Preschool Children's Use of Mouse Buttons

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ABSTRACT

We have observed numerous times how young children find it difficult to use software that provides different functionality with each mouse button. To better learn how young children use mice, we conducted a study with 4 year-olds, 5 year-olds, and adults. The study's participants played a game that responded equally regardless of the button used to click. The results showed that while adults and most 5 year-olds consistently clicked on the left mouse button, 4 year-olds did not. These results suggest that 4 year-olds are better served by user interfaces that provide the same functionality to all mouse buttons.

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General Terms: Human Factors.

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MOTIVATION

In developing technologies for children with children, we have observed that some young people have difficulty interacting with software that provides different functionality with each mouse button. When using such software, we have seen children assume that a program is broken, has a bug, or is too difficult for them to use if they click on the "wrong" button and get an unexpected result.

A search of the human development literature yielded a possible explanation for this difficulty [1]. According to this source, most children do not achieve orientation with respect to themselves until they are 6 years old, and cannot apply the concepts of left and right relative to other objects until they are 8 years old.

While we thought the human development research and our observations were pertinent, they did not provide empirical evidence of children's difficulties. To obtain this evidence, we decided to conduct studies of children using mice. As a first step, we sought to gain a better understanding of how children click the mouse without instruction. We believed this was a valid starting point, as children are often not instructed on how to click. It would also provide us with information on how children expect to interact with software. This information could prove useful in helping children avoid unexpected results when they click.

EXPERIMENTAL SETUP

Participants

Thirteen 4 year-old children (6 girls and 7 boys, mean age 4.4 years), thirteen 5 year-old children (6 girls and 7 boys, mean age 5.5 years), and thirteen 19-22 year-old adults (6 women, 7 men, mean age 20.5 years) participated in the study. All participants were right-handed. The children were a racially and ethnically diverse group from a preschool located on the campus of the University of Maryland. To recruit children, we gave the parents and guardians of all 4 and 5 year-olds at the preschool permission forms. The children who had a parent or guardian sign a permission form participated in the study. The adults were a similarly diverse group of undergraduate and graduate students from the University of Maryland. They were recruited through class announcements and word-of-mouth. We expect the results of this study to apply to similar populations of children and adults.

None of the participants required instruction on how to use a mouse. Parents of the 4 year-olds reported that eleven children used computers less than 1 hour a week, and two used computers between 1 and 5 hours a week. Parents of the 5 year-olds reported that four children used computers less than 1 hour a week; eight used computers between 1 and 5 hours a week; and one used computers between 5 and 10 hours a week. One adult reported using computers between 0 and 5 hours a week; one reported using computers between 6 and 10 hours a week; three reported using computers between 11 and 20 hours a week; and eight adults reported using computers more than 20 hours a week.

Materials

We used a laptop computer running Microsoft Windows 98, connected to a 21" monitor, with a Logitech USB Optical Mouse as an input device. The study software required participants to click on circles on the screen as part of a

game. The software responded immediately to user input regardless of where the click occurred, and regardless of which button was used. All clicks were recorded.

Procedure

The study was conducted in quiet rooms, one at the children's preschool, and the other at a research laboratory. The participants sat in front of a table where the mouse and monitor were located. We used chairs and tables of appropriate height given the age group. The participants were told that they would be playing a game in which they had to click on circles. We gave participants no further explanation on how they were supposed to click. While the participants practiced by clicking on five circles, they never saw the researchers demonstrate mouse use.

Design

The study had one between-subjects independent variable: age level. The game presented participants with 45 trials, each consisting of clicking on a circle. The dependent variable was the percentage of left clicks per trial.

RESULTS

Figure 1 provides a visual summary of the results. While all adults and most 5 year-olds used exclusively the left mouse button, 4 year-olds did not. Only five used the left mouse button exclusively, while two used the right mouse button most of the time. In addition, four of the 4 year-olds used neither button more than 90% of the time.

A repeated measures ANOVA showed a significant effect for age level ($F(2,36) = 5.002$, $p < 0.05$). In a post-hoc Tukey HSD test we found significant differences between 4 year-olds and 5 year-olds, and 4 year-olds and adults ($p < 0.05$ in both cases).

DISCUSSION

The contrast in button clicking between 4 year-olds and adults suggests software designed for preschoolers requires special attention when assigning functionality to mouse buttons. Giving each button different functionality may cause children frustration and confusion. A less harmful approach would be to provide all functionality with the left mouse button, but this could also lead to frustrating clicks on the non-functioning button. We recommend instead that developers provide the same functionality to all mouse buttons when creating software for preschoolers. Such a design leads to software that responds consistently and expectedly given children's use of mouse buttons without instruction. The major challenge is the lost functionality that could be provided with two or more buttons. But this may not be an important loss, as applications for this age group tend to provide limited functionality.

While most 5 year-olds did consistently click on the left button, this does not necessarily mean that they could successfully operate interfaces that provide different functionality with each mouse button. We did not test for

the ability to consistently click on one or the other button given a functionality requirement. The results may suggest though, that 5 year-olds could use software in which only the left button provides functionality without much frustration. While we do not encourage designers to implement such an interaction, it may be a valuable piece of information to someone evaluating software for children.
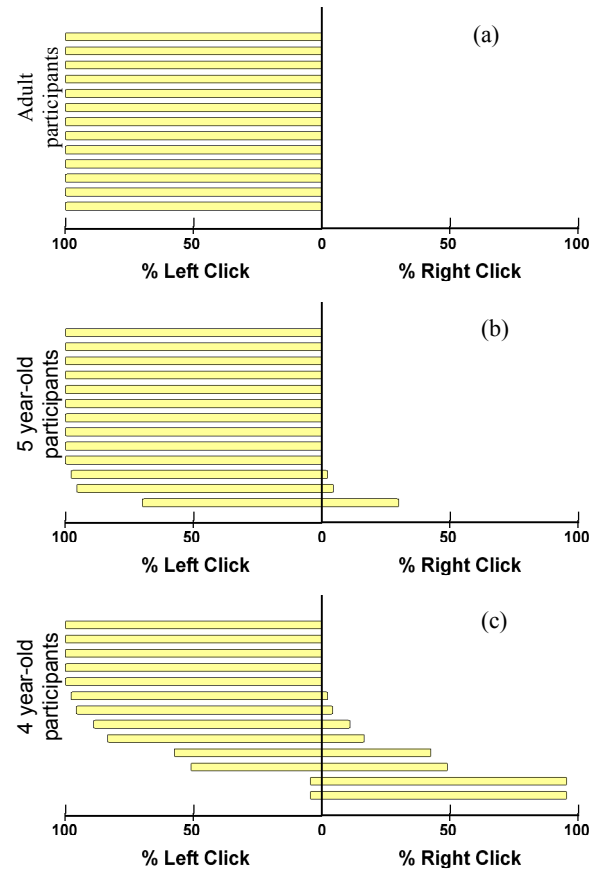

Figure 1: Percentage of left and right clicks by: (a) adults, (b) 5 year-olds, (c) 4 year-olds. Each bar represents one participant.

FUTURE WORK

The next step in this line of research is to gain a better understanding of the age level at which it is appropriate to provide different functionality with different buttons. This is a valuable feature in user interfaces for adults and it would be important to know when children are developmentally ready for it. A study where children of different ages are asked to perform tasks that require the use of different buttons could provide helpful information.

REFERENCES

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