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ABSTRACT

When preschool children were given a choice of activities, they spent significantly more time working with puzzles/brissle blocks than they did working at a computer. Sex and age differences were not statistically significant. Wide individual differences in the "holding power" of both the computer and puzzles/brissle blocks were found. The range of time spent on the computer varied from 121 to 0 minutes. Time spent at the puzzle/block activity ranged from 294 to 4 minutes. It would appear that the computer is similar to other activities in a preschool; some children love it, others do not. The question for future research is whether children should be forced to work on the computer when they might choose some other activity. (RH)

THE "HOLDING POWER" OF THE COMPUTER: A STUDY OF YOUNG CHILDREN'S COMPUTER TIME

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"A Nation at Risk" recommended that more time be devoted to learning and that time in school be used more effectively (Chronicle, 1983). Thus, in the search for excellence in education, an increased significance was attached to time as a variable in learning. State legislators focused on the quantity of time students should spend in the school and increased the number of hours in the school day as well as the number of days in the school year (Toch, 1984). A review of research revealed that the quality of learning time could be enhanced by having students spend more time on-task and less time off-task (Denham and Lieberman, 1980).

The concern for overall learning time has generated study in more specific areas, such as computing time. Again, both quantity and quality have been issues. A research project conducted in seven elementary schools and one junior high school found the average amount of computer time was 15 minutes per student per week. However, teachers in these schools felt the optimal student computer time would be 15 to 20 minutes sessions two or three times a week (Simpson, 1983). In a more detailed analysis, Becker (1983) reported a third of the elementary school students use a computer 15 minutes or less during the week. Those students who received more than 15 minutes had only an additional 10 or 15 minutes per week. Only one student in 50 in the elementary school had more than one hour of computer time during the week. The study further revealed that a majority of high

school students had 45 minutes per week on the computer. This John Hopkins University study concluded that elementary school teachers believed in giving computer access to the maximun of students, even if the student's time on the computer is minimal. However, secondary school teachers limit computer access and allow more time at the computer.

The relationship of computer time to learning has been examined in several studies. Kulik (1983) reviewed two studies on the amount of time required for students to learn subject matter content. Both studies compared students who were taught in the traditional way with students who were taught with computers. There was a 39% savings of time in one study and an 88% savings of time in the other. In 16 of 17 studies reviewed by Schuelke and King (1983), mastery of knowledge occured in significantly less time when using computer than when using traditional methods. Atkinson (1984) concluded that the most significant finding on the effectiveness of computer-assisted instruction (CAI) was that students still learned effectively even with a shortened length of instructional time.

Bear (1984) cautioned that while 20 minutes of CAI a week may improve math scores, it may have little effect in improving scores in reading or language arts. Therefore, more computer time may be needed in some subject areas than in others. Because of the academic gains in classrooms where students have more time to use computers, Bear advocated extending computer time before and after school. However, more time may not be the complete answer. Frequency of computer sessions may also be a factor. While one study reported that the number of sessions was more important than the total time spent on the computer, another one

found the opposite to be true (Fisher, 1983).

The results of one study indicated that the time on task doubled for students involved in computer enhanced learning as compared to students in the lecture-discussion situations (Jernstedt, 1983). Perhaps, the most promising finding, in terms of the quality of computer time, has been made by Silfen and Howes (1984). When three elementary schools using only teacher-based instruction were compared to an elementary school that added computer-assisted instruction, CAI improved student time on task and had a carry-over effect from the computer into the regular instructional time.

The above discussion focuses on elementary, junior, and senior high school. What about computer time in the preschool? A review of the literature reveals more descriptive accounts of young children and the computer than research evidence. Time was a variable in a study conducted with three groups of Mexican-American and black Head Start children using a premath computer program (Taylor, Smith, and Riley, 1984). One group was exposed to the computer for 10 minutes a day for one week, the second group for two weeks, and the third one for three weeks. The results indicated that the treatment was not effective regardless of the length of exposure time. One possible explanation for this finding was that the length of exposure to computer was too brief to produce measurable gains in number comprehension with this population.

Papert (1980) stressed that one of the strengths of the computer was its "holding power." However, some have observed that the computer's "holding power" is not universal among all young children; some spend large amounts of time on the computer while others spend no time at all

(Swigger, Campbell, and Swigger, 1983, Beeson and Williams, 1985). After reviewing the research on young children and computers, Brady and Hill (1984) concluded that one of the significant questions remaining was how much time children use computers? When young children are given a choice of activities, how does the time spent on a computer compare to time spent on another activity? Are there sex and/or age differences when the comparison is made?

Subjects

The subjects were 33 children attending two programs in an early childhood education center operated by a midwestern university. One program is primarily concerned with younger preschool children (under three years of age) and the other with older preschool children (over three years of age). Both groups included children of faculty and students of the university, as well as "town children." Parents participated in both programs.

The younger group was composed of 17 children who ranged in age from 24 to 35 months old. The older group was composed of 16 children who ranged in age from 36 to 69 months old. There were 14 females and 19 males in the two groups. (See Table 1.)

TABLE 1

Subjects by Age and Sex

	Younger	Older	Totals
Females	4	10	14
Males	13	16	19
Totals	17	16	33

Procedure

Preschool programs often have a time during the day when children have a choice of activities. Some programs offer the use of the computer as one of the choices (Karoff, 1983). The two preschool programs in this study followed this model. On the days when research observations were conducted, the children were given a choice of five activities: working with the computer, working with puzzles/brissle blocks, dramatic play in the family center, reading or looking at a book, and a teacher-selected activity (non-table type).

Working with puzzles/brissle blocks was selected as the activity to be compared to working with the computer. Both activities require fine muscle coordination and do not involve total body movement. They are relatively "quiet" activities done at a table by an individual or small group of two or three.

The study included 20 observational periods of 30 minutes each. Although the programs met three days a week, observations were conducted two days each week for ten weeks.

Two observers, one for the computer activity and one for the puzzles/brissle blocks activity, were trained to record times on data collection forms. An entry was not recorded unless the child worked on the computer or puzzles/brissle blocks for at least 30 seconds.

Results

The means and standard deviations for working with the computer and puzzles/brissle blocks by sex and age group are given in Table 2. The mean for time spent working on puzzles/brissle blocks (5439.880) was higher than the mean time for working on the computer (1485.945).

TABLE 2

Cell Means and Standard Deviations

for Computer and Puzzles/Brissle Blocks

	Younger Females		Older Females	
	Computer	Puzzles/Blocks	Computer	Puzzles/Blocks
Mean	675.25	4817.75	2717.60	5093.40
S.D.	586.72	3439.15	2457.50	3532.71

	Younger Males		Older Males	
	Computer	Puzzles/Blocks	Computer	Puzzles/Blocks
Mean	1536.92	3866.54	1014.00	7981.83
S.D.	1443.94	3405.43	1407.89	6537.00

The study utilized a 2x2x2 factorial analysis of variance. The $p < .05$ level of significance was selected to test the hypotheses. The results are given in Table 3.

TABLE 3

ANOVA for Time, Age, and Sex

Source	DF	SS	MS	F	P
Between Blocks/Subjects					
Age	1	29424779.594	29424779.602	2.513	.120
Sex	1	1010521.798	1010521.798	.086	
Age X Sex	1	1367967.962	1367967.963	.117	
Error	29	339564314.750	11709114.305		
Within Blocks/Subjects					
Time	1	210699318.000	210699318.063	24.307	<.001
Age X Sex	1	6945550.410	6945550.412	.801	
Sex X Time	1	6505896.582	6505896.584	.751	
Age X Sex X Time	1	34554989.766	34554989.781	3.986	.052
Error	29	251381458.188	8668326.160		

The difference between the time spent working on the computer and the time spent working with puzzles/brissle blocks was significant, $F = 24.307$, d.f. = 1, 29, $p < .001$. Differences due to sex were not

significant, F = .086, d.f. = 1, 29, nor were differences due to age group, F = 2.513, d.f. = 1, 29. Although not significant at the p <.05 level, the interaction of time, sex, and age group had an F = 3.986, d.f. = 1, 29, and p <.052. There was less difference in the time spent working on computers and time spent working with puzzles/brissle blocks in the older female group and the younger male group. This is shown in Figure 1.

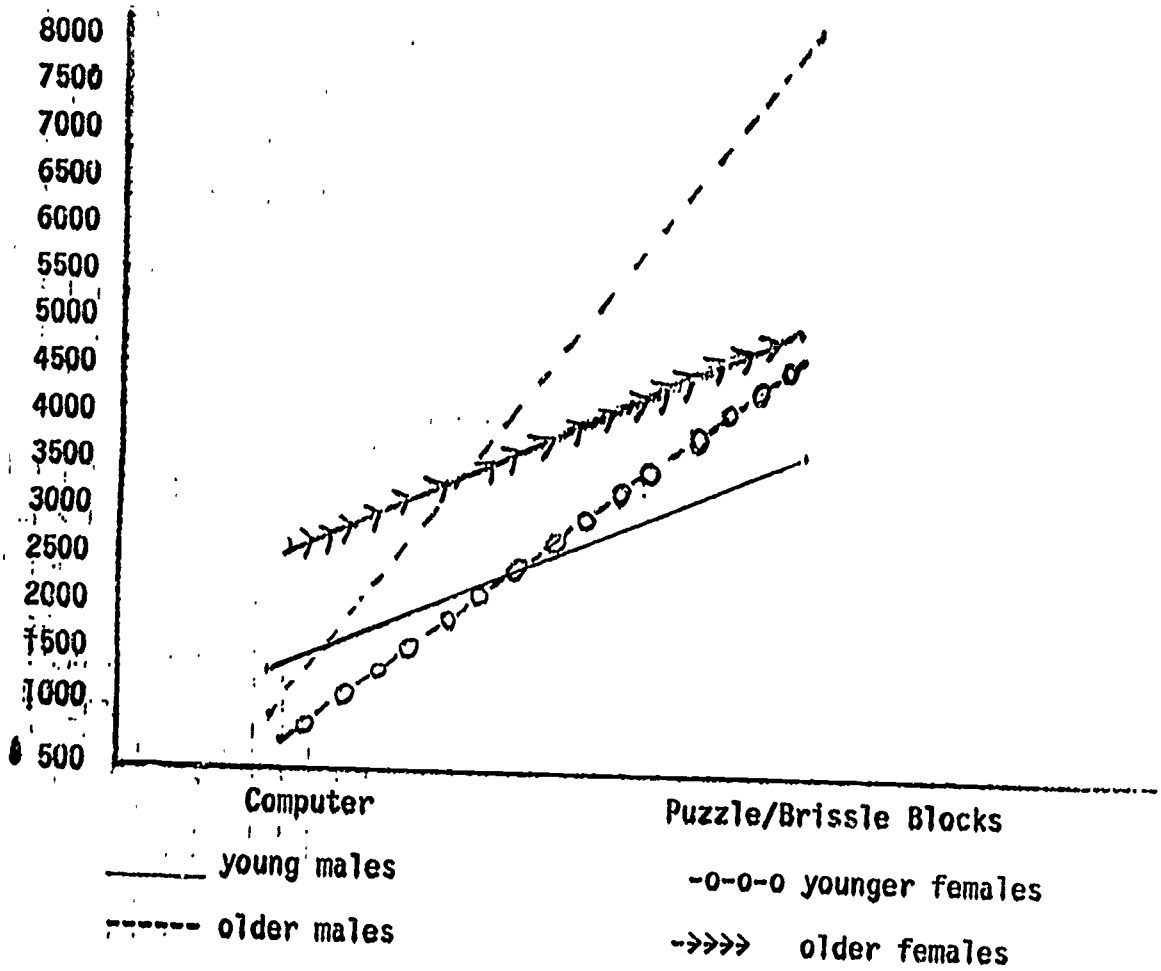

FIGURE 1. Plot of Means

Discussion

When young children in this study were given a choice of activities, they spent statistically significant ($p < .001$) more time working with puzzles/brissle blocks than they did working on the computer. Sex and age group (children under three- and over three-years of age) differences were not statistically significant.

The above finding is in conflict with Papert's (1980) belief that the strength of the computer is in its "holding power." More traditional preschool activities -- puzzles/brissle blocks -- had more "holding power" than the computer for this group of children. There were wide individual differences in the "holding power" of both the computer and puzzles/brissle blocks. (Note the size of the standard deviations shown in Table 2.) The range of time spent on the computer varied from 121 to 0 minutes. The same was true for time spent working with puzzles/brissle block, from 234 to 4 minutes. It would appear that the computer is similar to other activities in a preschool; some children love it, others do not. This finding serves as a reminder of the danger in making any broad generalization concerning children.

A belief that computers can make a significant contribution to children's learning may lead some preschool teachers -- and parents -- to strongly encourage their young children to spend time working on the computer. The question for future research is whether children should be forced to work on the computer when they might choose some other activity.

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