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DIFFERENCES IN EYE-HAND MOTOR COORDINATION OF VIDEO-GAME USERS AND NON-USERS[1]

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Summary.—The recent proliferation of electronic video games has caused an outcry from those who question the merits of the games, while others maintain the games improve eye-hand coordination. At present, no empirical data are available to indicate whether there are differences in eye-hand coordination between video game users and non-users. Comparing 31 video game users and 31 non-users showed users have significantly better eye-hand motor coordination on a pursuit rotor. However, no relationship was found between an individual's eye-hand motor coordination and the amount of time spent weekly playing video games or the length of experience with video games.

In recent months, considerable public attention has been focused on electronic video games. The proliferation of these games has seemingly sparked a controversy overnight between those who are opposed to the unrestricted use of the games, and those who claim beneficial effects from their use. Interestingly enough, this commotion occurs in the complete absence of any empirical substantiation as to the effects of video game use.

The arguments of opponents to video games were epitomized by R. Lamm and her grassroots movement (cited by Geist, 1982) in regarding the games as mindless and without pedagogical benefit. Supporters of video games counter with the claim that video game play both requires and improves eye-hand coordination (S. Kaplan, cited by Mitchell, 1982; Robin, 1983; Robin, cited by Mittenthal, 1982; Needham, 1982; J. Sehulster, cited by Atari, 1982). However, the relationship between video-game use and eye-hand coordination has not been established. The present study was a preliminary assessment of differences in eye-hand coordination for video-game users and non-users.

METHOD

Subjects

In the experimental group were 31 video-game users recruited from general psychology courses at a large midwestern university. Participants included 20 males (19 righthanded, 1 lefthanded) and 11 females (8 righthanded, 3 lefthanded). Participants had 2 to 99 mo. experience playing video games ($M = 32.97$, $SD = 27.14$) and played the games an average of 2 to 59 hr. per week ($M = 5.74$, $SD = 10.24$), including both arcade and home use.

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The control group of 31 video game non-users were recruited from general psychology courses at the same institution. Participants included 20 males (19 righthanded, 1 lefthanded) and 11 females (8 righthanded, 3 lefthanded). Each participant of the control group had less than 10 hr. of video-game playing experience during the previous 6-mo. period.

Participants in both groups volunteered to take part in the study and received course credit.

Apparatus

A photoelectric rotary pursuit unit (Lafayette Instrument Co., Model No. 30014) was used to test eye-hand coordination, with time on target being recorded in .001 sec. on a digital time clock (Lafayette Instrument Co., Model No. 54030). A solid stylus allowed subjects to exert as much pressure on the tracking surface as they wished. It is worth noting that the photoelectric rotary-pursuit unit employs a moving dot of light beneath a stationary glass plate. The duration of all trial intervals was controlled by two deci-interval timers (Hunter Mfg. Co., Model 111B, Series E).

Three geometric test plates were used: a circle with a 96-mm perimeter circumference, a square with an 80-mm perimeter, and a triangle with a 72-mm perimeter.

Procedure

Subjects were informed that the experiment was a test of eye-hand motor coordination and that their participation involved following a moving light-stimulus around the test field. Participants were instructed to use the preferred hand during the experiment. Subjects were given a detailed explanation of the duration of the trial intervals, the types of test patterns, varying speeds of the moving stimulus, and how their performance will be evaluated.

Subjects were required to complete three tasks on the photoelectric rotary-pursuit unit. The first task involved following the stimulus around a circular field for nine trials at randomly ordered speeds from 10 to 50 rpm, which were spaced at 5-rpm intervals. The remaining two tasks involved following the stimulus around a square and triangular field, respectively, for five trials each. The stimulus speeds were randomly ordered, ranging from 10 to 30 rpm, and were spaced at 5-rpm intervals. The stimuli were always presented in a clockwise rotation. Subjects began each trial with the target stationary.

Participants were given a 30-sec. practice trial at 5 rpm for each geometric pattern before beginning the actual test trials. All trial intervals were set at 30 sec., and the sequence of test patterns and speeds were identical for each subject. No feedback on performance was given to the subjects during the course of the experiment.

Information pertaining to the participant's video-game usage was obtained after the completion of all test trials to control effects of experimenter bias.

RESULTS

The data indicate no significant differences for sex ($t_{60} < 1.00$) and handedness ($t_{60} < 1.00$) between the groups. Table 1 presents the means, standard deviations, F ratios, and significance levels, for time on target on the pursuit rotor for video-game user and non-user groups. Time on target was recorded in seconds.

Analyses of variance between groups for performance on the circled yielded no significant differences at 10-rpm and 15-rpm trials, and significant differences at the 20-rpm, 25-rpm, 30-rpm, 35-rpm, 40-rpm, 45-rpm, and 50-rpm trials, and over-all performance mean. Performance levels for video-game users were consistently higher than for non-users. Analyses of variance between groups for performance on the square and triangle yielded significant differences at all rpm levels, and over-all performance means, for both geometric patterns. Again, video-game users' mean performance was consistently higher than that for non-users at all levels.

Pearson product-moment correlations were calculated to assess the relation between video-game use and performance on the pursuit rotor. Months of experience playing video games, average number of hours per week of play,

TABLE 1

MEANS AND STANDARD DEVIATIONS OF PERFORMANCE ON PURSUIT ROTOR FOR VIDEO-GAME USERS AND NON-USERS, RECORDED AS TIME ON TARGET IN SECONDS

rpm	Users (31)		Non-users (31)		$F_{1,60}$	p
	M	SD	M	SD		
Circle						
10	26.46	3.66	25.63	2.49	1.08	.3
15	23.94	3.69	22.40	3.42	2.91	.09
20	22.38	3.04	20.01	4.21	6.44	.01
25	16.97	4.93	14.55	4.06	4.45	.04
30	16.58	3.76	14.06	4.00	6.53	.01
35	14.46	4.28	12.27	4.04	4.30	.04
40	12.48	4.44	10.14	3.52	5.29	.02
45	11.43	4.80	8.36	3.70	7.91	.006
50	10.07	3.17	7.54	4.41	6.72	.01
Over-all	17.19	2.34	14.99	3.26	3.05	.003
Square						
10	26.57	1.75	24.79	3.46	6.50	.01
15	21.50	3.57	18.65	4.05	8.66	.005
20	16.47	3.37	13.05	3.53	15.24	.0002
25	13.14	2.28	10.22	2.75	20.67	.0001
30	8.58	2.60	6.97	2.09	7.28	.009
Over-all	17.25	2.27	14.74	2.70	3.97	.0002
Triangle						
10	25.09	2.41	22.57	3.25	11.95	.001
15	21.23	3.30	17.89	4.13	12.31	.0009
20	17.51	2.89	13.72	3.63	20.73	.0001
25	12.68	2.80	9.97	2.53	15.97	.0002
30	9.62	2.77	7.19	1.78	16.87	.0001
Over-all	17.22	2.27	14.27	2.80	4.56	.0001

and the product of these two factors combined, were correlated with the over-all performance means for the three geometric patterns. Correlations between months of experience playing video games and over-all performance means were .22, .06, and .05, for the circle, square, and triangle patterns, respectively. Correlations between average number of hours per week engaged in video-game play and over-all performance means were —.15, —.11, and —.18, for the circle, square, and triangle patterns, respectively. Correlations between video-game use factors combined with over-all performance means were —.15, —.14, and —.20, for the circle, square, and triangle patterns, respectively.

Discussion

The data clearly show that video-game users have substantially superior eye-hand coordination than a matched sample of non-users. Two possible explanations may account for these findings. One explanation is that playing video games may actually develop and improve such skills. This explanation is not highly plausible however, as no positive relationship was evidenced between eye-hand motor coordination and the length of exposure to video games or the amount of time engaged in video-game play each week. A second explanation may be that video-games attract and appeal to those individuals with exceptionally good eye-hand motor coordination. Success in many of the games is contingent upon quick reflexes and well-developed eye-hand motor coordination. It is possible that individuals without these qualities seek out other pastimes.

This study was only a preliminary one to determine if skills differences exist between users and non-users and does not adequately test either explanation. An interesting extension of the present study might use a pretest-posttest design with video-game users to determine if video-game play affects an individual's eye-hand motor coordination over time. An increase in individual performance over time would lend some support to the first explanation.

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