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ERGONOMIC WORK CULTURE AS A PREREQUISITE FOR HEALTHY COMPUTER WORK TOWARDS QUALITY OF LIFE

Abstract

Ergonomic culture can be explained as a component of general safety culture related to ergonomic working environment on the one hand, and computer users' attitudes towards ergonomically safe computer use, defined by work safety regulations, on the other hand. Both those aspects are important components within general safety culture. The article analyses various factors of ergonomic culture in different environments in Latvia, as well as partially in the Czech Republic and Slovakia.

ERGONOMICZNA KULTURA PRACY JAKO WARUNEK WSTĘPNY DLA ZDROWEJ PRACY Z KOMPUTEREM POD WZGLĘDEM JAKOŚCI ŻYCIA

Streszczenie

Ergonomiczna kultura może być wyjaśniona jako składnik ogólnej kultury bezpieczeństwa odnoszącej się do ergonomii środowiska pracy z jednej strony i postaw użytkowników komputerów i ergonomicznie bezpiecznego korzystania z komputera, określonej przez przepisy bezpieczeństwa pracy, z drugiej strony. Oba te aspekty stanowią ważne komponenty wewnątrz ogólnej kultury bezpieczeństwa. Artykuł analizuje różne czynniki kultury ergonomicznej w różnych środowiskach na Łotwie, jak i częściowo w Czechach i na Słowacji.

Introduction

According to EUROSTAT data in 2010 information technologies (IT) were available to approximately 70% of all households throughout European Union (EU)¹, however in such countries as the Czech Republic (CZ), Latvia (LV) and Slovakia (SK) the availability of IT was respectively 64, 50 and 64% out of all households. Meanwhile the number of individual computer users aged 16 – 74 in 2010 reached 67% LV, 69% CZ and 78% SK, but in 2011 – 74%, 78% and 83% respectively, which confirms very rapid growth in computer use. Compared with average value in EU, 78%, all three countries are approx. on EU-average level

¹ *Information society statistics* (2011); http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Information_society_statistics. (Retrieved 15.02.2012.)

of computer use by 16-74 y. o. individuals, although they lag behind countries such as Sweden and Norway (each 96%) and Iceland (97%)². But given the fact that in today's schools children start using computers at a very early age, sometimes even pre-school age, it must be assumed that the percentage of users is even larger.

Since the computer, or rather working on the computer, is recognised as a serious health risk factor, those in charge of educating new users must teach their students how to use their computers and organise their work stations ergonomically. Moreover it is essential to inform users about various potential health risks, the most serious of which are *loss of hearing*, *computer vision syndrome*, *E-thrombosis*, *generalized anxiety disorder*, and *back problems*³, as well as teach them methods how to prevent and reduce those health disorders.

Among other health problems caused by neglecting the basic demands for healthy computer use *Carpal tunnel syndrome* (CTS) is mentioned as one of the most serious, although, as it has been stated by J. F. Thomsen, F. Gerr, and I. Atroshi, there is insufficient epidemiological evidence that computer work causes CTS⁴. *Neck pain* and *headaches* are frequent among users who spend long hours by their computers⁵. The conclusion, therefore, is that computer users have to be educated regarding appropriate working practices and possible risks through neglectful attitude towards working ergonomics.

However, is equally important to ensure that all computers users, regardless of age and working intensity, have not only acquired the theoretical basis for ergonomically appropriate computer use but also put them to practice on a daily basis. Although the work⁶ reveals that even among students who have acquired the fundamentals of ergonomics only a half practically observe those demands.

Certainly each country issues its own regulations regarding safe working practices. However, experience *apriori* reveals, that users, for various – mostly subjective – reasons, fail to observe even the basic demands. Moreover working safety legislation in Latvia and many other countries refers only to employees, forgetting about university and school students. Those laws do not apply also in situations when employees use computers at home – mostly for entertainment and leisure. It is very difficult to detect to what extent, if any, computer

² Computer skills in the EU27 in figures. EUROSTAT NEWSRELEASE (2012). http://epp.eurostat.ec.europa.eu/cache/ITY_PUBLIC/4-26032012-AP/EN/4-26032012-AP-EN.PDF (Retrieved 03.09.2012.)

³ *Top 5 Health Problems Caused By Computer Use* (2008). <http://www.safecomputingtips.com/blog/healthy-computing/top-5-health-problems-caused-by-computer-use>. (Retrieved 15.02.2012.)

⁴ Thomsen J.F., Gerr F., Atroshi I., (2008). Carpal tunnel syndrome and the use of computer mouse and keyboard: A systematic review. *BMC Musculoskeletal Disorders*, vol. 9:134 [doi:10.1186/1471-2474-9-134]

⁵ Smith L., Louw Q., Crous L., Grimmer-Somers K. (2008). Prevalence of neck pain and headaches; impact of computer use and other associative factors. *Cephalgia*, vol. 29, 250-257.

⁶ Kamaroddin J.H., Abbas W.F., Aziz M.A., Sakri N.M., Ariffin A., (2010). Investigating Ergonomics Awareness Among University Students. *International Conference on User Science Engineering*, 296-300.

users observe the demands for safe working in their homes, although the problem itself is serious.

The goal of this research is to summarise the available data, including the results of recent (2010-2012) pilot researches in Latvia, the Czech Republic and Slovakia regarding the ergonomic working culture among different groups of computer users. The data obtained from the questionnaires as well as from previous publications have been processed using the SPSS program.

1. The concept of *ergonomic culture* as a component of *safety culture*

In order to evaluate *the ergonomic culture of computer users*, it is first necessary to establish what is meant by the concept in the context of this article. Provided that: *Ergonomics is the scientific discipline concerned with the fundamental understanding of the interactions among humans and other elements of a system ... in order to optimize human well being and overall system*⁷, and bearing in mind that *ergos* (from Greek) means *work*, the fundamental aspect is *work done by man*. Further on we could talk about the concept of the *culture of work* which is usually defined as *a set of tools, methods, guidelines, samples and standards of behaviour inherent in a particular group of people working together employed*⁸. The culture of work equally depends on the contents of this work and the technical equipment, on how the working process is organized as well as on employees – their level of education, professional skills and life experience. In this context the concept of the culture of work is closely related to the notion of *organizational culture*.

The concept of *organizational culture*, in turn, includes the component of *safety culture*, which is defined as follows: *The safety culture of an organisation is the product of individual and group values, attitudes, perceptions, competencies, and patterns of behaviour that determine the commitment to, and the style and proficiency of, an organisation's health and safety management. Organisations with a positive safety culture are characterised by communications founded on mutual trust, by shared perceptions of the importance of safety and by confidence in the efficacy of preventive measures*⁹.

⁷ Ergonomics Guidelines for Occupational Health Practice in Industrial Developing Countries/ *Joint Project of the International Ergonomics Association and the International Commission on Occupational Health*, 2010, p. 12.

⁸ [Free glossary of terms, concepts and definitions in economics, finance and business. *Work culture*]. <http://termin.bposd.ru/publ/12-1-0-9748>. (*In Russian*, Retrieved 20.01.2012.)

⁹ Successful health and safety management (1997)., HSE books, – <http://www.hse.gov.uk/pubns/books/hsg65.htm> (Retrieved 01.03.2012.)

The design of every individual working place, on the one hand, and the demands for healthy working practices on the computer, on the other hand, are to a great extent regulated by the general ergonomic demands; which is why we can and should be discussing employees' ergonomic culture as a component of the culture of work as far as it corresponds to ergonomic regulations maintained by the rules of work safety. This is the particular context in which the article discusses ergonomic culture.

The concept of the *ergonomic culture*, related to teachers work, has been analysed by L.Sidorchuk, and she considers teachers' ergonomic culture as necessary set of universal ideas and values, professional guidance and ergonomic qualities of the individual, universal ways of learning and teaching activities of ergonomic technology. The presence of such a culture allows the teacher to examine and diagnose the level of students, to understand them, to enter into the world of culture, to organize joint etc.¹⁰

It has to be noted that neither scientific nor normative sources have yet extensively analysed the concept of ergonomic culture. R.T. Smith points out that: *The concept of an 'ergonomics culture' is one where everyone understands and bears some responsibility for ergonomics. This implies that all members of a work organization are informed and empowered to make improvements appropriate to their level of assigned responsibility*¹¹. This work provides a broader overview of various types (5 in total) of ergonomic culture¹². R. Pater wrote "*ergonomic culture*" is, ..., *one where most organizational members pay attention to small changes that could build up – either those that further or those that harm safety and performance*"¹³.

2. The elements of ergonomic culture in practical computer use

The factors characterising computer users' ergonomic culture are varied. First of all those are: the posture assumed while working, organization of work and management of time spent by the computer – how varied the activities carried out on the computer, how lengthy the periods of work, how frequent the breaks and activities during those are, etc. The manifestations of ergonomic culture based on these factors mostly depend on the understanding and attitude of a particular computer user as well as on their psycho-emotional state. It is those

¹⁰ Сидорчук Л.А., Формування ергономічної культури вчителя в системі його професійної підготовки. *Наукові Записки/ Сер. Педагогічні науки*, 2009, вып. 82 (2), с. 68-73.

¹¹ Smith R.T., Growing an ergonomics culture in manufacturing. (2003). *Proceedings of the Institution of Mechanical Engineers, Part B: Journal of Engineering Manufacture* July 1, vol. 217 no. 7, 1027-1030.

¹² Pater R., (2008). Advancing Ergonomic Culture. *Occupational Health and Safety*, 77 (10), 20.

¹³ Pater R., Personal Communication, 25 October 2011

manifestations that characterises each user's individual ergonomic culture which, in turn makes up the ergonomic culture of the group.

Table 1. Work safety briefing for different computer users, per cent

№	Groups of respondents	Number of respondents	Last briefing during			It has not happened	I do not need it	Reference
			Last month	Last half-year	Last year			
1	Teachers, LV ¹	40	0	12.8	12.8	48.7	25.6	¹⁴
2	Students, LV, 1 st year students monitoring 2004-2011							¹⁵
	2004/2005	132	16.7	10.6	31.1	36.4	5.3	
	2008/2009	251	8.0	12.0	31.5	37.1	11.6	
3	Students, pilot research, Autumn term 2010							¹⁶
	LV	62	0	16.7	35.2	38.9	9.3	
	CZ	70	23.4	14.1	29.7	20.3	12.5	
	SK	57	19.3	8.8	24.6	28.1	19.3	
4	Employees, LV, unpublished data (2009/2010)							¹⁷
	Office workers	188	2.2	26.6	28.3	29.3	13.6	

Notes: ¹ LV – Latvia, CZ – Czech Republic, SK – Slovakia

One such manifestation of ergonomic culture is each individual computer user's attitude to work safety trainings better known as work safety briefings (Table 1). However, due to those briefings being conducted by work safety experts instead of computer users themselves, the absence of safe computer use briefings might be explained by unsatisfactory management of work safety in general. Although quite many respondents have noted that they have never attended such briefings or – what is equally significant – part of them do not believe such briefings are necessary at all. (Table 1).

¹⁴ Бикше К., Гедровицс Я., (2012). Эргономическая культура учителей – пользователей компьютера // Актуальные задачи педагогики (II): материалы междунар. заоч. науч. конф. (г. Чита, июнь 2012 г.). — Чита: Издательство Молодой ученый, с. 141-145.

¹⁵ Gedrovics J., Urpena I., Elers G., (2012). [Monitoring of Riga Teacher Training and Educational Management Academy' Students as Computer Users 2004 – 2011. 1. Computer Work Habits and Work Culture]. In: *Teorija un prakse mūsdienā sabiedrības izglītībā, RPIVA*, 29.-31.03.2012. Rīga, pp. 94-101. (in Latvian)

¹⁶ Gedrovics J., Bilek M., (2011). Ergonomic culture as a prerequisite for healthy computer work: a comparative research among Czech, Latvian and Slovakian students. *Media4u Magazine*, Vol. 8, Nr. X3/2011, 22-28.

¹⁷ Celmina Z., Qualification Paper, Riga, 2010. [Unpublished]

Table 2. Breaks and activities during breaks, per cent

№	Groups of respondents	Number of respondents	Breaks				Activities during breaks				Reference
			Yes. regularly	No	the work is complete	Irregularly.	Walking	Exercises	Computer games	Other activities	
1	Teachers, LV ¹	40	30.0	2.5	22.5	45.0	65.0	7.5	0	45.0	¹⁸
2	Students, LV, 1 st year students monitoring 2004-2011										¹⁹
	2004/2005	138	26.0	3.9	11.0	59.1	52.0	57.1	1.6	8.7	
	2008/2009	251	26.3	3.5	9.7	60.6	48.7	6.0	1.5	59.2	
	2011/2012	237	39.4	1.3	8.2	51.1	64.6	18.1	0	46.4	
3	Students, pilot research, Autumn term 2010										²⁰
	LV	62	29.3	1.7	1.7	67.2	66.1	0	11.3	46.8	
	CZ	70	17.6	8.8	23.5	50.0	31.4	17.1	4.3	68.6	
	SK	57	26.3	12.3	15.8	45.6	35.1	15.8	3.5	50.9	
4	Employees, LV, unpublished data (2009/2010)										²¹
	Office workers	218	20.9	1.6	9.1	68.4	70.5	1.1	0.3	18.6	

Notes: see Table 1

Another factor indication at the level of ergonomic culture is the observance of mandatory breaks and engagement in suggested activities during those (Table 2). The table shows that slightly over ¼ of respondents have indicated that they observe breaks regularly (exception – 1st year students during the autumn semester in 2011; 39,4%). Most popular activities during breaks are: walking, eating, doing home chores, etc., whereas specific suggested exercises are taken relatively rarely.

Given the popular attitude towards safety briefings and observance of breaks (Table 1 and 2), it is no surprise that a large part of respondents spend 4 or more hours continuously working on their computers daily (Table 3). For example, among teachers 40% do so *at work*, while every fifth (or 20%) do this *at home*. Among Latvian respondents-students around 1/3 spend over 4 hours a day by their computers.

¹⁸ Бикше К., Гедровицс Я., (2012). Эргономическая культура учителей – пользователей компьютера // Актуальные задачи педагогики (II): материалы междунар. заоч. науч. конф. (г. Чита, июнь 2012 г.). — Чита: Издательство Молодой ученый, с. 141-145.

¹⁹ Uņena I., Gedrovics J., Elers G., (2012). [Monitoring of Riga Teacher Training and Educational Management Academy' Students as Computer Users 2004 – 2011. 2. Student Perceptions of the Workstation Ergonomics in the Context of Their Health Problems] In: *Teorija praksei mūsdienīgu sabiedrības izglītībā, RPIVA, 29.-31.03.2012*. Riga, pp. 349-355. (in Latvian).

²⁰ Gedrovics J., Bilek M., (2011). Ergonomic culture as a prerequisite for healthy computer work: a comparative research among Czech, Latvian and Slovakian students. *Media4u Magazine*, Vol. 8, Nr. X3/2011, 22-28.

²¹ Celmina Z., Qualification Paper, Riga, 2010. [Unpublished]

Among office workers 75% of respondents work on their computers over 4 hours a day; moreover almost one out of ten of them spend over 4 hours daily by their home computers as well (Table 3).

Table 3. Time spent at computer, per cent

№	Groups of respondents	Number of respondents	At university or work location (institution), hours				At home, hours				Reference
			less than 2	2-4	3 and more	more than 4	less than 2	2-4	3 and more	More than 4	
1	Teachers, LV ¹	40	23.1	35.9	-	41.0	42.5	37.5	-	20.0	²²
2	Students, LV, 1 st year students monitoring 2004-2011										²³
	2004/2005	132	45.8	20.8	-	33.3	60.0	30.8	-	9.2	
	2008/2009	251	47.5	27.9	-	24.8	43.1	39.1	-	17.7	
	2011/2012	237	-	-	4.0	-	-	-	32.5	-	
3	Students, pilot research, Autumn term 2010										²⁴
	LV	62	36.8	23.7	-	36.8	50.0	39.3	-	10.7	
	CZ	70	60.6	28.8	-	10.6	25.8	60.6	-	13.6	
	SK	57	72.7	12.7	-	14.5	21.7	47.8	-	30.4	
4	Employees, LV, unpublished data (2009/2010)										²⁵
	Office workers	218	10.9	13.1	-	75.4	64.1	26.1	-	9.5	

Notes: see Table 1

As to other important aspects characterising ergonomic culture, those are working station design, including the computer (its construction, technical parameters, etc.), furniture, accessories (mouse pad, screen filter, and so on) and a range of other factors; however these aspects are more or less constant and not so much depending on users' understanding and attitude. In the long run, they undergo little change; therefore their effect on the computer user's ergonomic culture is relatively smaller, at least in the context of individual ergonomic culture.

²² Бикше К., Гедровицс Я., (2012). Эргономическая культура учителей – пользователей компьютера // Актуальные задачи педагогики (II): материалы междунар. заоч. науч. конф. (г. Чита, июнь 2012 г.). — Чита: Издательство Молодой ученый, с. 141-145.

²³ Gedrovics J., Urpena I., Elers G., (2012). [Monitoring of Riga Teacher Training and Educational Management Academy' Students as Computer Users 2004 – 2011. 1. Computer Work Habits and Work Culture]. In: *Teorija un prakse mūsdienī sabiedrības izglītībā, RPIVA*, 29.-31.03.2012. Riga, pp. 94-101. (in Latvian).

²⁴ Gedrovics J., Bilek M., (2011). Ergonomic culture as a prerequisite for healthy computer work: a comparative research among Czech, Latvian and Slovakian students. *Media4u Magazine*, Vol. 8, Nr. X3/2011, 22-28.

²⁵ Celmina Z., Qualification Paper, Riga, 2010. [Unpublished]

3. Discussion

While evaluating computer users' ergonomic culture we have to take into account that a considerable proportion of respondents have not had work safety briefings and even do not believe them to be necessary. This obviously is one of the reasons why only around ¼ of users observe regular breaks while working on their computers. There are far more users who take irregular breaks or stop for a pause only when a particular work is completed. What is more – many respondents work on the computer over 4 hours a day either at home or at work (Table 3). While respective sources state that: *computing 4 or more hours consecutively without taking a break associate with 87 % increased health risk*²⁶.

It has to be noted though, that during the autumn semester of year 2011 in the respondent group of Latvian students almost 40% maintained that they took regular breaks (Table 2). This could be evidence of better ergonomic culture awareness and consequently – a higher level of ergonomic culture as compared to students from previous years. However, in order to reach unequivocal positive conclusions, it is necessary to continue monitoring students as well as other respondent groups.

Users rarely take the recommended special exercises while taking a break, although questionnaires reveal that practically all of them (92-98%) have agreed the computer and working on it affects health, and one of the ways to make working on the computer healthier is taking those specific exercises.

This brings us to the conclusion that ergonomic culture is at lowest among the *long-time-workers* and those who fail to observe regular breaks and to take exercise. Obviously those users have paid insufficient attention to ergonomic work demands regarding computer use. Since among Latvian respondents there are many such people in all groups, we can conclude that ergonomic culture in Latvia is not highly developed.

If compared to their Czech and Slovakian peers, Latvian students do not differ much. Latvians more often use computers at the university, while Slovaks – at home. Besides that, work safety briefings for Latvian students are organised far less frequently.

We have to bear in mind that the fundamentals of work safety demand not only for a single training session on work safety principles, but on recurrent briefings, depending on the features of each specific occupation. Observing those demands could serve as an important step towards an increase in overall ergonomic culture among computer users.

²⁶ Amick B.C., Robertson M., Tullar J., Fossil A., Coley C., Hupert N., Jenkins M., Katz J., (2003). Regular and binge computing and college student health: preliminary findings, – [http://www.sph.uth.tmc.edu/course/occupationalenv Health/bamick/home/Conference/Amick%20College%20and%20Binge%20 Computing.PDF](http://www.sph.uth.tmc.edu/course/occupationalenv%20Health/bamick/home/Conference/Amick%20College%20and%20Binge%20Computing.PDF). (Retrieved 20.10.2011).

Conclusion

The results of pilot researches carried out from 2010 to 2012 and the analysis of respective scientific sources have revealed that, alongside general work culture, which certainly includes work safety, it is useful to focus also on the concept of computer users' ergonomic culture and the manifestations of it among various groups of respondents. The attitude to work safety as such, and to safety while working on the computer in particular, is based in thorough understanding of ergonomic culture which, in turn, affects how each particular user views their computer as an integral component of their work and leisure. Having realised the risks the computer poses to their health, users modify their attitude towards their current and future living quality, thus invariably raising their level of ergonomic culture.

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