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·*Original Article*·

Does exposure to computers affect the routine parameters of semen quality?

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Abstract

Aim: To assess whether exposure to computers harms the semen quality of healthy young men. **Methods:** A total of 178 subjects were recruited from two maternity and children healthcare centers in Shanghai, 91 with a history of exposure to computers (i.e., exposure for 20 h or more per week in the last 2 years) and 87 persons to act as control (no or little exposure to computers). Data on the history of exposure to computers and other characteristics were obtained by means of a structured questionnaire interview. Semen samples were collected by masturbation in the place where the semen samples were analyzed. **Results:** No differences in the distribution of the semen parameters (semen volume, sperm density, percentage of progressive sperm, sperm viability and percentage of normal form sperm) were found between the exposed group and the control group. Exposure to computers was not found to be a risk factor for inferior semen quality after adjusting for potential confounders, including abstinence days, testicle size, occupation, history of exposure to toxic substances. **Conclusion:** The present study did not find that healthy men exposed to computers had inferior semen quality. *(Asian J Androl 2005 Sep; 7: 263–266)*

Keywords: computer; magnetization; electromagnetization; male reproduction; semen analysis; semen quality; semen parameters

1 Introduction

Reports of decreasing human sperm counts and increasing abnormalities of human testes have directed more attention to the possible impact of environmental factors on male reproduction [1, 2]. People are concerned that the extensive use of computers will affect male fertility function. The screens of personal computers produce extremely low frequency electromagnetic fields, which may alter the structure of cell membranes [3, 4]. Previous studies have indicated that computing managers or operators had a higher risk of infertility than service and clerical workers and that the percentage of pathological sperm increased along with the years of regular computer use [5, 6]. Men who were exposed to electromagnetic fields were found to have an increased risk of low semen quality [7]. These studies were, however, done in the infertile population. This study explores the effect of computer exposure on semen quality among healthy young men.

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2 Materials and methods

2.1 Subjects and data collection

The subjects were recruited from volunteers taking their premarital physical examination in two maternity and children healthcare centers (MCHs) in two urban sections of Shanghai from August 2001 to May 2003. Subjects with a history of serious chronic disease and reproductive disease, such as infertility, cryptorchidism, varicocele and prostatitis were excluded. Inclusion criteria also required participants to have lived in Shanghai for more than 2 years and to be aged between 20 and 44 years.

Information about computer exposure, life-style factors, occupation, reproductive history, medication history and toxic substance exposure were collected from a structured questionnaire interview. The testis size was measured by using a set of testis models made by Fenghua Medical Device CO., Ltd (Hangzhou, Zhejiang, China). The men who had been using computers in the preceding 2 years for 20 h or more per week were recruited into the exposed group. The men who had never used computers and other video display terminals or had only been exposed for a short time (no more than 10 h per week), were included in the control group. Subjects could also be further categorized as: no or little exposure (≤10 h per week), low-dose exposure (20–39 h per week) and high-dose exposure (≥40 h per week).

Semen samples were collected by masturbation at the two MCHs, where the samples were processed and analyzed by two trained technicians. An abstinence period was requested before semen collection. The semen samples were stored in a heating chamber at 37 °C for liquefaction. Volume, sperm density, proportion of progressively motile sperm and proportion of normal form sperm were examined according to the World Health Organization (WHO) guidelines for the examination of human semen [8].

In the motility assessments, sperm samples were enumerated and classified as: “good-progressive”, “sluggish-progressive”, “non-progressive” and “no movement”. Good-progressive and sluggish-progressive sperm were taken to be progressive sperm.

2.2 Data analysis

A non-parametric test was used to compare the distribution of semen variables of the control and the exposed groups. Logistic regression analysis was used to explore the effect of computer exposure by controlling potential confounders. Semen volume, sperm density

Table 1. Characteristics of the computer-exposed and the control groups. [c]$P < 0.01$.

	Control group (n = 87)		Exposed group (n = 91)	
	n	%	*n*	%
Age (years)				
<25	18	20.7	20	22.0
25–29	46	52.9	52	57.1
≥30	23	26.4	19	20.9
Body mass index				
<19.8	13	14.9	14	15.4
19.8–25.9	62	71.3	66	72.5
≥26	12	13.8	11	12.1
Occupation[c]				
Manual worker	14	16.1	2	2.2
Service worker	29	33.3	30	33.0
Research worker	8	9.2	34	37.4
Administrative worker	17	19.5	22	24.2
Driver	13	14.9	0	0.0
No fixed job	6	6.9	3	3.3
Education[c]				
Senior school and lower	47	54.0	13	14.3
College and higher	40	46.0	78	85.7
Sedentary work[c]				
No	57	65.5	27	29.7
Yes	30	34.5	64	70.3
Smoking[c]				
No	38	43.7	69	75.8
Yes	49	56.3	22	24.2
Drinking				
No	61	70.1	67	73.6
Yes	26	29.9	24	26.4
History of parotitis				
No	74	85.1	70	76.9
Yes	13	14.9	21	23.1
Exposure to toxic substance				
No	76	87.4	84	92.3
Yes	11	12.6	7	7.7
Sexual experience				
No	14	16.1	13	14.3
Yes	73	83.9	78	85.7
History of partner pregnancy				
No	61	70.1	70	76.9
Yes	26	29.9	21	23.1

and proportion of progressive sperm were divided as dichotomized variables according to the criteria of WHO [8]. We used 50 % as the dividing point for the other two variables (sperm viability and percentage of normal form sperm) according to the distribution of the data in our study with about 15–25 % of subjects under the limit. We did not intentionally choose the limit according to the results from other studies or other indices, such as the incidence of male infertility in the population because of the small sample of the study. We just changed the limit of the two variables (25 % down for sperm viability and 20 % up for normal form sperm) on the basis of WHO criteria [8]. Abstinence days, time from semen collection to test, volume of testicle, body mass index, occupation, exposure to toxic substances, age of spermatorrhea, smoking, alcohol intake, wearing tight pants, sedentary work and study center were controlled in the logistic regression. SAS 8.2 software was used in the analysis.

3 Results

A total of 178 volunteers participated in the study, with 91 in the exposed group and 87 in the control group. The median of exposure to computers was 40 h (25th–75th percentile: 28–54) and 0 h (25th–75th percentile: 0–7) per week for the exposed and control groups, respectively. Table 1 shows the basic characteristics of the two groups. The exposed and the control groups were similar in age, body mass index, drinking, sexual experience, history of parotitis and history of partner pregnancy. However, the exposed group had higher education level, smoked less and more often worked in research and sedentary occupations than the control group.

There were no differences in the distribution of semen volume, sperm density, viability, percentage of progressive sperm and percentage of normal sperm between the exposed and the control groups (Table 2).

The results of the logistic regression analysis showed no association between computer exposure and increased risk of inferior quality of semen after controlling potential confounders (Table 2). Men with high-dose exposure to computers (≥ 40 h per week) did not have inferior semen compared with the low-dose exposed group and the control group (data not shown).

4 Discussion

The present study did not find any association between computer exposure and the risk of reduced semen quality in the routine parameters, including semen volume, sperm density, sperm viability, percentage of progressive sperm and percentage of normal form sperm.

Our findings support a study done among welders, in which a high level of extremely low frequency exposure was not related to the risk of reduced semen quality [9]. It did not, however, support the results from infertile population [5–7]. The specificity of this study is that the studied population was healthy young people. The technicians who performed the semen analysis were blinded to the exposure conditions of the subjects. However, the potential selection bias should be taken into consideration. The control group most frequently comprised manual workers and drivers, while the computer-exposed group comprised mainly research workers. The

Table 2. Distribution of semen parameters in computer-exposed and control groups and odds ratios (OR) of inferior semen quality of computer exposure group, compared with the controls (logistic regression). *Adjusted for abstinence days, time from semen collection to test, volume of testicles, body mass index, occupation, exposure to toxic substances, age of spermatorrhea, smoking, alcohol intake, wearing tight pants, sedentary work and study center.

Semen parameters	Mean (Standard deviation)		Median (25th – 75th percentile)		Adjusted OR* (95%CI)
	Control group (n = 87)	Exposed group (n = 91)	Control group (n = 87)	Exposed group (n = 91)	
Semen volume (mL)	2.7 (1.7)	2.8 (1.2)	2.2 (1.5-3.3)	2.8 (2.0-4.0)	0.71 (0.32-1.57)
Sperm density (10^6/mL)	19.5 (73.8)	124.0 (82.4)	110 (70.0-165.0)	112 (80.0-160.0)	0.17 (0.02-1.32)
Progressive sperm (%)	40.9 (20.6)	44.2 (19.5)	38 (25.0-53.5)	40 (28.8-58.0)	0.52 (0.22-1.26)
Viability (%)	60.8 (16.1)	64.1 (12.6)	60 (51.0-73.0)	64 (56.0-72.3)	0.37 (0.14-0.96)
Normal form sperm (%)	57.3 (11.8)	58.9 (13.7)	56 (49.5-66.3)	57.5 (49.5-70.3)	1.26 (0.53-3.01)

results of this study showed that the semen parameters of the control group were appreciably lower than the exposed group. We did not measure the electromagnetic field levels produced by the computers and the environmental background. Actually, the environment is full of magnetic fields produced by objects that pass currents. It would be better to measure the density of the electromagnetic fields with individual portable instruments. The study sample was not large enough and the findings should, therefore, be interpreted with caution.

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