shopping centres to have computers available for patrons' use. The "Cyber cafes" or "Internet bars" are rapidly becoming very popular places for teenagers to socialize with their friends and play computer games together in small groups. The attraction of these places lies in the large variety of computer game packages that they can offer, and the teenagers can meet and play alongside with their friends rather than playing alone by themselves at home. 11% of the Form 4-7 students reported spending 1-7 hours in these places per week. This type of places is also becoming popular in other Asian countries, and our findings may possibly reflect the general situations both in Hong Kong and nearby south-east Asian metropolitan cities.

In contrast, teenagers in western countries may be more actively involved in sporting activities outside of school and they may not spend as much time at home with computers. In Hong Kong, due to the limited sporting facilities and the urban lifestyle, many young people are turning to their computers as their main instrument for leisure activities, and this may have a serious adverse effect on their health and fitness. Already, there has been a rising trend for obesity and poor fitness among school children in Hong Kong, which may be partly due to the lack of exercise and obsession with computers. There has also been a few extreme isolated cases of sudden deaths where teenagers died from dehydration and exhaustion after spending many hours non-stop playing computer games.

Computer Workstation Set-ups in schools and at home

We have visited a number of schools as well as a number of students at their homes in order to get first-hand knowledge of the physical environments in both settings.

In secondary schools that had limited resources or if the computer labs were established more than a few years ago, the workstation designs were usually less than ideal. It is common to have a 3-tier set-up with the display screen mounted on top of the CPU which is on top of the keyboard holder, and very often the chairs are plastic stackable chairs or stools with no back support at all. As the standard class sizes in secondary schools are between 35-45 students, the computer laboratory may need to house 30-40 computer workstations, and therefore the 3-tier system would help to save space. Figure 1 shows the typical set-up of a computer workstation in a local secondary school. Sitting in such chairs with no back support for 1-2 hours working with the computers may create considerable strain on the musculoskeletal system. And one can imagine the very short students would be really disadvantaged with this workstation set-up.

On the other hand, in schools that have more resources or if computer labs were recently installed, they may be equipped with the more “modern” workstation designs. The backward-inclined display screen sunken into the computer desk as suggested by Burgess-Limerick et al (1999) has been a popular design in recent years. However, these desks would still be incorporating the slide-out keyboard tray and there usually is very little room for forearm support. The use of swivel chairs with height adjustability is still very uncommon in these “newer” computer laboratories.

This problem of matching students with the right computer workstation furniture is not an easy one to solve, and it is an important issue that is only addressed recently, in both the developed as well as developing countries. The lack of adjustable furniture being used in school computer workstations, resulting in poor postures adopted by students, have also been reported in Canada, USA and Australia (Greig et al, 2002; Oates et al, 1998; Zandvliet and Straker, 2001).

In the home environment locally, there are large variations in the computer set-up and it is mostly affected by the availability of space, personal habits and family dynamics. Most households have one computer shared between the adults and the children and it is usually a desktop computer. In public

housing estates, it is common for a family of 4 to live in a high-rise flat of about 25 sq.m. Many teenagers or children have to share a room with their siblings and there is often not enough space for a proper computer desk. Use of the LCD screens or the laptop computer would help to save space but these are not very commonly used yet, mainly due to pricing factor.

Harris and Straker (2000) studied over 300 students aged 10-17 in Western Australia and reported on their commonly adopted postures in using laptop computers in schools, homes and boarding houses. These students were found to be either sitting at a desk, or sitting on the floor, the beanbag or a stool when using their laptops at home. In contrast, Hong Kong students would be either sitting at an ordinary study desk, or possibly at one end of their beds, working with their desktop computers in a very confined space. There are indeed quite big contrasts between the habits of computer use among Australian students and Chinese students in Hong Kong.

Prevalence of Computer-related musculoskeletal discomforts

In the questionnaire survey of the Form 1-3 students, the eyes and the neck were the most frequent areas of discomforts with 49.4% and 40.3% of respondents with complaints respectively; and the mean discomfort was 3.1 ± 1.6 on a numerical scale of 0-10. For the Form 4-7 students, the respective number of respondents with discomforts in the eyes were 155 (35%), the neck 133 (30%) and the shoulders 132 (29.7%). Majority of the complaints in these areas were bilateral and the mean score ranged from 3.2 ± 1.9 for the eyes, to 3.9 ± 2.1 for the shoulders.

Interestingly among the Form 1-3 students, the percentages of students indicating that their eye and neck-shoulder discomforts were related to computer use, ranged from 94% for the eyes, 86% for the neck and 71% for the shoulders. These figures were not as high among the Form 4-7 students with only 20% for the eyes, 16% for the neck and 14% for the shoulders. One of the possible explanations for these differences may be that the Form 4-7 students may spend more time on their written homeworks, reading and studying from books as they are usually preparing for major public examinations. Hence they may feel that their visual and neck-shoulder discomforts were more related to the studying rather than computer use. Another possible explanation may be that these students in the age range of 15-17 may be already nearing the later or end stage of their growth spurts, and therefore may not experience as much “growing pains” as their more junior fellow students. This

aspect is an interesting area that requires more detailed exploration in future studies.

Harris and Straker (2000) reported a 60% prevalence rate for musculoskeletal discomforts associated with laptop use and a similar rate of discomforts was also found related to the carrying of laptop back and forth from school. Both the different computer use patterns, the lifestyles, as well as the different cultural perceptions of discomforts must be considered in comparing the discomfort prevalences of the western and eastern students.

CONCLUSION

Computers are being used increasingly by people of all ages. They are also becoming an important educational medium in the school system in Asian countries. In a city like Hong Kong, most students are being exposed to computers at school and at home. The questionnaire survey results showed rising trends for computer use among the older teenagers. Computers are also become an important leisure tool for these teenagers both at home and in “cyber cafes”.

However, the problems of limited space and resources mean that very little consideration is given to ergonomic principles in designing computer laboratories in schools. Same problems also apply in the home situation. This issue needs to be addressed seriously in the near future as it may have profound implications on the children’s growth and development, and such adverse health effects may also impact on their adult lives.

REFERENCES

- Briggs, A., Greig, A., and Straker, L. 2002. Posture of school children using information technology (Part A). Proceedings of Human Factor 2002, Nov 25-27, Melbourne, Australia.
- Burgess-Limerick, R., Plooy, A., Fraser, K., & Ankrum, D. 1999. The influence of computer display height on head and neck posture. *International Journal of Industrial Ergonomics*, 23, 171-179.
- Harris, C., Straker, L., 2000. Survey of physical ergonomics issues associated with school children’s use of laptop computers. *International Journal of Industrial Ergonomics* 26 (2), 337-347.
- Oates, S., Evans, G.W. and Hedge, A. 1998. An anthropometric and postsural risk assessment of children’s school computer work environments. *Computers in the Schools*, 14, 55-63.
- Szeto, G.P.Y., Lau, J.C.C., Siu, A.Y.K., Tang, A.M.Y., Tang, T.W.Y., and Yiu, A.O.Y. 2002. A study of physical discomforts associated with

- computer use in secondary school students. *Proceedings of CybErg* 2002. <http://cyberg.wits.ac.za/>
- Zandvliet, D.B., and Straker, L.M. 2001. Physical and psychosocial aspects of the learning environment in information technology rich classrooms. *Ergonomics*, 44 (9), 838-857.



Figure 1: Typical computer set-up in a local secondary school computer laboratory. The 3-tier system consists of the display screen on top of the CPU which is on top of a metal frame housing the slideout keyboard tray. The table has just enough room to hold the computer and the printer. It is not clear where the student would place the mouse. The chair used is a non-adjustable fold-up chair.