Mental Symptoms and the Use of New Technical Equipment

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The aim of this paper was to present how mental symptoms are connected to the use of desktop, portable or minicomputers (communicators and hand-held computers), mobile phones, and background information such as age and gender in the Finnish working-age population. The study was carried out as a cross-sectional study by posting a questionnaire to 15 000 working-age (18–65) Finns. The mental symptoms of 6 121 respondents were analysed using the model factors age, gender, the use of computers and the use of mobile phones. In all data, the use of desktop computers was related to mental symptoms. However, the results of our data are not highly reliable, because the nonresponse rate was over 50%. Nevertheless, it may be essential to take into account in the future that working with computers can increase workers' mental symptoms, and it is important to observe their mental health.

mental symptoms   questionnaire study   computer

1. INTRODUCTION

Many human beings have mental health problems, which are a significant reason for leaving working life. According to the Finnish statistical office in 2006 over 112 600 Finnish workers received disability pensions based on mental health problems [1]. In 2004 under 110 000 received this disability pension [2]. In a Finnish study, 3 122 persons aged 25–64 were interviewed by phone; 2 229 of them were working persons [3]. The gender division was 51% male and 49% female. The average age was 44.6 years. Mental symptoms were, e.g., weakness (28%), insomnia (25%), tension and nervousness (23%), irritation (22%) and depression (13%). In the Fourth European working conditions survey the factor analyses of individual symptoms showed that stress launched a type of health outcome [4]. The analyses included physical (associated with physically demanding work environments), psychological (associated with psychologically demanding work environments) and chemical/biological (associated with chemical/biological risks) factors. In stress, the physical factor was .59, the psychological factor was .58 and the chemical/biological factor was 0.03. In sleeping problems, the physical factor was .16, the psychological factor was .73 and the chemical/ biological factor was .15. In anxiety, the physical factor was .15, the psychological factor was .74 and the chemical/biological factor was .08. In irritability, the physical factor was .29, the

psychological factor was .70 and the chemical/biological factor was 0.09.

According to earlier studies, the 12-month prevalence of depressive and anxiety disorders in the general populations varied between 4 and 11%, and 4 and 19%, respectively [5, 6, 7, 8]. In the Finnish health 2000 study depressive, alcohol use and anxiety disorders were found in 6.5, 4.5 and 4.1% of the subjects, respectively [6]. Alcohol use disorders were found in 7.3% of men and in 1.4% of women. Eight point three percent of women and 4.6% of men had depressive disorders. Gender, age, marital and employment status were distributed unevenly for mental disorders and their comorbidities. The study did not show any association between educational level and mental disorders. According to Pirkola, Isometsä, Suvisaari, et al., there appeared to be no single population subgroup at high risk for all mental disorders, but rather several different subgroups at risk for particular disorders or comorbidity patterns [6].

In recent years the nature of work has changed. More and more employees take charge of their work, and even planning is mostly their own responsibility. Another big change affecting the work tasks of many is the ever increasing amount of information. The Internet, in particular, has made it possible to access more information, including real-time information. Information acquisition has been made easier with various kinds of mobile services, used either in mobile phones or laptops. Working is no longer bound to a certain time or place. In the Fourth European working condition survey ~26% of workers work with computer all or almost all, the time. In 1990, the equivalent figure was ~13% [4]. According the Finnish statistical office 35% of households had one mobile phone, 37% had two, 13% had three mobile phones, 10% had four, 5% had five or more mobile phones and 1% of households did not have any [9]. According the Finnish statistical office, in 2006 there were 5 679 010 telephone subscriber connections and in 2001 the number was 4 137 337. The number of subscriber connections increased 31.8% during the 5 years [10].

Many health problems have a multifactorial etiology. Psychosocial factors, e.g., stress, seem to play an important role by interacting with personality characteristics [11]. Lundberg concluded that both physical and psychosocial work conditions may contribute to work-related upper extremity disorders by inducing physiological stress and muscle tension [11]. In addition, sickness absence is caused by various factors [12, 13, 14]. Lund, Labriola, Christensen, et al. studied the effects of the physical work environment on long-term sickness absence and interaction between physical and psychosocial risk factors [14]. They concluded, e.g., that simultaneous intervention targeting two psychosocial risk factors in the work environment—role conflicts and emotional demands—might increase the effect of interventions towards physical risk factors among female employees owing to interaction effects [14].

Our work was a part of a large questionnaire study on the possible influence of new technical equipment on the health of the working-age population. In the designed questionnaire multiple choice questions were clearly related to technology, ergonomics and medically-known symptoms experienced by laypersons. The aim of this paper was to present how self-reported mental symptoms like sleeping disorders/disturbances, depression, exhaustion at work, substance addiction, anxiety or fear were connected to the use of desktop, portable or minicomputers (communicators and hand-held computers) and mobile phones, and background information such as age and gender. The research question was whether self-reported mental symptoms were connected to the use of mobile phones and different kinds of computers.

Earlier papers on this large questionnaire study [15, 16] presented preliminary results and results of ergonomic aspects.

2. METHODS

2.1. Study Population

The questionnaire was sent to 15 000 Finns in October 2002. Because the study focused on the working age population, the questionnaire was sent only to people aged 18–65. Although some of them were already retired, unemployed or still studying, all the answers were taken into account. The names and addresses were obtained as a random sample from the Finnish population register centre. This way the study population represented the whole working-age population relatively well. Concerning the residence and the socioeconomic status random sampling also gave approximately the same number of men and women. All the answers were handled anonymously and the study design was approved by the Ethical Committee (Pirkanmaa Health District, Finland, decision R02099).

2.2. Questionnaire

The questionnaire was posted with a cover letter. The first page was a letter to the participant. In it the leader of the study explained the study and gave some practical instructions. The second page was an example of how to answer questions. Questions followed. The questionnaire was divided into six sections. The first one dealt with background information such as age, gender, marital status, education, trade and home county (Finland is divided geographically into six counties). In section two the familiarity and the use of given technical devices were mapped. New technical units included desktop, portable and hand-held computers, communicators, the Internet, mobile phones, electronic marketplaces/commerce, teletex, digital television and associated services. People were also asked how important those devices were to them at work and at leisure. If respondents did not have a job at the moment, they only answered questions about leisure.

In the third section the focus was on physical loading and ergonomics. People were asked if they had experienced pain, numbness or aches in their wrists, fingers, elbows, forearms, neck, shoulders, back or feet during the past 12 months. They were also asked if they presumed those symptoms to be caused by the use of desktop or portable computers. The fourth section concerned psychological welfare. Respondents were asked if they had suffered sleeping disorders/disturbances, depression, exhaustion at work, substance addiction, anxiety or fear during the past 12 months. They were also queried if they somehow connected those symptoms to an increase in information-retrieval or information available through different electronic sources such as e-mail, the Internet or digital television. The choices for the questions in section three and four were *cannot say*, *not at all*, *sometimes*, *quite often*, *often*, *very often* and *not applicable*. Accidents were handled in the fifth section. The questions were to elicit information if mobile phones had caused or had been a partial cause of an accident or a close-call situation. There were separate sections for accidents at and outside work. The choices for the questions were *cannot say*, *not at all*, *somewhat*, *noticeable*, *very noticeable* and *not applicable*. The last part was an open-ended question "Other observations concerning technology and health". A lottery ticket was also attached; it was, however, handled separately from the answers, so privacy was secured.

2.3. Statistical Analysis

The statistical analyses were done using SPSS version 16; they consisted of general linear models (GLM) with the symptoms assigned as target variables. Certain procedures were also applied to the explanatory variables. For statistical analyses we chose the most common equipment (mobile phones and different computers) and did not deal with less important equipment like teletex, digital television or electronic marketplaces/commerce. The use of desktop, portable or minicomputers and mobile phones at home and at work were combined. In the analyses for the question "Have you suffered (a) sleeping disorders/disturbances, (b) depression, (c) exhaustion at work, (d) substance addiction, (e) anxiety or (f) fear during the past 12 months?", the model factors were age, gender,

the use of a desktop computer (UC), the use of a portable or minicomputer (UP), the use of a mobile phone (MP); and two-way interactions age × gender, age × UC, age × UP, age × MP, gender × UC, gender × UP, gender × MP, UC × UP, UC × MP, UP × MP. The effects of environmental factors were studied by dividing the data between the different environmental (i.e., age and gender) groups and then performing similar GLM procedures to see how the effects of the background factors changed between levels. Age groups were classified (<20, 21–30, 31–40, 41–50, 51–60 and >60). In the analysis of subgroups (age and gender), the model factors

were the use of a desktop (UC), portable or minicomputer (UP), the use of a mobile phone (MP); and two-way interactions UC × UP, UC × MP, UP × MP. In this study $p = .05$ was chosen.

3. RESULTS

3.1.Background Information

During the winter of 2002–2003, 6 121 responses arrived. Thus the response rate was 41%. The average age of the respondents was 41.

TABLE 1. A Summary of Background Information (%); the Use of Technical Devices; Mental Symptoms; and Experienced Pain, Numbness or Aches

Topics of Questions and Choices	All		At Work		Outside Work		Women		Men	
Marital status										
single	1 343	(22.0)	768	(17.6)	547	(34.3)	747	(21.5)	594	(22.6)
married or live-in partners	4 219	(69.0)	3 218	(73.8)	895	(56.1)	2 356	(67.7)	1 857	(70.8)
divorced	449	(7.3)	328	(7.5)	108	(6.8)	294	(8.4)	154	(5.9)
widowed	101	(1.7)	48	(1.1)	46	(2.9)	82	(2.4)	18	(0.7)
Education										
comprehensive school	1 075	(17.6)	586	(13.5)	441	(27.7)	567	(16.3)	506	(19.3)
matriculation	654	(10.7)	349	(8.0)	299	(18.8)	443	(12.8)	209	(8.0)
vocational school	1 665	(27.3)	1 208	(27.7)	404	(25.4)	790	(22.7)	871	(33.3)
vocational high school	1 879	(30.8)	1 534	(35.2)	315	(19.8)	1 196	(34.4)	682	(26.1)
university	828	(13.6)	679	(15.6)	133	(8.4)	478	(13.8)	349	(13.3)
Occupation										
none[1]	49	(0.8)	0	(0.0)	46	(2.9)	21	(0.6)	28	(1.1)
entrepreneur	451	(7.4)	366	(8.4)	66	(4.1)	179	(5.2)	271	(10.4)
farmer	194	(3.2)	105	(2.4)	73	(4.6)	103	(3.0)	91	(3.5)
upper-level white-collar worker[2]	1 121	(18.4)	971	(22.3)	132	(8.3)	555	(16.0)	565	(21.6)
lower-level white-collar worker[3]	1 425	(23.4)	1 150	(26.4)	257	(16.2)	995	(28.6)	428	(16.4)
blue-collar worker[4]	2 122	(34.8)	1 548	(35.5)	523	(32.9)	1 122	(32.3)	997	(38.1)
work at home, student	461	(7.6)	48	(1.1)	402	(25.3)	336	(9.7)	125	(4.8)
other	279	(4.6)	171	(3.9)	92	(5.8)	164	(4.7)	112	(4.3)
Use at work of										
desktop computer	3 479	(78.0)	3 425	(78.8)	19	(35.2)	1 958	(79.7)	1 516	(76.0)
mobile phone	3 146	(70.5)	3 057	(70.7)	40	(70.2)	1 448	(59.2)	1 694	(84.4)
portable or minicomputer	1 062	(23.8)	1 040	(23.9)	6	(11.4)	406	(16.6)	654	(32.6)
Use at leisure of										
desktop computer	4 665	(77.0)	3 504	(80.6)	1 075	(68.4)	2 650	(76.9)	2 007	(77.2)
mobile phone	5 875	(96.5)	4 253	(97.4)	1 495	(94.0)	3 334	(96.1)	2 532	(96.8)
portable or minicomputer	1 432	(23.6)	1 157	(26.6)	250	(16.0)	658	(19.0)	771	(29.7)

TABLE 1. (*continued*)

Topics of Questions and Choices	All		At Work		Outside Work		Women		Men	
Mental symptoms										
sleeping disorders/ disturbances	3581	(59.0)	2573	(59.4)	922	(58.4)	2150	(62.2)	1425	(54.8)
depression	2618	(43.3)	1801	(41.6)	754	(48.1)	1584	(46.1)	1030	(39.8)
exhaustion at work	3767	(62.5)	3053	(70.4)	638	(41.2)	2214	(64.5)	1549	(59.8)
substance addiction	582	(9.6)	392	(9.1)	172	(10.9)	190	(5.5)	392	(15.1)
anxiety	2079	(34.4)	1413	(32.6)	618	(39.4)	1269	(36.8)	808	(31.1)
fear	965	(16.0)	611	(14.0)	327	(21.0)	595	(17.3)	369	(14.2)
Pain, numbness or aches										
in wrists or fingers	3235	(53.8)	2335	(54.0)	820	(52.9)	1959	(57.0)	1270	(49.4)
in elbows or forearms	2242	(37.5)	1650	(38.3)	540	(35.2)	1310	(38.3)	927	(36.4)
in neck	5182	(85.5)	3728	(85.8)	1332	(85.0)	3148	(91.0)	2024	(78.2)
in shoulders	3680	(61.3)	2656	(61.4)	926	(59.6)	2204	(64.2)	1467	(57.1)
in hips and lower back	4215	(69.9)	3004	(69.3)	1105	(71.2)	2501	(72.6)	1709	(66.2)
in feet	3648	(60.4)	2546	(58.6)	1005	(64.4)	2182	(63.1)	1463	(56.6)

Notes. 1—never had an occupation; 2—administrative or managerial duties, designing, research, teaching; 3—clerical duties and supervision; 4—industrial workers, distribution and services.

There were 3486 women and 2625 men. The respondents were relatively well distributed around Finland, so it can be assumed that they corresponded to the entire working-age population. At the time of the questionnaire, 71% of the respondents were employed. Fifty-seven percent of the respondents were women. A summary of background information and the use of the technical devices is in Table 1.

Table 1 shows the result from all repondents, working persons, persons outside working life, women and men. It shows the number of answers and the percentage values. In the parts related to the use of computers, the number of positive answers is given. They include *less than monthly*, *monthly*, *weekly* or *daily*. In the part on mental symptoms the results are based on question 16 "Have you suffered (a) sleeping disorders/ disturbances, (b) depression, (c) exhaustion at work, (d) substance addiction, (e) anxiety or (f) fear during the past 12 months?". The table shows the number of *yes* answers (*sometimes*, *quite often*, *often*, *very often*). In the part related to experienced pain, numbness or aches the results are based on question 13 "Have you had an ache, pain or numbness in the following body part during the past 12 months? (a) in wrists and fingers, (b) in elbows and forearms, (c) in neck, (d) in shoulders, (e) in hip and lower back, (f) in feet during the past 12 months?". In Table 1, the number of *yes* answers (*sometimes*, *quite often*, *often*, *very often*) is given.

The data included 366 entrepreneurs, 105 farmers, 970 upper-level white-collar workers (administrative or managerial duties, designing, research, teaching), 1150 lower-level white-collar workers (clerical duties and supervision) and 1548 blue-collar workers (industrial workers, distributive and services). The entrepreneurs were 19–75 years old; M (SD) = 47.0 (10.4). Farmers were 20–65 years old; $M(SD)$ = 44.0 (10.8). Upper-level white-collar workers were 16–66 years old; $M(SD)$ = 42.0 (10.4). Lower-level white-collar workers were 16–65 years old; $M(SD)$ = 43.0 (10.9) and blue-collar workers were 18–64 years old; $M(SD)$ = 39.1 (11.7). Figure 1 shows the number of answers of upper-level white–collar workers to questions 16 and (without *cannot say* answers) 11b (the use of a desktop computer at work), and 11e (the use of a portable or minicomputer at work). Figure 2 includes lower-level white-collar workers' results to the same questions, and Figure 3 includes blue-collar workers' answers.

Figure 1. The number of answers of upper-level white-collar workers to questions 16 and (without *cannot say* **answers) 11b (the use of a desktop computer at work), and 11e (the use of a portable or minicomputer at work).** *Notes.* 1—*not at all*, 2—*less than monthly*, 3—*monthly*, 4—*weekly***,** 5—*daily*.
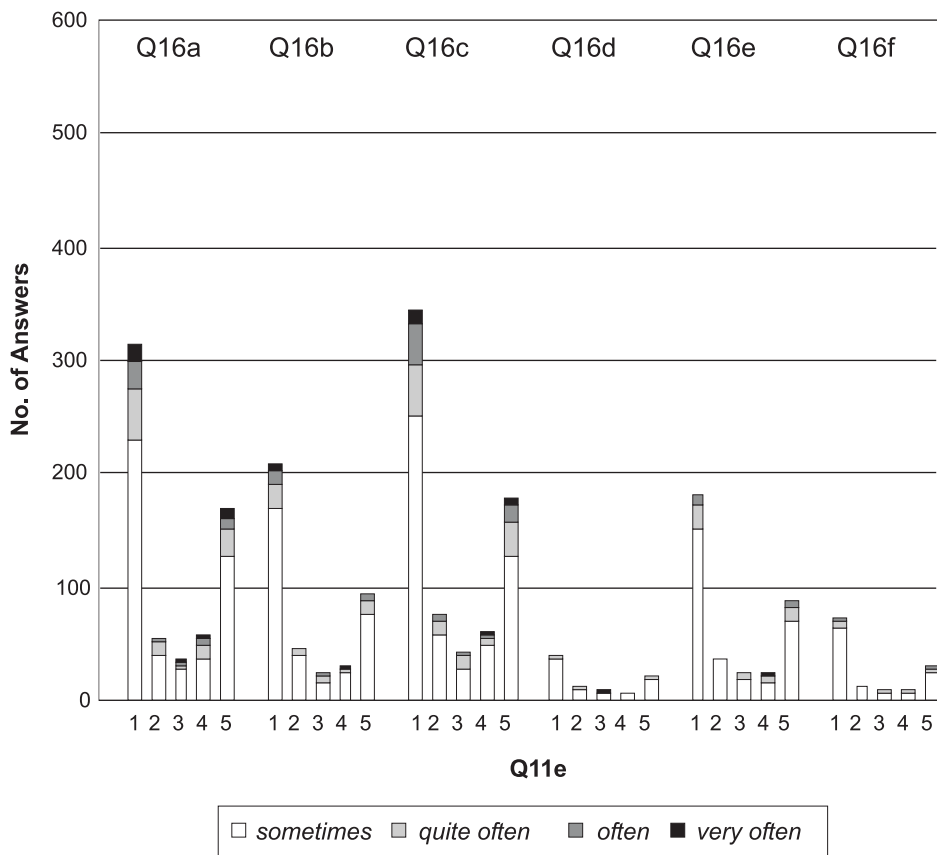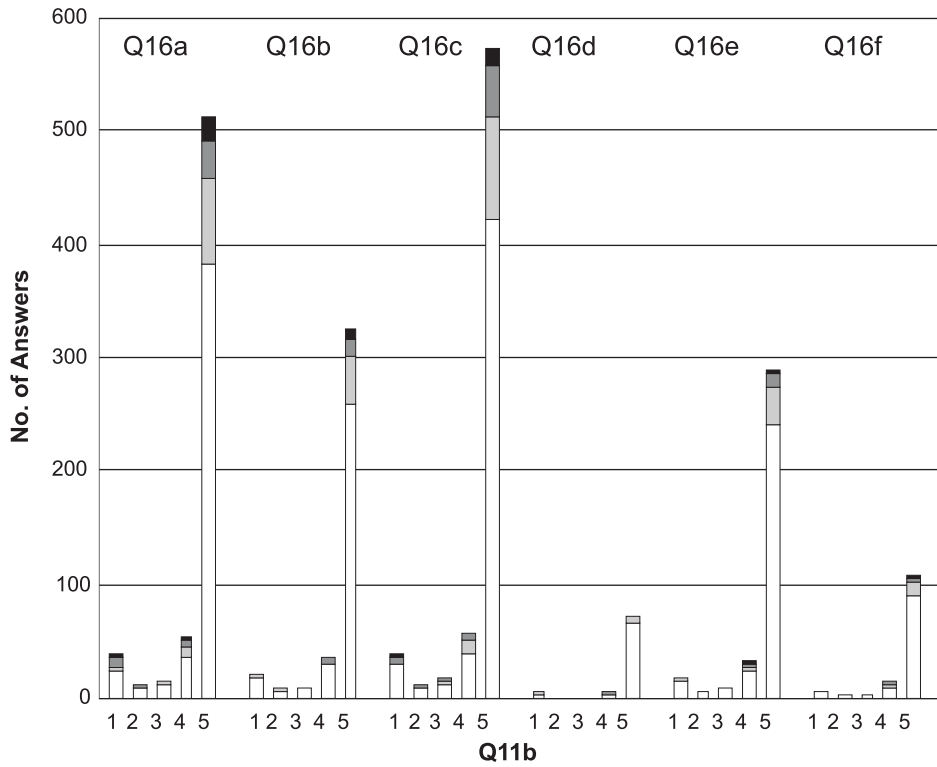
Figure 2. The number of answers of lower-level white-collar workers to questions 16 and (without *cannot say* answers) 11b (the use of a desktop computer at work), and 11e (the use of a portable or minicomputer at work). *Notes.* 1—*not at all*, 2—*less than monthly*, 3—*monthly*, 4—*weekly*, **5**—*daily*.

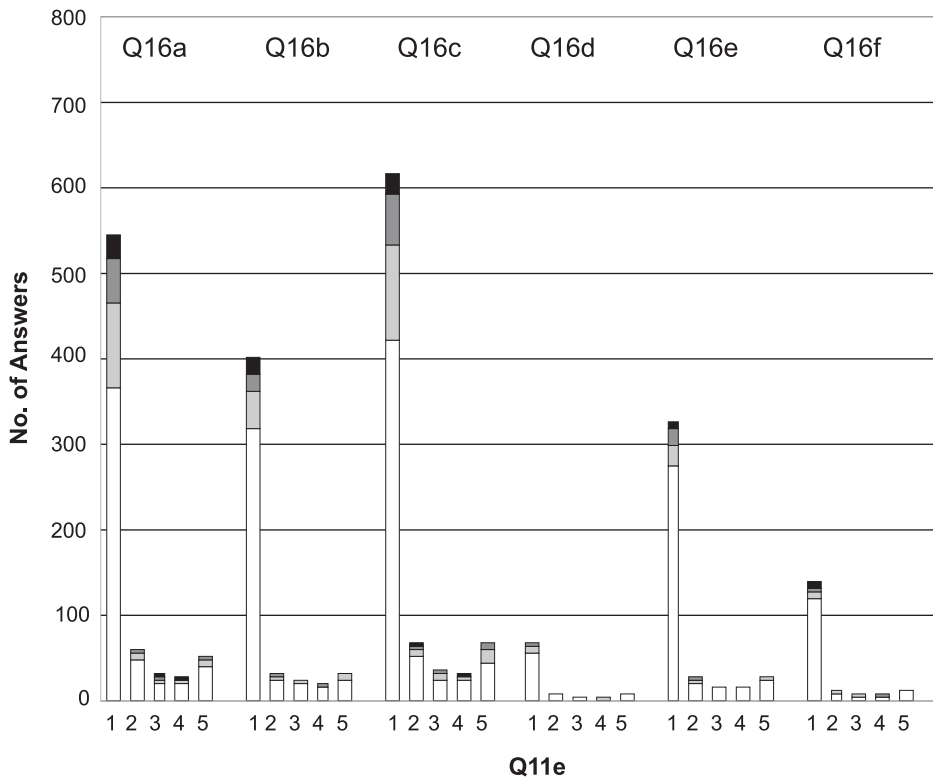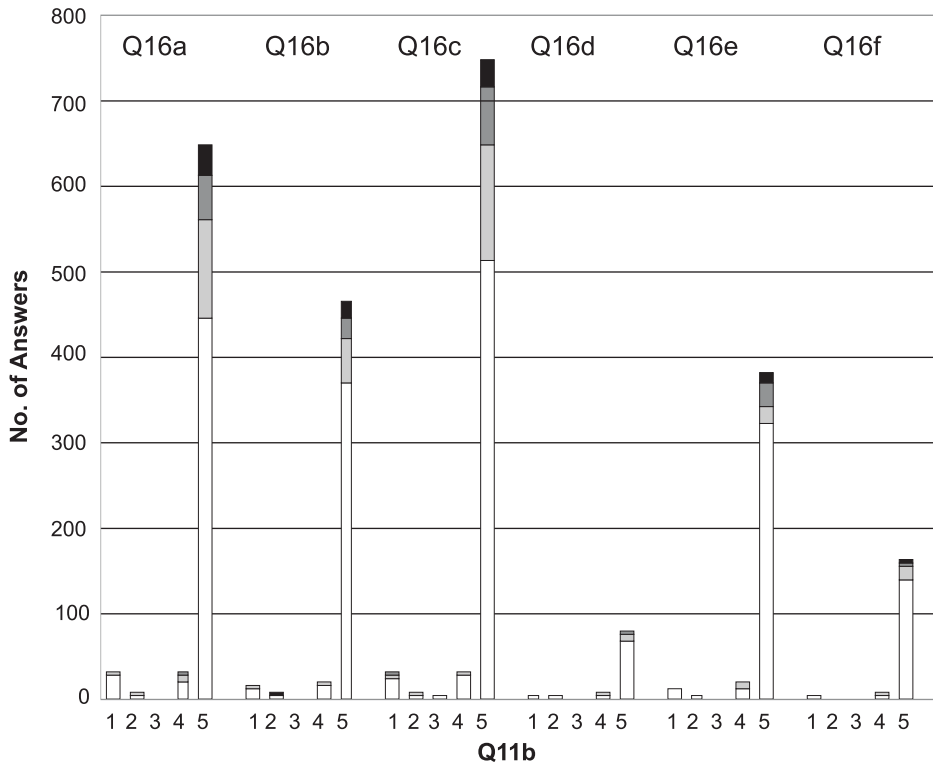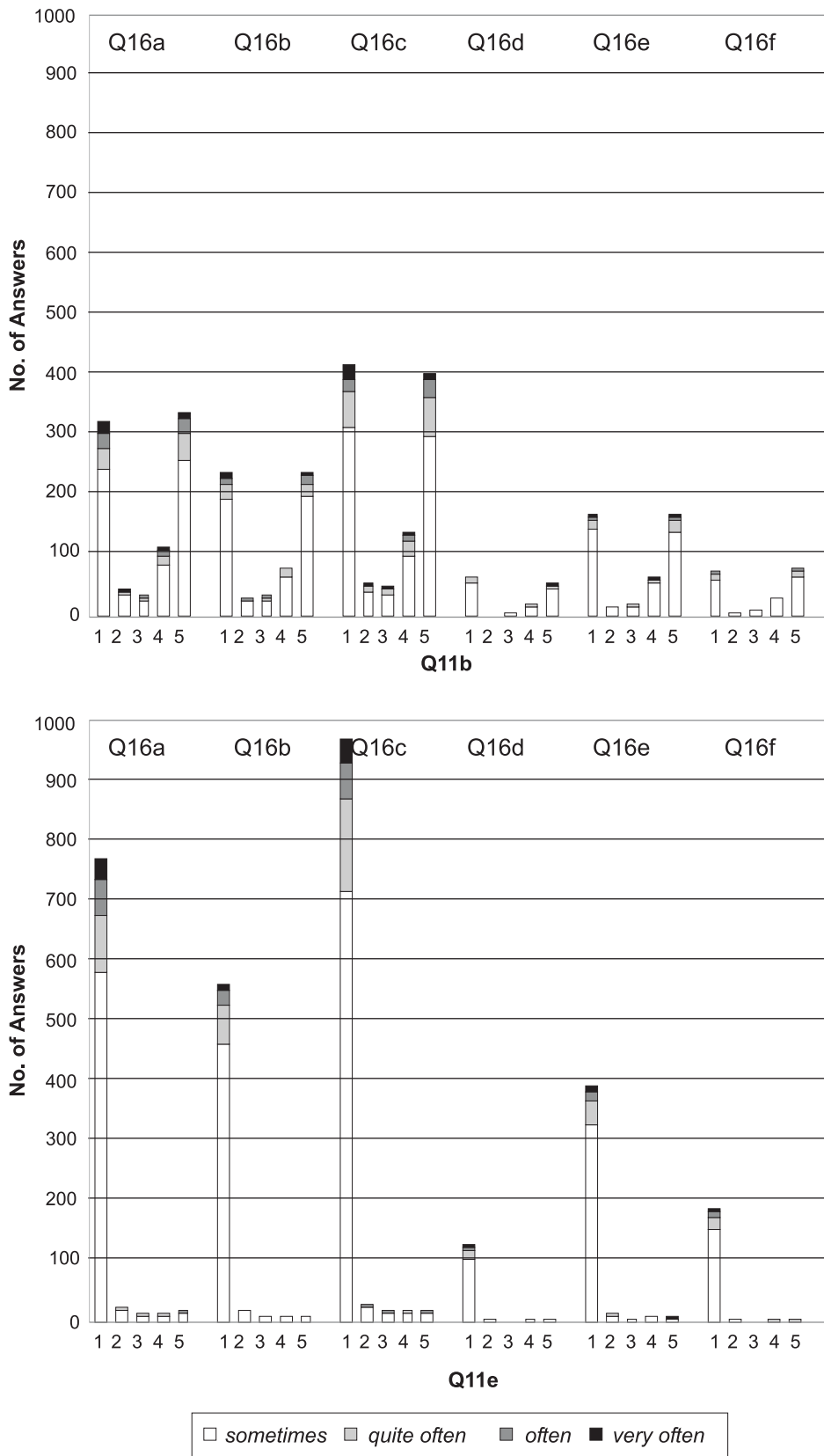**Figure 3. The number of answers of blue-collar workers to questions 16 and (without *cannot say* answers) 11b (the use of a desktop computer at work), and 11e (the use of a portable or minicomputer at work).** *Notes. Notes.* 1—*not at all*, 2—*less than monthly*, 3—*monthly*, 4—*weekly*, **5**—*daily*.

3.2. Statistical Analyses of Mental Symptoms

Table 2 presents the number of all answers to questions 16 and the percentage values. Tables 3–5 show the results of statistical analyses for question 16 "Have you suffered (a) sleeping disorders/ disturbances, (b) depression, (c) exhaustion at work, (d) substance addiction, (e) anxiety or (f) fear during the past 12 months?" In all data, the use of desktop computers had a relation to the mental symptoms, but the use of mobile phones, portable or minicomputers did not have a relation to any mental symptoms. Some relation can also be seen together with two-way interactions (age × UP, gender × UC, gender × MP). In addition, one-way interaction, gender and depression had significance.

TABLE 2. Number of All Answers (%) to Questions 16 (Q16)

Symptoms and Choices in Q16	All		At Work		Outside Work		Women		Men	
Sleeping disorders/disturbances										
cannot say	52	(0.9)	32	(0.7)	16	(1.0)	27	(0.8)	24	(0.9)
not at all	2432	(40.1)	1736	(40.0)	637	(40.4)	1278	(37.0)	1152	(44.3)
sometimes	2565	(42.3)	1865	(43.0)	646	(41.0)	1513	(43.8)	1048	(40.3)
quite often	523	(8.6)	381	(8.8)	133	(8.4)	319	(9.2)	204	(7.8)
often	290	(4.8)	202	(4.7)	73	(4.6)	183	(5.3)	106	(4.1)
very often	203	(3.3)	125	(2.9)	70	(4.4)	135	(3.9)	67	(2.6)
Depression										
cannot say	116	(1.9)	73	(1.7)	39	(2.5)	62	(1.8)	53	(2.0)
not at all	3309	(54.8)	2457	(56.7)	775	(49.4)	1793	(52.1)	1512	(58.3)
sometimes	2084	(34.5)	1451	(33.5)	586	(37.4)	1243	(36.1)	837	(32.3)
quite often	292	(4.8)	202	(4.7)	85	(5.4)	175	(5.1)	117	(4.5)
often	141	(2.3)	92	(2.1)	42	(2.7)	95	(2.8)	46	(1.8)
very often	101	(1.7)	56	(1.3)	41	(2.6)	71	(2.1)	30	(1.2)
Exhaustion at work										
cannot say	120	(2.0)	45	(1.0)	71	(4.6)	51	(1.5)	68	(2.6)
not at all	2143	(35.5)	1238	(28.6)	844	(54.3)	1164	(33.9)	975	(37.6)
sometimes	2718	(45.1)	2200	(50.7)	464	(29.9)	1582	(46.1)	1132	(43.7)
quite often	598	(9.9)	491	(11.3)	93	(6.0)	347	(10.1)	251	(9.7)
often	286	(4.7)	238	(5.5)	46	(3.0)	175	(5.1)	111	(4.3)
very often	165	(2.7)	124	(2.9)	35	(2.3)	110	(3.2)	55	(2.1)
Substance addiction										
cannot say	64	(1.1)	35	(0.8)	27	(1.7)	22	(0.6)	41	(1.6)
not at all	5391	(89.3)	3902	(90.1)	1366	(87.3)	3224	(93.8)	2159	(83.3)
sometimes	457	(7.6)	324	(7.5)	119	(7.6)	151	(4.4)	306	(11.8)
quite often	65	(1.1)	41	(0.9)	21	(1.3)	18	(0.5)	47	(1.8)
often	35	(0.6)	16	(0.4)	19	(1.2)	13	(0.4)	22	(0.8)
very often	25	(0.4)	11	(0.3)	13	(0.8)	8	(0.2)	17	(0.7)
Anxiety										
cannot say	97	(1.6)	58	(1.3)	34	(2.2)	41	(1.2)	55	(2.1)
not at all	3871	(64.0)	2866	(66.1)	914	(58.4)	2134	(62.0)	1731	(66.7)
sometimes	1682	(27.8)	1171	(27.0)	476	(30.4)	1005	(29.2)	675	(26.0)
quite often	202	(3.3)	134	(3.1)	63	(4.0)	131	(3.8)	71	(2.7)
often	118	(2.0)	71	(1.6)	43	(2.7)	80	(2.3)	38	(1.5)
very often	77	(1.3)	37	(0.9)	36	(2.3)	53	(1.5)	24	(0.9)
Fear										
cannot say	108	(1.8)	59	(1.4)	43	(2.8)	55	(1.6)	52	(2.0)
not at all	4963	(82.2)	3661	(84.5)	1191	(76.3)	2787	(81.1)	2169	(83.7)
sometimes	780	(12.9)	503	(11.6)	258	(16.5)	470	(13.7)	309	(11.9)
quite often	101	(1.7)	67	(1.5)	31	(2.0)	67	(1.9)	34	(1.3)
often	46	(0.8)	23	(0.5)	20	(1.3)	33	(1.0)	13	(0.5)
very often	38	(0.6)	18	(0.4)	18	(1.2)	25	(0.7)	13	(0.5)

TABLE 3. The Results (Type III *SS* and Significance, Sig.) of Statistical Analyses for Question 16

Source of Variation	a		b		c		d		e		f	
	SS	Sig.	*SS*	Sig.	*SS*	Sig.	*SS*	Sig.	*SS*	Sig.	*SS*	Sig.
Main effect												
age	3.424	.236	1.640	.464	1.103	.716	0.531	.427	3.043	.140	1.341	.239
gender	2.593	.073	2.907	.033**	0.599	.391	0.292	.217	1.808	.071	0.817	.109
UC	9.978	.030**	12.047	.002**	11.166	.018**	12.747	.000**	8.559	.009**	11.035	.000**
UP	5.277	.257	6.323	.079	5.266	.264	0.926	.436	2.583	.459	1.489	.455
MP	2.977	.297	2.842	.218	1.516	.601	0.217	.768	2.174	.270	1.118	.318
Two-way interactions												
age x gender	0.872	.781	2.643	.248	3.418	.241	0.499	.456	2.349	.237	0.464	.691
age x UC	3.854	.852	8.946	.124	8.748	.294	0.749	.916	3.493	.709	3.448	.286
age x UP	17.500	.006**	5.881	.327	6.020	.495	1.133	.655	5.962	.217	4.396	.087
age x MP	4.615	.766	2.193	.945	8.419	.324	1.594	.500	3.193	.763	2.055	.691
gender x UC	3.469	.231	10.313	.001**	3.935	.185	0.993	.158	3.948	.068	1.414	.217
gender x UP	1.677	.555	3.561	.135	2.168	.447	0.295	.672	1.683	.386	0.466	.689
gender x MP	0.150	.980	7.259	.010**	5.144	.098	0.599	.372	3.274	.117	0.671	.549
UC x UP	3.085	.922	4.586	.620	5.112	.711	0.939	.841	2.296	.901	1.766	.782
UC x MP	6.476	.530	5.711	.445	1.988	.982	1.262	.678	2.309	.900	1.599	.831
UP x MP	7.708	.297	3.773	.659	5.564	.555	0.173	.999	3.153	.682	1.139	.892

Notes. **—significant at *p* < .05; a—sleeping disorders/disturbances, b—depression, c—exhaustion at work, d—substance addiction, e—anxiety, f—fear; UC—the use of a desktop computer, UP—the use of a portable or minicomputer, MP—the use of a mobile phone.

TABLE 4. The Results (Type III *SS* and Significance, Sig.) of Statistical Analyses for Question 16 Using Women's Data

Source of Variation	a		b		c		d		e		f	
	SS	Sig.	*SS*	Sig.	*SS*	Sig.	*SS*	Sig.	*SS*	Sig.	*SS*	Sig.
Age 20–30												
UC	1.388	.809	1.097	.675	1.268	.750	0.056	.879	1.797	.404	0.982	.644
UP	3.051	.356	1.209	.436	2.738	.280	0.026	.856	1.101	.408	1.346	.327
MP	1.802	.741	2.496	.334	1.605	.675	0.083	.801	2.009	.354	1.559	.455
two-way interactions												
UC x UP	0.000	—	0.000	—	0.000	—	0.000	—	0.000	—	0.000	—
UC x MP	0.481	.987	4.933	.163	1.866	.773	0.355	.384	1.079	.772	2.772	.332
UP x MP	0.000	—	0.000	—	0.000	—	0.000	—	0.000	—	0.000	—
Age 31–40												
UC	10.814	.004**	13.138	.008**	11.177	.024**	11.308	.000**	14.102	.002**	11.639	.000**
UP	1.815	.224	0.396	.786	0.708	.659	0.201	.417	0.188	.880	0.424	.550
MP	1.122	.602	1.578	.591	1.806	.547	0.110	.811	1.100	.685	0.912	.464
two-way interactions												
UC x UP	2.795	.330	8.032	.048**	6.524	.108	0.626	.246	7.797	.035**	1.239	.480
UC x MP	4.967	.226	5.506	.354	3.483	.536	1.426	.057	1.993	.845	0.868	.873
UP x MP	0.800	.516	0.741	.638	0.073	.958	0.158	.502	0.320	.805	2.342	.038**
Age 41–50												
UC	0.707	.848	0.224	.953	2.223	.497	0.143	.778	0.805	.759	0.327	.818
UP	0.425	.975	0.644	.914	4.725	.283	0.183	.843	0.766	.891	0.261	.945
MP	4.548	.161	2.609	.271	3.119	.343	0.029	.974	0.489	.870	0.458	.728
two-way interactions												
UC x UP	0.727	.975	1.149	.884	1.481	.810	0.020	.997	2.517	.598	0.294	.933
UC x MP	12.493	.120	8.311	.192	12.288	.161	1.597	.207	11.711	.052	5.037	.116
UP x MP	3.994	.474	3.139	.452	3.570	.575	0.100	.979	3.279	.444	0.189	.990

TABLE 4. (*continued*)

Source of Variation	a		b		c		d		e		f	
	SS	Sig.	*SS*	Sig.	*SS*	Sig.	*SS*	Sig.	*SS*	Sig.	*SS*	Sig.
Age 51–60												
UC	5.146	.137	2.781	.169	3.378	.209	0.102	.729	0.620	.731	1.861	.143
UP	4.690	.283	10.283	.001**	3.109	.381	0.029	.985	1.973	.392	0.273	.938
MP	0.525	.904	5.878	.014**	2.040	.432	0.013	.982	0.619	.731	0.369	.781
two-way interactions												
UC x UP	6.315	.080	4.851	.033**	4.480	.111	0.011	.986	1.678	.322	1.429	.243
UC x MP	8.391	.433	5.689	.325	2.498	.946	1.043	.156	4.012	.499	2.108	.719
UP x MP	1.534	.894	7.272	.023**	6.628	.114	0.004	1.00	0.983	.841	0.805	.796

Notes. **—significant at *p* < .05; a—sleeping disorders/disturbances, b—depression, c—exhaustion at work, d—substance addiction, e—anxiety, f—fear, UC—the use of a desktop computer, UP—the use of a portable or minicomputer, MP—the use of a mobile phone.

TABLE 5. The Results (Type III *SS* and Significance, Sig.) of Statistical Analyses for Question 16 Using Men's Data

Source of Variation	a		b		c		d		e		f	
	SS	Sig.	*SS*	Sig.	*SS*	Sig.	*SS*	Sig.	*SS*	Sig.	*SS*	Sig.
Age 20–30												
UC	0.398	.936	0.884	.765	0.813	.674	1.260	.448	0.139	.961	0.000	1.00
UP	0.689	.714	1.110	.512	0.781	.497	0.215	.783	0.605	.563	0.281	.670
MP	1.113	.771	0.318	.934	3.450	.159	2.594	.189	0.278	.901	0.270	.845
two-way interactions												
UC x UP	0.172	.686	0.454	.462	0.777	.252	0.024	.818	0.454	.364	0.000	1.00
UC x MP	0.383	.826	0.383	.783	0.283	.765	0.000	1.00	0.283	.756	0.000	1.00
UP x MP	0.167	.691	0.375	.502	0.667	.286	0.042	.763	0.167	.576	0.167	.500
Age 31–40												
UC	2.550	.282	2.294	.240	0.465	.898	1.877	.156	2.645	.061	1.530	.009**
UP	1.625	.485	0.083	.984	4.348	.144	0.213	.895	2.116	.115	1.746	.004**
MP	0.433	.883	1.228	.517	3.224	.258	3.182	.033**	2.553	.068	0.617	.182
two-way interactions									.			
UC x UP	4.407	.359	1.092	.914	5.035	.388	0.782	.896	1.330	.700	1.426	.087
UC x MP	8.562	.053	5.016	.167	4.950	.399	5.166	.030**	4.693	.045**	1.406	.091
UP x MP	0.513	.855	1.540	.416	1.389	.624	0.217	.892	2.108	.116	0.761	.114
Age 41–50												
UC	1.891	.382	0.546	.750	3.022	.213	1.004	.307	1.433	.247	0.255	.841
UP	1.089	.621	0.447	.803	1.565	.504	0.716	.461	0.912	.449	0.178	.900
MP	3.012	.183	0.144	.956	0.421	.888	0.641	.510	0.591	.632	0.386	.738
two-way interactions												
UC x UP	2.694	.496	1.546	.634	1.834	.736	1.197	.504	2.305	.248	0.312	.960
UC x MP	6.771	.210	1.524	.905	2.773	.838	1.722	.620	2.710	.446	1.349	.815
UP x MP	1.671	.259	0.032	.965	0.085	.938	0.064	.890	0.106	.857	0.172	.755
Age 51–60												
UC	2.898	.321	0.851	.743	3.572	.270	1.388	.436	0.308	.901	0.072	.964
UP	3.758	.338	3.102	.344	1.735	.749	1.969	.424	2.261	.377	1.220	.321
MP	1.239	.680	4.745	.079	2.946	.355	0.255	.918	1.185	.528	0.026	.992
two-way interactions												
UC x UP	4.253	.274	0.213	.989	0.400	.978	0.959	.755	0.395	.945	0.077	.990
UC x MP	17.668	.009**	5.509	.434	5.237	.667	1.894	.876	2.310	.822	0.318	.996
UP x MP	0.821	.319	1.053	.217	0.112	.725	0.021	.839	0.925	.189	4.514E–5	.989

Notes. **—significant at *p* < .05; a—sleeping disorders/disturbances, b—depression, c—exhaustion at work, d—substance addiction, e—anxiety, f—fear, UC—the use of a desktop computer, UP—the use of a portable or minicomputer, MP—the use of a mobile phone.

In Tables 4–5, there are women's and men's data. In the women's age group of 31–40, the use of a desktop computer had a relation to all mental symptoms (16a–f) and in the age group 51–60, the use of mobile phones and portable or minicomputers had a relation to depression (16b). In addition, there are three two-way interactions in the 31–40 age group, and two in the age group of 51–60. In the men's age group of 31–40, the use of desktop computers or the use portable or minicomputers had a relation to fear and the use of mobile phones had a relation on the substance addiction. Some relation can also be seen together with two-way interactions.

3.3. Other Observations Concerning Mental Health and New Technology

In total, 1300 respondents (~21%) answered the open-ended question "Other observations concerning technology and health". The answers had been read through and classified mostly on the basis of comments on physical or mental loading, accidents and some other aspects. In total, there is estimated to be 2508 comments. It is possible that persons responded to more than one aspect. On mental loading people commented with 790 opinions concerning some quite different subjects. The answers were divided into a seven subgroups: mental loading at work (322), mental loading at leisure (235), social activities (49), addiction (71), technology and the mental development of children and juveniles (42), rest (41) and other topics of mental loading (30).

The comments on the mental loading at work included: the amount of work has increased and the quality of the work has changed (56), learning new technology is laborious and the updating of knowledge and skills is difficult (92), technology and depression/anxiety at work (26), attention and concentration (22), technology has made work easier, quicker or lighter (62) and other comments (64). The comments on the mental loading at leisure included: persons always have to be reachable (26), high-speed flow of information and stress of too large information-retrieval (54), the tone of mobile phones and the use of mobile phones in public places irritates (21), technology is useful at leisure (55), business has increased

(22) and other comments (57). The comments of social acitivities included: social acitivities have got better (10), social activities have got worse (20) and other comments (19). The comments of the addiction included: mobile phones (21), the Internet (13), computer (7) and others (30). Only a few admitted that they personally felt they were addicted. There was also a great deal of concern about the effect of new technical devices and services on the mental development of children and juveniles. The comments of the rest of the topics included: knowledge work requires breaks and relaxation periods (6), computer lessens the time of rest, or relations to sleep (10) and other comments (25).

4. DISCUSSION

4.1. Evaluation of Methods

The population was 15000 Finns and the number of responses was 6121, which is quite large. However, the results of data are not highly reliable, because the nonresponse rate was over 50%. Nonresponding persons can be healthier, nobody knows, so, e.g., in our data the number of symptoms could be too high. It is important to take this into account, when the results are analysed. In this study only a questionnaire was used. When using a questionnaire we cannot get as much information as we can get in interviews. Persons may understand questions and words in different ways. In general, when using a questionnaire the population can be larger than when interviews are used. Research on the possible relation of new technical equipment on health is quite difficult, because the possible relation can be marginal and limited. Based on that, we used a questionnaire and chose the population of 15000. In the study the p value was .05. We chose .05, because this is usual practice in medical and psychological studies [17].

In the statistical analyses the use of equipment at work and at leisure was combined; *less than monthly*, *monthly*, *weekly* and *daily* were the alternatives. The choice *less than monthly* means that a person uses, e.g, a computer very rarely. Therefore, many are users of new technical

equipment. In Table 1 there are some persons who answered that they were outside working life, but at the same time they answered that they used, e.g., a computer at work. In open-ended questions some of them reported that they had just retired or become unemployed, but they had worked during the past 12 months and answered on the basis of this. These answers were also included in the final results. For the statistical analyses we chose the most common equipment (mobile phones and different computers). Less important equipment like TV and digi-boxes played a minor role. In addition, e.g., the workers' use of computers was quite different, so it was also possible to find out some relations in analyses.

In the fourth section, psychological welfare, there was also the question "Have you suffered mental symptoms, which you somehow associate in connection with an increase in information-retrieval or informing through different electronic sources such as email, internet or digital television during the past 12 months?" This question was leading. Therefore, it was not used in statistical analyses.

Different types of biases also occurred in the study. The questionnaire and questions can relate to patricipants so that active persons sent the questionnaire back and opinions can change quite quickly as technology developes. Not all participants understand symptoms in the same way. For example, psychological symptoms can be difficult to describe. However, we got many comments on psychological symptoms from the open-ended question. The questionnaire did not include all possible questions. There can be other factors, which can be related to the mental symptoms, e.g., difficulties at work or at home, different diseases, financial problems.

4.2. Evaluation of Mental Loading

According to other studies prevalence of depressive and anxiety disorders in the general population varies between 4 and 11%, and 4 and 19%, respectively [5, 6, 7, 8]. In the Finnish health 2000 study depressive, alcohol use and anxiety disorders were found in 6.5, 4.5 and 4.1% of the subjects, respectively [6]. In our studies, 59% of persons had sleeping disorders/

disturbances, 43.3% had depression, 62.5% experienced exhaustion at work, 9.6% had substance addiction, 34.4% experienced anxiety and 16.0% experienced fear (Table 2). In our material the values are quite high. However, when we take away *sometimes* answers, 8.8% had depression, 2.1% had substance addiction and 6.6% had anxiety. This results are at the same level as in other studies [5, 6, 7, 8]. In the Finnish health 2000 study 7.3% of men had alcohol use disorders and 1.4% of women. Eight point three per cent of women had depressive disorders and 4.6% of men. In our data 62.2% of women and 54.8% of men had depression, and 5.50% of women and 15.10% of men had substance addiction. However, our results were based on people's own answers, which is not the same as if they had mental diseases and diagnosis.

4.2.1. Number of symptoms and their relations

In statistical analyses (one-way interaction), the use of desktop computers had a relation to all mental symptoms and gender had a relation to depression (Table 3). In the women's age group of 31–40, the use of a desktop computer had a relation to all mental symptoms, and for 51–60, the use of a mobile phone and portal or minicomputer had a relation to depression (Table 4). In the men's age group of 31–40, the use of a desktop computer or the use of a portable or minicomputer had a relation to fear and the use of mobile phones had a relation to substance addiction (Table 5). Some relation was also together with two-way interactions. It is difficult to say why the use of desktop computers had a relation to all mental symptoms particularly in the women's age group of 31–40.

In the Finnish questionnaire studies, the mental symptoms of women increased in the city of Tampere [18, 19]. The researchers explained that women's working life changed. The changes were quick and stressful. Maybe this also affected our data. The reason for our result can be that in Finland many women take care of children and work outside home at this age, and it is stressful to do both. In general, it is possible that working with computers can have a relation to mental

symptoms more than other tasks and therefore we got the results that the use of desktop computers had a relation to all mental symptoms. Maybe men's and women's mental symptoms are generally somewhat different. We found that in the men's age group of 31–40, the use of desktop computers or the use portable or minicomputers was related to fear. Nowadays men also take care of children (in Finland) and it is also stressful for them to combine work and looking after children.

In addition we got results that in the men's age group of 31–40, the use of mobile phones had a relation to substance addiction (Table 5). It is difficult to find a reason for this. Maybe some persons can also have addiction problems with mobile phones. It was surprising to see that the use of computers had such a relation to mental health issues. In the future, mobile phones will be more like computers. Nowadays they are already more than just phones, e.g., they include games.

4.2.2. Evaluation of mental symptoms in different uses of computers

In the upper- and lower-level white-collar workers' groups the persons who used a desktop computer at work daily had more sleeping disorders/disturbances, depression, exhaustion at work, anxiety or fear than other persons (Figures 1–2). So it is possible that in these workers' groups the amount of use can increase the symptoms. However, in the lower-level white-collar workers' group the persons who did not use a portable or minicomputer at work had more sleeping disorders/disturbances, depression, exhaustion at work, anxiety or fear than other persons (Figure 2). In this workers' group the use of portable or minicomputers was quite low and this could influence the results. In the upper-level white-collar workers' group (Figure 1) the persons who used a portable or minicomputer at work or did not use one at all, had the most sleeping disorders/disturbances, depression, exhaustion at work or anxiety. It is possible that in the upper-level white-collar workers' group the high use of different computers had little relation to mental symptoms.

In the blue-collar workers' group the persons who did not use the desktop computer at work or used it daily, had most mental symptoms (Figure 3). So the results were quite similar as in the lower-level white-collar workers' group. In addition, the blue-collar workers did not use portable or minicomputers very much at work, so in this group the persons who did not use portable or minicomputers had most mental symptoms (Figure 3). In addition, it is possible that the physical work environment generally influenced the results, because according to earlier studies many health problems had a multifactorial etiology [11, 12, 13, 14].

5. CONCLUSION

In conclusion, it can be stated that based on our data in the Finnish working-age population 59% had some or more sleeping disorders/disturbances, 43.3% had depression, 62.5% experienced exhaustion at work, 9.6% had substance addiction, 34.4% experienced anxiety and 16.0% experienced fear. However, the results are not highly reliable, because the nonresponse rate was over 50%. Based on statistical analyses of all data the use of desktop computers had a relation to mental symptoms. On the other hand, it is possible that nonresponding persons can be healthier than responding persons and their use of desktop computers had no relation to mental symptoms. In the women's age group of 31–40, the use of desktop computers had a relation to all mental symptoms, and in the 51–60 age group, the use of a mobile phone and portable or minicomputers had a relation to depression. In the men's age group of 31–40, the different computers had a relation to fear, and the use of mobile phones had a relation to substance addiction. Some relations were also together with two-way interactions. In the future it will be essential to take into account, that working with computers can increase workers' mental symptoms and it is important to pay attention to workers' mental health.

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