



The Effectiveness of a Modified Typing Tutorial Program for Students with Intellectual Disabilities

Thomas J* and Pagpatan V

Department of Occupational Therapy, Downstate Health Sciences University, USA

*Corresponding author: Jasmin Thomas, OTD, OTR/L, BCP, Department of Occupational Therapy, SUNY Downstate Health Sciences University, 450 Clarkson Ave, Brooklyn, NY, United States, Tel: 718-270-7733; Email: Jasmin.Thomas@downstate.edu

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Abstract

People who have an intellectual disability [ID] often have difficulty learning to type using the traditional ten-finger approach. Typing is an essential skill for present social and educational relevance. The pilot program, ABC Typing Program [ABCTP], was developed and analyzed to determine if a modified typing tutorial program could be effective in teaching students with severe intellectual disabilities typing by eliminating the complex skills required for traditional typing. The effectiveness of ABCTP for increasing typing speed and accuracy was measured using a pretest-posttest design with eight high school students. A student questionnaire was used to determine participants' satisfaction. The paired t-test analysis results indicated a significant improvement in typing speed. There was no significant improvement in typing accuracy. All participants responded with 100% satisfaction with the program. The findings suggest that ABCTP is effective to teach people with ID typing, an increasingly necessary skill for everyday life.

Keywords: Intellectual Disability; ID; Students; Typing; Occupational Therapy; Special Education; Technology; Keyboarding; Computer

Introduction

Typing skills have become increasingly essential in everyday life [1]. The traditional 10-finger system of typing on a QWERTY keyboard requires an extensive amount of cognitive abilities, motor-learning skills, visual-motor skills, motor-memory skills, dexterity, finger strength and manipulation, fine motor coordination/control, kinesthesia, endurance, concentration, and perseverance [2]. Due to the complex skills needed for traditional typing, people with intellectual disabilities [ID] tend to have difficulty learning traditional keyboarding skills [3,4]. Intellectual disability (ID) is defined by the World Health Organization [5] as a "significantly reduced ability to understand new or complex information and to learn and apply new skills (impaired

intelligence). This results in a reduced ability to cope independently (impaired social functioning), and begins before adulthood, with a lasting effect on development. The disability depends not only on a child's health conditions or impairments but also and crucially on the extent to which environmental factors support the child's full participation and inclusion in society." ID significantly limits a person's ability to learn at an expected level and function in daily life. These challenges include the ability to learn, reason, problem solve, develop adaptive behavior, and engage in everyday life and social skills (Centers for Disease Control and Prevention [6]).

People with ID can learn necessary life skills, but often require support, assistive technology, and creative

strategies to achieve these skills [7]. Relevant adaptations, modifications, and adjusted teaching approaches will enable people to have access to activities that are meaningful and satisfying, increase their independence, and productively function within [8,9]. In order to maintain present/future social, educational, and vocational relevance, people with ID must learn basic technology and typing skills, which are essential for the home, school, and work environment [10,11]. Due to the challenges with learning and processing, people diagnosed with ID often have difficulty with the intricate skills needed for traditional typing. Cognitive, fine-motor, and visual- motor integration impairments, and decreased planning and execution of movements may impede their ability to learn and execute the multifaceted skills required for typing [2,12].

Methods

Research Design & ABC Typing Program

ABC Typing Program [ABCTP] is a pilot typing tutorial program that eliminates the need for many higher-level motor and executive functioning skills required by the traditional 10-finger typing method on a QWERTY keyboard. It was created to reduce and compensate for the difficult and complex skills necessary for typing and to provide people with severe ID greater accessibility to technology.

ABCTP was designed for typists diagnosed with ID to use a unilateral or bilateral one to two finger approach to provide a clearer visual of the keyboard, which may increase their potential success rate. The program was designed to methodically provide repetitive practice of keyboarding skills. Repetition and practice are essential to increase the chances of a person with ID to learn and succeed [13]. ABCTP teaches one letter of the alphabet at a time in alphabetical order. For example, to teach the letter “e,” two rows of the letter “e” are typed by following the pattern: typing three “e’s,” pressing the spacebar one time, typing three “e’s,” pressing the spacebar one time... until the two rows are completed. The participants will then proceed to type words created by all previously learned letters (letters “a, b, c, d, e”) to increase recall of letter positioning on the keyboard and for the opportunity to practice. Eventually, the complexity of the typing program was expanded from typing words to sentence, and to typing short paragraphs. Correlating homework assignments were given to the students to practice and review newly obtained skills at home.

The easiest solution to allow people with ID to gain sustainable access to technology is by using availability within current standard operating systems to create individualized [14,15]. By only using a standard word processing system, any computer could be modified to compensate for the

distinct needs of each participant. Some modifications used by ABCTP to aid in creating an optimal environment for success included changing the font, increasing the text size, using arrow keys to limit mouse use, and pacing the amount of typing practice. Since the program does not demand hardware or software alterations, such as changing the positions of keys, nor does it require the availability of the Internet, ABCTP can be accessed on any public computer for students to practice the correlating homework assignments without the need of additional changes or equipment to a computer.

Participants

The participants consisted of eight high school students (n= 8) with severe ID including three male students (37.5%) and five female students (62.5%) who attended a private special education high school in Brooklyn, New York. Enrollment into the high school required the students to be classified with severe ID, which included diagnosis such as down syndrome, learning disabled, and other health impaired as identified on their Individualized Education Program (IEP) by the City of New York. The participants’ ages ranged from 15 to 21 years old, had varying socio-economic backgrounds, varying ethnic backgrounds, and they lived in three boroughs of New York City – Manhattan, Queens and Brooklyn (Table 1). Inclusion criteria included students who received occupational therapy, had no former typing instructions prior to the study, easily recognized all the letters of the alphabet, and had access to a computer in their home or community.

Setting/Procedures

All procedures were given prior approval and consent. Instruction time was limited to approximately 30 minutes per session during regularly scheduled occupational therapy sessions at the school. The research study was conducted on a one-to-one basis by an occupational therapist in a room with an available computer. Participants were allowed to withdraw from this program at any time without penalties or consequences to the entitlement of their occupational therapy services.

Data Collection and Analysis

The effectiveness of ABCTP on typing speed and typing accuracy was measured using a pretest-posttest method. Each participant was provided an identification number in order to analyze data using a paired t-test calculation. The questionnaire to determine participants’ satisfaction consisted of five questions and was analyzed with a percentage comparison of answers “Yes” vs. “No” except for Question Five, which was an open-ended question.

Participants were individually tested with the pretest of typing a predetermined sentence prior to beginning ABCTP. The time of the pretest was recorded at the start of the first stroke and the timer was stopped after the last stroke was completed. Once all letters were practiced from A-Z, the posttest was conducted by typing the same sentence as the pretest. The time of the posttest was also recorded at the start of the first stroke and the timer was stopped after the last stroke was completed.

Instruction time was provided two times per week for eight to ten weeks. The participants were given one to three letters to learn and review during each session. The students also practiced typing with corresponding homework assignments that were checked by the instructor during the following session.

Errors in the participants' work for the pretest and posttest were calculated to determine a change in typing accuracy. An error was any character that was added to, substituted for, or left out of the participants' work. Errors in spacing, punctuation, and spelling were not taken into account to determine a change in typing speed.

The need for assistance to learn and recall basic computer skills, including but not limited to using the mouse,

opening the word processing program, saving documents and printing varied for each participant. This assistance was provide as necessary during the instructional sessions, but no assistance was provided during the pretest or posttest. Modifications were also made when necessary on an individual basis for each participant. Some modifications included decreasing the amount required to type due to bilateral upper extremity tremors and fatigue, increasing the text size for those with limited visual acuity, placing line markers to increase the participants' ability to visually scan the page, and adjusting the position of the keyboard and/or paper.

Upon completing the program, a formal questionnaire was conducted with the eight participants to assess their satisfaction with ABCTP. The questionnaire consisted of five simple questions (four "Yes"/"No" questions and one open-ended question). To complete the five-item questionnaire, some students read and answered the questions independently, while other students required assistance to read the questions and write their answers. The questions included: "Do you like the ABC Typing Program?", "Is this an easy way to learn to type?", "Does this program help you when you use computers?", "Are you happy learning to type?", "What is your favorite part about the ABC Typing Program?"

Gender	Age	Boroughs	Ethnicity
Female 5	16.0 – 16.11 years of age 1	Brooklyn 6	African-American 1
Male 3	17.0 – 17.11 years of age 1	Queens 2	Asian 1
	18.0 – 18.11 years of age 2		Caucasian 3
	19.0 – 19.11 years of age 3		Hispanic 3
	20.0 – 20.11 years of age 1		
	Median Age 18.5		

Table 1: Demographic Information.

Results

Table 2 displays the results of the effectiveness of ABCTP on typing speed. There was a significant improvement between the pretest and posttest for typing speed. The mean typing speed for the pretest was 251.00 seconds with a standard deviation of 98.85 compared to the posttest mean of 140.63 seconds with a standard deviation of 58.05. Eight out of eight participants increased their typing speed after completing ABCTP. The paired t-test analysis resulted in $P = .0020$ with a 95% confidence interval indicating this difference is statistically significant.

Table 3 displays the results of the effectiveness of ABCTP on typing accuracy. The mean typing accuracy for the

pretest was 43.13 correctly typed characters with a standard deviation of 7.06 compared to the posttest mean of 47.88 correctly typed characters with a standard deviation of 3.68. Five out of eight participants improved their accuracy after completing ABCTP. One participant had 100% accuracy on the pretest and posttest and two participants showed a slight decrease in accuracy. The paired t-test analysis resulted in $P = .1224$ with a 95% confidence interval indicating this difference is not statistically significant.

The results of the questionnaire conducted assessed participants' satisfaction with ABCTP. Eight out of eight participants for questions one to four reported 100% satisfaction. The open-ended question, "What is your favorite part about the ABC Typing Program?" allowed students to

further elaborate on their experience with the program. The students' responses included "I get to type all the letters.", "I

am good at typing.", "I learn typing ABC." and "It's fun."

Participant	Pretest Time in Seconds	Posttest Time in Seconds	Change in Speed	Percentage Change
1	170	68	102	60.00%
2	220	150	70	32.00%
3	340	136	204	60.00%
4	360	195	165	46.00%
5	132	95	37	28.00%
6	332	245	87	26.00%
7	325	143	182	56.00%
8	129	93	36	28.00%
Mean	251	141	110	42.00%
Standard Deviation	98.85	58.05	-	-

Table 2: Typing Speed (nearest second).

Participant	Pretest Accuracy	Posttest Accuracy	Change in Accuracy	Percentage Change
1	52	52	0	0%
2	47	50	3	6%
3	38	51	13	34%
4	47	44	-3	-6%
5	48	45	-3	-6%
6	44	44	0	0%
7	30	45	15	50%
8	39	52	13	33%
Mean	43	48	5	14%
Standard Deviation	7.06	3.68	-	-

Table 3: Typing Accuracy.

Discussion

These preliminary results show that ABCTP made a significant improvement in the typing speed of eight out of eight participants. This indicates that ABCTP is an effective tutorial program to teach people with ID the skill of typing. Increased speed would help people with ID access technology at a faster rate.

The results for the posttests of typing accuracy did not demonstrate a significant improvement. However, the overall accuracy for the participants was greater after completing the program as compared to the pretest scores. Speed and accuracy are inversely related. Thus, though two participants displayed a decrease in typing accuracy, they showed a significant increase in their typing speed.

The five-question participant questionnaire allowed the students to express their personal experience with the program as people diagnosed with ID are unique and have individual perspectives [16]. The survey indicated 100% positive responses. The responses to the open-ended question demonstrated that the students enjoyed the program, were proud of their new skill, felt they made improvements, and had fun while learning to type. Positive self-esteem and motivation can be increased by successfully accomplishing challenging tasks. Students who completed the program indicated an increase in their self-esteem because they learned a challenging task within their functional capabilities [17,18].

The research study demonstrates that ABCTP is clinically applicable in schools and therapy. The design of the

program was adapted to fit each student's unique needs by easily providing simple modifications. The ability to adapt the program grants students the opportunity to learn to type regardless of impairments in motor-coordination, visual-motor, fine-motor, and visual-perceptual skills. In addition, ABCTP uses a standard word processing system and did not demand hardware alterations, software alterations, and it did not require the availability of the Internet. The easy accessibility of ABCTP allowed the participants to use the program at school, at home and even public community computers at local libraries.

Future Research

Future research with ABCTP should address certain issues. The pretest-posttest method does not clearly indicate the total effectiveness of the program without a control group. A control group or comparison group would strengthen the results of the study. Additionally, a longitudinal component would be helpful to investigate the retention of skills by reevaluating typing speed in six months. It would also be beneficial to determine if accuracy will significantly improve over time with additional practice.

The research study took place in one school program; therefore results are not representative of the larger population of students with ID. Furthermore, the sample size was small and limited to students who were receiving occupational therapy services. A randomized and larger sample size would be strongly recommended. Along with the student survey, a teacher and parent survey to assess satisfaction would have been valuable to understand the effectiveness of the typing program in the classroom and home environment.

In a future study, it would be beneficial to investigate if learning to type using ABCTP allows people with ID to access touch screens devices and personal digital assistant devices (PDA) more efficiently. The design of this tutorial program taught students to type using a one to two fingers approach, which is often used when operating such devices. The ability to access various technologies will enable students to obtain technological relevance.

Conclusion

In the present study, a pretest-posttest design was used to determine if a pilot tutorial typing program, ABCTP, was effective in teaching students with severe intellectual disabilities typing skills by measuring typing speed and typing accuracy. Data from this study provided evidence that ABCTP was able to increase typing speed significantly for students with ID. Findings did not display a significant increase for typing accuracy. The participants in the study

reported 100% satisfaction with the tutorial experience. The study found that the program was easily modified to compensate for the individual needs of the participants in various areas such as cognition, motor-coordination, visual-motor, fine-motor, and visual-perceptual skills. Furthermore, ABCTP did not require hardware alterations, the installment of software programs, or the availability of the Internet, which gave the students accessibility to the program on any school, home, or community computer. Findings indicate that ABCTP is an effective tutorial program to teach modified typing skills to people with severe ID and it can be a successful and valuable alternative to traditional typing programs for this population. This study highlights the need for further longitudinal studies of the effectiveness of ABCTP and the value of modified typing programs for people with ID.

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