

H-EtICT-K8 (HEALTH EDUCATION THROUGH ICT FOR K-8): COMPUTERS AND YOUR HEALTH

A. Naci Çoklar, Serkan Şendağ, S. Duygu Erişti

Computer and Instructional Technologies Teaching Department, Eskisehir, TURKEY.

ncoklar@anadolu.edu.tr, ssendag@anadolu.edu.tr, sdbedir@anadolu.edu.tr

ABSTRACT

This paper concentrates on a software prepared as a series of Health Education for K8 students in Turkey. Bearing in mind that healthy mind rests in a healthy body, the researchers prepared a series of software on different aspects of health. This specific software tries to donate the K8 students with healthy use of computers in everyday life. Thus, the software includes the ideals in physical environment, ergonomics and the health problems in computer setting.

Keywords: Health Education, Computers and Software K-8.

INTRODUCTION

We all thought technology would make our lives easier. Indeed they did, they have become smaller, easier to use and fast. With the introduction of WWW, computers have become a center of attention (Aarogya, 2004). However, the health problems introduced with computers has been underrated. Research tells us that more than 10 million people in USA suffer from computer related health problems, ranging from eyestrain to disabling hand and wrist injuries (LOHP, 2006). Since living with computers is a lifestyle of its own, individuals must be donated with the necessary knowledge to remain healthy in computer settings.

Using computer for long periods causes important and permanent disorders on young children. There is an important increase in the rate of children applying clinics due to disturbances related to using computer. Current statistics reveal that over twenty children apply to clinics for help every month in Turkey. Although children were playing physically active games in past, today they sit for hours and play computer games for long periods. It is obviously important that children, too, use computers. However playing computer games, and using computers for long periods have the risk of catching permanent illnesses (Kirazlı, 2002).

Computer-related health problems are caused by improper use and lack of knowledge about "safe computing techniques". It is therefore important to educate the computer users on these health issues. It is impossible to not to use the opportunities of computer today. So for a healthy use of computer some questions need to be answered by computer users, "How could an ergonomical work environment be arranged for computer use?", "What kind of health problems appear for the people who do not use

computers ergonomically?", "What are the requirements for a healthy computer use?", "What kind of exercise could be done to prevent disorders due to computer use?" (Keser, 2005). Although there are courses that include muscular and skeleton systems and exercise in primary school curriculum in Turkey, there is no subject on computer health and requirements for using computer (MEB, 2006). Since computers are used widely in Turkish K8 system, it is a must that primary school students be donated with the necessary skills to use the computers efficiently.

Common Computer-Related Health Problems

Healthy computer use is one of major concerns of information era. We all know the importance of understanding users and their environment when we design software. Before designing the software we really need to start our analyses from scratch in a complex, dynamic environment of computer use. Indeed, it is hard to imagine a less promising educational strategy for young children than emphasizing abstract thinking, fueled by powerful computers. Research findings across many scientific disciplines strongly suggests that later intellectual development is rooted in rich childhood experiences that combine healthy emotional relationships, physical engagement with the real world, and the exercise of imagination in self-generated play and in the arts. Intense use of computers can distract children and adults from these essential experiences. So that is why healthy computer use is important in childhood and why we focus on K8 (Gosbee & Ritchie, 1997; Healthy Children, 1997).

Many health concerns can be associated with intense computer use. Parents, teachers and adults must know about the children's cognitive psycho-social and physical development process. They must arrange children's computer use and appropriate settings. If the parents do not pay attention to computer use of their children, some hazards will be waiting for them. The most common health effects associated with using a computer are muscular skeletal discomfort, eye fatigue, and Repetitive Stress Injuries (RSI). Repetitive Strain Injury is caused by repetitive movements, awkward working positions, inadequate rest breaks and poor design of equipment. Specific types of RSI are tenosynovitis inflammation of the

tendon sheath in hands, wrists and arms), writer's cramp and tennis elbow. The symptoms are pain or discomfort in the upper limbs, tingling sensations, restricted joint movement (particularly in the wrists) and poor grip. As with any activity that involves sitting for long periods of time, using a computer can make the muscles sore and stiff. These effects can be minimized by setting up the workstation carefully, by taking frequent breaks to rest tired muscles, and by doing some simple stretching exercises to relieve strain. Much of the muscle soreness, eye fatigue, and other discomforts and injuries can occur from other activities. In fact, misuse of the same muscles and joints during multiple activities can make the problem worse. For example, if someone engage in non-work activities that may involve repetitive stress on the wrist — such as playing the piano — and also use computer keyboard improperly; likelihood of developing wrist problems may be increased. Preventing health problems is a multi-faceted task that requires careful attention to the way we use the body every day. Repetitive Stress Injuries (RSIs) also known as Cumulative Trauma Disorders (CTDs) can occur when a certain muscle, joint, or tendon is repeatedly overused and forced into an unnatural position. The exact amount of stress that will cause RSI is still not known, but in addition to awkward postures, factors such as the amount of repetition, force used in the activity, and the individual's physiology and lifestyle may affect the creation of RSI. RSIs did not suddenly arise with computer use; tennis elbow and writer's cramp are two well-known RSIs. Pianists have frequently suffered from RSIs, sometimes terminating very promising careers. One RSI discussed more often today, however, is a wrist problem called Carpal Tunnel Syndrome (CTS). It may be caused or aggravated by improper use of computer keyboards. This nerve disorder results from excessive pressure on the median nerve as it passes through the wrist to the hand. We offer advice on setting up the chair, desk, keyboard, and other parts of computer workstation. Proper workstation ergonomics will help to minimize the possibility of developing RSI. The effects of repetitive movements associated with using a computer can be compounded by other work or leisure activities to produce or aggravate physical problems, so proper use of computer system must be considered as just one element, an important one, of a healthy lifestyle. No one can guarantee that someone will not have problems even when he/she follow the most expert advice on using computer equipment. A person should always check with a qualified health specialist if muscle, joint, or eye problems occur (FEOS&HP, 2006; Dennerlein et. al, 2002; UBIS, 2000). When we mention a software design in any subject, it is

essential that we need a systems approach. Computer related health problems require understanding of many interdependent systems which are especially related to environmental factors. So we will explain these settings here. Our software developed for healthy computer use, "Computers and Your Healthy" is organized under an acronym COMPUTE which is developed by Kennard (Kennard, 2004). COMPUTE stands for;

- Contact stress
- Organisation
- Monotony
- Posture
- Uncomfortable environment
- Tetchiness
- Exercise

Contact Stress

One of the common and important problems are encountered are wrist and hand problems called contact stress. In general, contact stress refers to the pressure that is put on different parts of the body whilst in a relatively fixed position. For example, 'floating' the hand over the mouse for long periods leads to strain on the ligaments in the back of the hand and the wrist. Mostly, health problems may occur as a result of high repetition of hand movements, forceful typing, or having bent wrists whilst using the keyboard. One of them is Carpal tunnel syndrome which is a painful condition that affects the wrists and hands following pressure to the median nerve. Numbness may also be experienced in one or both hands and even the simplest of tasks involving the hands becomes a painful and sometimes impossible activity. Attention to posture, light keyboard actions and mouse movement and simple regular exercise can help to prevent problems. If problems arise it is important to stop and seek medical assistance. Contact stress can occur either internally or externally. Internal stress occurs when a tendon, nerve, or blood vessel is stretched or bent around a bone or tendon. External contact stress occurs when part of your body rubs against a component of the workstation, such as the edge of the desk. Nerves may be irritated or blood vessels be constricted as a result.

- A kid can experience contact stress to her forearms when someone rest them on the leading edges of work tables or, if the nerves in the forearm are affected, the fingers and hands may tingle and feel numb, similar to the feeling when she hit her "funny bone".
- A kid may experience pain and numbness in your legs if blood circulation is cut off by contact with the leading edge of a chair.

- Her forearms and wrists can be affected if wrist rests have sharp, hard leading edges.
- Tendons can be damaged when repetitive finger motion tasks are performed with a bent wrist (Kennard, 2004; USDL, 2006).

Organization

Organization can help preventing computer-related health problems. Think about the nature and pattern of the work. If it is necessary to undertake repetitive tasks with the computer try, where possible, vary these with other activities. Take small breaks. It is essential not to sit at the computer during breaks; much better to get the circulation going and step out for some fresh air. Think carefully before accepting overtime or agreeing to take on extra work, or forcing the pace to try and finish the work you have. Many computer workstation tasks are highly repetitive. A kid may perform the same motions repeatedly at a fast pace and with little variation. When motions are isolated and repeated frequently for prolonged periods, there may be inadequate time for the muscles and tendons to recover. Combining repetitive tasks with factors such as awkward postures and force may increase the risk of injury. Computers require little task variation. Old typing activities, such as adding paper or mechanically advancing pages, have been reduced or eliminated. Users can stay in their chairs and type or perform mouse work for an almost unlimited amount of time. Here, the hazard may be greater because the motions are often concentrated in only a few fingers of one hand. A computer operator may remain in essentially the same posture for an entire shift. This forces a few isolated muscles to repeatedly activate to accomplish a task such as holding the head up or focusing on a computer screen. A poorly designed workstation may cause the kid to repeatedly reach to use a mouse or answer the phone. This can fatigue the muscles of the shoulder and irritate the tendons. Even when the design of the workstations is correct and environmental factors are at their best, users can face risks from task organization which can intensify the impact of other risk factors, such as repetition. Additionally, failing to recognize early warning signs could allow small problems to develop into serious injuries. Addressing task organization factors and medical awareness can help minimize the risk of developing musculoskeletal disorders (MSDs) and stop the progression to injury. Prolonged Periods of Activity may cause serious hazards. Computer works, whether it's for a job or for fun, may appear to be a low effort activity when viewed from a total body perspective, but maintaining postures or performing highly repetitive tasks for extended periods can lead to problems in localized areas of the body. For example, using a mouse for a few minutes should not be a problem for most users,

but performing this task for several uninterrupted hours can expose the small muscles and tendons of the hand to hundreds or even thousands of activations. There may not be adequate time between activations for rest and recuperation, which can lead to localized fatigue, wear and tear, and injury. Likewise, maintaining static postures, such as viewing the monitor, for a prolonged period of time without taking a break can fatigue the muscles of the neck and shoulder that support the head (Kennard, 2004; USDL, 2006).

Monotony

Any task that involves staring at a computer screen, no matter how exciting or interesting, leads to physical fatigue. So whilst you may be quite happy to press on with work your body may have other ideas. The most common physical complaints are eye strain and problems with vision. Headaches are also a product of prolonged staring at a screen. Remember to look away from the screen when kids do not need to use it. Parents must check that the light levels are comfortable and that you are not dealing with screen-reflected glare from windows or lighting. Some people find glare-reducing screens useful. A display screen that is too high or low will cause you to work with your head, neck, shoulders, and even your back in awkward postures. When the monitor is too high, for example, a kid has to work with her head and neck tilted back. Working in these awkward postures for a prolonged period fatigues the muscles that support the head. Taking Breaks is an essential way to put an end to monotony. The kids should not use the computer for too many hours in a row. Spreading computer use over the week and taking regular breaks will make the body relax. To listen to the signals sent by the body should guide you taking breaks. Pain should not be ignored but should be taken seriously in order to prevent possible damage (Kennard, 2004; USDL, 2006; UC Ergonomics Program, 2006).

Posture

Bad posture is one of the most important problems. Correct posture is important to allow correct blood circulation and to avoid stress and strain to the neck, back and limbs (Figure 1) (UBIS, 2000). The feet and the back should be supported. The back should be supported. The shoulders should be relaxed. The wrists should not be excessively bent. The legs should not be crossed. Actually, posture includes most of the factors previously discussed under Contact Stress. Kids should be able to reach the keyboard and mouse whilst bending their elbows at 90 degrees, with their shoulders relaxed. If they are stretching, this could cause problems. Their back should be straight and the top of the monitor should

be just below eye level. If their monitor is to the left or right of their keyboard they are putting strain on their neck. Long periods of time at the computer often lead to pain in the lumbar region of the back. They should vary the posture.

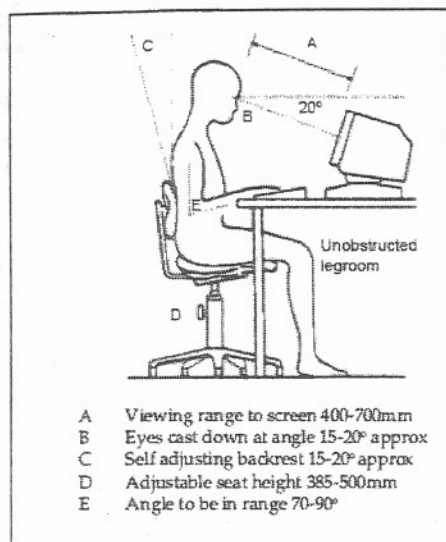


Figure 1: Suitable Posture Position

They should not just sit and dictate—stand up at the computer, or pace around (as microphone cord allows). Wireless microphones can give even more pacing room. One of the benefits of speech recognition is that they are not stuck in a frozen, rigid posture at the keyboard (UBIS, 2000; Kennard, 2004; Dragon Naturally Speaking, 2006).

To understand the best way to set up a computer workstation, it is helpful to understand the concept of neutral body positioning. This is a comfortable working posture in which the joints are naturally aligned. Working with the body in a neutral position reduces stress and strain on the muscles, tendons, and skeletal system and reduces your risk of developing a musculoskeletal disorder (MSD). The following are important considerations when attempting to maintain neutral body postures while working at the computer workstation (USDL, 2006):

- Encourage kids to use good posture when working at the computer, sitting straight on a well-fitted chair, and resting wrists on a desk.
- Workstations in schools should be adjustable for different-sized students. Look for chairs with adjustable seats, adjustable-height work surfaces or separate keyboard trays, keyboards at elbow-height, and possibly adjustable footrests.
- If your child's feet don't reach the floor, try boxes, blocks, or telephone books as a footrest.

- Encourage your child to change positions frequently to avoid fatigue. Simply walking around the room rests both eyes and body (Family Education, 2006).

Uncomfortable Environment

Some of the issues previously mentioned contribute to an uncomfortable work environment. For example, poor lighting levels or screening, poor air circulation, noise and equipment issues all contribute to an uncomfortable work setting. A good combination of environmental and relationship factors are necessary to help avoid stress. The best way to stay healthy at the computer is to stay relaxed. Many of us tense up around computers. Cultivating calmness will make the body of child feel them good. A comfortable, adjustable chair lasts many years and can prevent or lessen back pain. Look for a chair that adjusts in height and swivels, and that has a tilting back and seat. Several alternative keyboards are available that offer different shapes and key configurations. Manufacturers claim that typing on their keyboards strain the hands less than the traditional flat keyboard. (Kennard, 2004; Dragon Naturally Speaking, 2006). Appropriately placing lighting and selecting the right level of illumination can enhance ability to see monitor images. Lighting for your work area must provide enough illumination for your keyboard, screen and paper documents without causing problems of reading your display due to glare, reflection or washout. For example, if lighting is excessive or causes glare on the monitor screen, the kids may develop eyestrain or headaches, and may have to work in awkward postures to view the screen. Do not set up the display right in front of a window, or if you must, use blinds or curtains to reduce or soften the incoming light. Similarly, sunlight coming from directly behind you can cause undesirable glare or reflection. If possible, set up your workstation so that the overhead lights are to the left or right of the monitor and are at right angles to it. Position lamps so they do not shine directly into your eyes or reflect off the screen. Ventilation and humidity levels in office work environments may affect user comfort and productivity (USDL, 2006; FEOS&HP, 2006).

Tetchiness

When the demands made on a person outstrip their ability to deal with them effectively, the term 'stress' is applied. A lot of stigma is still attached to stress despite the fact that it is the single most common factor for missing work. People rarely phone in to say they are sick through stress and are more likely to

refer to something opaque like a viral infection. People are fairly good at spotting the signs of stress in others, but not always as sensitive to their own feelings. Signs of stress are feeling irritable, feeling down, not sleeping properly, digestive problems, backaches and headaches and an increase in blood pressure. Realizing that you are experiencing stress in a negative way is the first step in taking corrective action (Kennard, 2004). Spending long uninterrupted hours at the computers, especially under stressful conditions, using improper work habits and improper postures can increase the stress (UC Ergonomics Program, 2006).

Exercise

Exercise is a wonderful tonic and it can be as simple as stretching the arms and legs and flexing back, neck and hands whilst sitting in front of the monitor. We all know that exercise is good for the body and the mind, yet not everyone participates in the way they could or should. A combination of good diet, low caffeine, and regular movement of the limbs can go a long way to preventing or solving health problems associated with your computer, and of course, your life in general. If you typically make hand gestures as you speak to other people in person, go ahead and make those gestures at the computer. Your voice will have more energy, and speaking will be more relaxed and comfortable (Kennard, 2004; Dragon Naturally Speaking, 2006). Here you will find stress management tips for the telecommuter as well as stretching exercises that can be extremely useful in eliminating ergonomic-related discomfort (LHC, 2006a). Shifting your position and occasionally changing your routine by performing different activities and/or stretching exercises can be extremely useful in eliminating ergonomic-related discomfort. Some of the more common stretching exercises that you can perform at your desk are listed below. In addition, don't forget that keeping yourself in good physical condition through a regular exercise program will keep you healthy both at home and at work (LHC, 2006b).

- General: Stand up and stretch your arms over your head
- Eyes: Rest your eyes by occasionally looking into the distance and/or closing them for a few seconds.
- Neck: Turn your head slowly to the left for 5 seconds and then to the right for 5 seconds. Repeat several times.
- Shoulders: Let your arms relax at your side and then raise your shoulders, rotating them up and back in a circular motion. Repeat several times.

- Upper Back: Make sure that your chair is stable. With feet flat on the floor, clasp your hands behind your head and slowly arch your back, bending your head backward. Hold up to 5 seconds.
- Wrists: With your hands held in front of you, gently rotate your wrists so that the fingertips form circles in the air. Repeat several times.
- Fingers: First clench both fists and hold for 5 seconds. Then spread fingers as far as you can and hold for 5 seconds. Relax and repeat several times.

All these issues regarding a healthy use of computers forced us to develop a software for K8 students. The goal of our application is not to teach skills explicitly, but rather to provide a motivating experience through which kids may practice social and group work skills. The pedagogical design of our software stems from Piaget's constructivist learning theories; we wanted to create a tool where learners could be active participants in the task and construct their own knowledge, based on experiences with others in the world. We also draw on Vygotsky's theory that learning is a social process and has its roots in social interaction (Piper et. al, 2006).

COMPUTERS AND YOUR HEALTH SOFTWARE

The project, improved in Anadolu University Education Faculty, Computer and Instructional Technologies Teaching Department, as a series of Health Education for K8 student. At the design process the character of target audience (Turkish K8 students aged 7-15) determined the visual and auditory properties of the software. Macromedia Dreamweaver is used to reflect the design in html code and the animated applications which make student's understanding easier were designed by Macromedia Flash and Macromedia Director. There is a title selection screen at the home page of the software (Figure 2).



Figure 2: Title Selection Display Screen

By the help of "Title Selection Screen" students enter each of the titles to get knowledge. The students meet a screen includes text about the selected health problem (Figure 3).

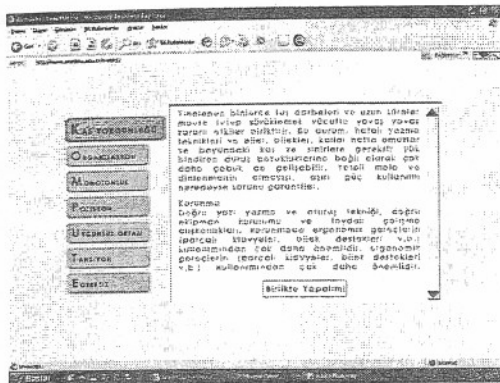


Figure 3.:Title Content Selection Display Screen

There is also a button called "Let's exercise together" on each title screen (Figure 4). This button helps the students learn about the exercise by the help of animated applications and videos through the health problem.

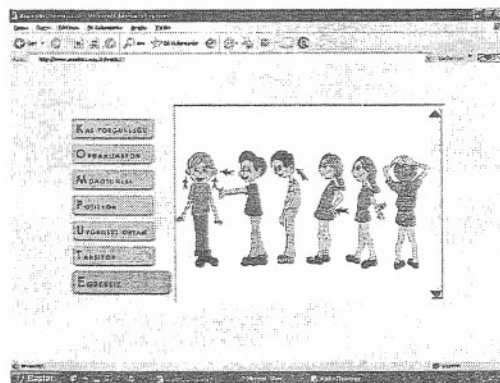


Figure 4: "Let's exercise together" Display Screen

Software is transferred to internet media by the help of Anadolu University server.

CONCLUSION

With the increasing use of computers in K-8 settings in Turkey, necessary steps should be taken for an effective use of computers. Whether for or through ICT, all the educators should aim for the proper use of computers. This project improved within a series of health education, specifically includes the title, Computers and Your Health. The software prepared is ready for evaluation at the moment. The future steps will include the following:

- The evaluation of the software by K-8 students for comprehensibility
- The evaluation of the software by K-8 teachers for reliability
- The evaluation of the software by instructional designers

On completion of the above steps the software will be distributed to K-8 schools in Eskişehir. It is also thought that these software can be applied in Europe where there are Turkish students thus the software is believed to be a strong communication tool for Erasmus Activities of the Computer and Instructional Technologies Teaching Department.

REFERENCES

- Aarogya, (2004). *Computer Health Hazards*, T-Edge Solutions Pvt. Ltd., Pune, India, URL: <http://www.aarogya.com/Conditions/computer/index.asp>.
- Avenue, NW Washington, URL: <http://www.osha.gov/SLTC/etools/computerworkstations/pdf/computerworkstations.pdf>.
- Dennerlein, J., DiMarino, M.H., Becker T. & Johnson, P. (2002). *Wrist And Shoulder Muscle Activity Changes Across Computer Tasks for HFES 46th Annual Meeting*, Presented at HFES 46th Annual Meeting 2002, Baltimore, MD USA, URL: www.hsph.harvard.edu/ergonomics/hobs/dennerleinHFES2002.pdf.
- Dragon Naturally Speaking, (2006). *Healthy Computing*, Web Services of Nuance Communications, URL: <http://lib.store.yahoo.net/lib/sayican/bookc15.pdf>.
- Family Education, (2006). *Healthy Computer Use: Eyestrain and Back Pain*, Pearson Education, URL: <http://life.familyeducation.com/computers/eyes/36252.html>.
- FEOS&HP-Federal Employee Occupational Safety & Health Program, (2006). *Creating A Healthy Workstation Environment*, Department Of Energy, United States of Am Erica, URL: <http://www.eh.doe.gov/FEOSH/pubs/ergo4.pdf>.
- Gosbee, J. & Ritchie, E. (1997). *Human-Computer Interaction and Medical Software Development*, ACM Interactions. URL: <http://www.hci.iastate.edu/TRS/REPORTS/ISU-HCI-2006-02.pdf>.
- Healthy Children, (1997). *Lessons from Research on Child Development*, University of Chicago Press, pp.8. URL: <http://www.allianceforchildhood.net/projects/downloads/chapter1.pdf>.

- Kennard, J. (2004). *Are computers damaging your health?*, Computers and Men's Health-About.com, URL: <http://menshealth.about.com/cs/workhealth/a/computers.htm>.
- Keser, H. (2005). *İnsan Bilgisayar Etkileşimi ve Sağlığa Etkisi*, Nobel Publication, Ankara, Turkey,
- Kirazlı, Y. (2002). *Bilgisayar ve Sağlık*, Metu Computer Center (Computing & Information Services Newsletter), URL: <http://www.cisn.odtu.edu.tr/2002-5/health.php>.
- LHC-Lenovo Healthy Computing, (2006a). *Stress Management for Telecommuters*, Web Services of Lenovo, URL:<http://www.pc.ibm.com/ww/healthycomputing/stress.html>.
- LOHP-Labor Occupational Health Program, (2006). Web Services Labor Occupational Health Program University Of California At Berkeley, USA, URL:http://ist-socrates.berkeley.edu/~lohp/Publications/Computer_Health___Safety/computer_health___safety.html.
- LHC-Lenovo Healthy Computing, (2006b). *Stretching exercises*, Web Services of Lenovo, URL:<http://www.pc.ibm.com/ww/healthycomputing/stretching.html>.
- MEB, (2006). *Yeni Öğretim Programları*, URL:http://ttkb.meb.gov.tr/ogretmen/modules.php?name=Downloads&d_op=viewdownload&cid=18.
- Piper, A.M., O'Brien, E., Morris, M.R. & Winograd, T. (2006). *SIDES: A Cooperative Tabletop Computer Game for Social Skills Development*, Proceedings of CSCW 2006, URL:<http://hci.stanford.edu/cstr/reports/2005-07.pdf>.
- BIS-University of Brighton Information Services, (2000). *Having a healthy relationship with your computer?*, URL:http://staffcentral.brighton.ac.uk/xpedio/groups/Public/documents/workshop_docs_IS/doc002851.pdf.
- USDL- U.S. Department of Labor, (2006). *Occupational Safety & Health Administration*, Web Service of U.S. Department of Labor Constitution UC Ergonomics Program, (2006). *Safe Computer Use Tip*", Web Services UC San Francisco/UC Berkeley Ergonomics Program Web Site, 2006, URL:<http://www.me.berkeley.edu/ergo/services/tips.html>.