Evaluating Behavioral Skills Training to Teach Basic Computer Skills to a Young Adult with Autism

Layla A. Sump¹ · Breanna C. Mottau¹ · Linda A. LeBlanc²

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Abstract

The current study evaluated the effects of behavioral skills training (BST) on acquisition of basic computer skills using Microsoft Word®, Microsoft Excel®, and Microsoft PowerPoint® by a 15-year-old male diagnosed with autism. A concurrent multiple-baseline design across computer programs (i.e., Word®, Excel®, and PowerPoint®) was used to evaluate the effects of BST on the acquisition of basic computer skills. BST was successful in teaching the participant to learn basic functions in each of the three programs, and he was able to use the programs to complete schoolwork independently following completion of the study.

Keywords Autism · Behavioral skills training · Computer skills · Job readiness · Microsoft excel · Microsoft PowerPoint · Microsoft word · Vocational skills

In 2017, only 18.7% of individuals with autism were employed, contrasting with 65.7% of individuals without disabilities (U.S. Bureau of Labor Statistics, 2018). These data are alarming considering that the benefits of employment are vast. Employment allows individuals with intellectual disabilities (ID) to become more independent, and it positively impacts their quality of life (e.g., Hendricks, 2010; Persson, 2000).

Despite the benefits of employment, there are few experimental studies examining strategies for teaching vocational skills to individuals with ID. Dotson, Richman, Abby, Thompson, and Plotner (2013) evaluated the effects of behavioral skills training (BST) to teach skills for running a recycling business to eight individuals with ID. BST was effective in teaching self-employment skills, and skills generalized across environments. More recently, Lerman, Hawkins, Hoffman, and Caccavale (2013) evaluated the effects of BST in training four adults how to implement discrete-

trial training with children with autism. The authors found that three participants acquired the skills, and the skills generalized across targets.

Taylor and Seltzer (2011) interviewed 66 young adults with autism and found that computer skills along with the ability to work independently increased the likelihood that an individual with autism will be competitive in today's technology-based workplace. However, we do not have a substantial behavior-analytic literature on teaching computer skills to young adults with autism. Dotson et al. (2013) included a single computer-related step in their targeted job-related skills (i.e., entering data on an Excel® spreadsheet). Only one other study systematically taught computer skills to individuals with ID. Jerome, Frantino, and Sturmey (2007) taught Internet leisure skills (i.e., searching for music videos, playing online games) to three adults using errorless learning and backward chaining. Results suggested that the teaching strategies used were effective to teach leisure skills on the computer to adults with ID; however, no job-related skills were taught.

Computer skills are critical employment skills, particularly for individuals who might be seeking office administrative jobs that do not require advanced social skills and extensive social contact. The literature on teaching computer-related job skills to individuals with autism is sparse and more research is warranted. Thus, the purpose of this study was to evaluate the effects of BST on the acquisition of basic Microsoft Word®, Microsoft Excel®, and Microsoft PowerPoint® computer skills for a young adult with autism.

Linda A. LeBlanc is now at LeBlanc Behavioral Consulting, Golden, Colorado.

✉ Layla A. Sump
lsump@tbh.com

¹ Trumpet Behavioral Health, San Bruno, CA 94066, USA

² Trumpet Behavioral Health, Lakewood, CO 80228, USA

Method

Participants, Materials, and Setting

John was a 15-year-old male diagnosed with autism who resided at home and was a sophomore in high school. His reading skills were at a fifth-grade level, he engaged in conversation with full sentences, and he completed daily living skills independently. He was working on increasing various adaptive skills to prepare for the workplace and independent living after graduation. More specifically, John was working on learning skills related to public transportation, grocery shopping, and potential job identification. He received 4 h of direct therapy of applied behavior-analytic therapy each week in a one-on-one session format. John attended a computer class in school, where the sole focus was increasing his typing skills in terms of utilizing both hands to type and increasing typing speed and accuracy. John also used the computer to play games and to navigate websites to watch videos. John was included in the study because he and his parents wanted him to learn job-readiness skills to prepare for workforce entry and because he lacked experience with basic computer skills related to Microsoft Word®, Excel®, and PowerPoint®. Sessions were conducted on a PC laptop in an office or in his home. All task analyses were printed in 14-point Arial font on an 8.5 × 11 in. (21.59 × 27.94 cm) piece of paper. Task analyses were developed by the first author who uses each software program frequently. She opened each program (i.e., Microsoft Word®, Excel®, and PowerPoint®) and identified basic tasks in each program. Then, the task analyses were reviewed with a group of four PhDs, in which one of them was a Board Certified Behavior Analyst (BCBA) and three were BCBA-Ds (doctoral level), who frequently use each program. The task analyses had a score of 0 for Flesch reading ease and Flesch–Kincaid grade level. The Microsoft Office® 2006 programs were installed on the computer, and there were no files or program shortcuts installed on the desktop area. The computer was on and open to the desktop prior to the start of the sessions, but no programs or files were open.

Response Measurement, Interobserver Agreement, and Procedural Integrity

Data were collected via paper and pencil. Each step was scored as either “correct independent” or “incorrect.” A correct independent response was recorded if the skill was demonstrated in the correct order and without errors or prompts provided. An incorrect response was recorded if the step was not completed to its entirety, was omitted, was completed incorrectly, or was completed out of order resulting in prompts being delivered. John did not engage in an out-of-order response during any phase of the study. A second independent observer scored a sample of the baseline, posttraining, and

maintenance sessions by examining the permanent product created by John’s effort for 30% of the sessions. In the situation where John did not save the document, the experimenter printed and saved the document with her own name on the file for the second observer to score. Because these were all non-intervention sessions, no prompts or error correction was provided. The accuracy of certain steps (e.g., save the file) was able to be discerned by the naming convention for the saved product. Interobserver agreement (IOA) was calculated by dividing the total agreements by the total number of agreements plus disagreements and converting the ratio into a percentage. Mean agreement was 97% (range 91%–100%).

Experimental Design and Procedure

A concurrent multiple-baseline design across computer programs was used to evaluate the effects of BST. The order of the sessions was determined by random draw without replacement until the data were stable. Because all three programs had stable baseline performance, random draw was used to select the first program for intervention.

Baseline The session started with the experimenter providing the task analysis specific to the computer program and the following instruction to the participant:

We are going to work on using [name of the program] on the computer. Here is the instruction. [Task analysis was handed to John.] Please try to complete the steps the best way you can. Unfortunately, I can’t help you or answer any questions. Start when you are ready and let me know when you are finished.

Praise was not delivered and questions were not answered. Mean session duration was 8 min (range 3–12 min).

BST BST consisted of the experimenter (a) providing the task analysis specific to the computer program being taught along with providing the rationale of the study, (b) modeling all of the steps, (c) role-playing the skills with the participant, and (d) delivering behavior-specific praise (e.g., “Good job changing the font size.”) contingent on correct responses and corrective feedback (e.g., a gestural prompt of pointing to the correct response on the screen) contingent on incorrect responses until a mastery criterion was met. The rationale for the study involved telling John that the learning program was targeting skills related to using Microsoft Word®, Microsoft Excel®, and Microsoft PowerPoint®, and that John’s clinician and mother identified this skill as an important vocational skill for him to learn. The mastery criterion for training was completing the task analysis independently with 90%

Table 1 Task analysis for each of the three Microsoft Office® computer programs

Word®	PowerPoint®	Excel®
Open Word®	Open PowerPoint®	Open Excel®
Type food/drink items	Change layout	Type a color in row 3 and column B
Change font	Type first/last names	Type a color in row 3 and column C
Change font size	Change alignment	Underline words typed
Change font color	Create numbered list	Select cells
Bold	Type mom's name on first number	Merge cells across
Highlight	Type dad's name on second number	Fill in cells with green shading
Cut word	Add shape to slide	Add outside border
Paste word	Add picture to slide	Undo outside border
Save file	Save file	Save file
Exit Word®	Exit PowerPoint®	Exit Excel®

accuracy for two consecutive trials (see Table 1 for the task analysis). The participant reached the mastery criterion in a single training session for each program, and only one program was trained per week. These data are not graphed. Mean session duration was 18 min (range 14–22 min).

Posttraining Posttraining was identical to baseline and began as soon as a program was mastered during BST. Posttraining sessions continued until John completed at least two sessions with at least 80% accuracy. The very first posttraining session for each computer program was conducted at least 12 h after training. Mean session duration was 4 min (range 3–6 min).

Maintenance Maintenance sessions were identical to baseline. All maintenance sessions for each program were conducted during the same day. The maintenance sessions occurred 14 weeks after mastery of the first program, which was 13 weeks after mastery of the second program, and 11 weeks after mastery of the last program. Mean session duration was 3 min (range 2–4 min).

Results and Discussion

The percentage of correct independent responses across computer skills is depicted in Fig. 1. The baseline level of accuracy was low and stable across all computer skills ($M = 10\%$). A slight increase in responding was observed during the PowerPoint® (from 0% to 16%) and Excel® (from 0% to 23%) baselines following the introduction of training for Word®. Following Word® training, John accurately opened the PowerPoint® and Excel® programs, illustrating generalization, but no other steps showed the same effect. That is, the only step that John performed during baseline was opening Word®, PowerPoint®, and Excel®; however, John only opened PowerPoint® and Excel® during baseline after training for Word® was conducted. Therefore, John had the

opportunity to engage in all other task analysis steps across all computer programs during baseline. During Word® baseline, after opening the document, John looked at the task analysis sheet and moved the mouse around potentially attempting to engage in the further steps. After a few minutes without completing any steps, John said he was all done. During Excel® and PowerPoint® baseline, John attempted to type on each document, but no letters appeared on the screen because he never clicked on the screen to allow the letters to show. Then, he eventually said he was all done.

After BST was conducted, the percentage of correct responses rapidly increased over baseline across all computer programs ($M = 98.6\%$). John performed at 100% accuracy across all posttraining sessions except for the first Excel® posttraining session, where John missed one step by deleting the second word instead of the first word. John's skills maintained for several sessions and at 14, 13, and 11 weeks respectively.

These results suggest that BST was effective for teaching basic computer skills commonly used in office jobs. These findings support those of Dotson et al. (2013) and Lerman et al. (2013) who also used BST to teach job-related skills to individuals with special needs. The current study also extends the prior work of Jerome et al. (2007) who evaluated the effectiveness of errorless learning and backward chaining to teach Internet leisure skills. The current study was novel in using BST to teach response chains for using computer programs for future employment opportunities. For this participant, the chain was able to be established with a printed task analysis and a single BST training session rather than systematically chaining each step to prior or subsequent steps. Although generalization and social validity measures were not collected during the study, the participant descriptively reported using the skills learned during the study throughout multiple settings (e.g., school, office) and applying these skills in a school-based office job while completing more cumbersome computer tasks.

The study is not without limitations. Due to limited resources, we did not collect procedural integrity data or have a second observer present to score the sessions in real time. We used permanent product for IOA scoring, and IOA was not able to be scored for the sessions when John did not open Excel® or Office® in baseline. Moreover, although the effects of BST replicated across the three computer programs, the targeted skills were very basic and only one participant was included in the study. The current study conducted the evaluation using the Microsoft Office® 2006 version to teach basic repertoires that anyone should learn in these programs (e.g., in Word®, changing font or font size, copying, and pasting; in Excel®, typing in cells, selecting cells, and merging cells; and in PowerPoint®, changing slide layout and adding pictures and shapes). Moreover, learning about creating a new file and saving with the appropriate file name are core skills for each program. Future studies should use a more recent version of the Microsoft Office® software and teach more advanced responses. For instance, future studies could teach how to use formulas in Microsoft Excel® and how to create a full PowerPoint® presentation with animation. Acquiring basic computer skills may position individuals with autism to be more employable (Taylor & Seltzer, 2011). Future studies should consider collecting procedural integrity data, replicating the results across multiple participants, teaching more

complex skills, evaluating generalization of skills, and collecting social validity measures.

Implications for Practice

- This study advances the literature on teaching basic computer skills to an individual with autism.
- BST was effective in teaching basic computer skills to a young adult with autism.
- Basic computer skills were maintained across time by a young adult with autism.
- Basic task analyses for simple tasks in each program are described.

Compliance with Ethical Standards

Conflict of Interest The authors of this manuscript declare no conflict of interest regarding this manuscript.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from the participant's parents and assent was obtained from the participant.

Fig. 1 Percentage of correct responses for John across Microsoft Word® (top panel), PowerPoint® (middle panel), and Excel® (bottom panel) during baseline, posttraining, and maintenance. Maintenance data were collected at 14, 13, and 11 weeks following posttraining for Word®, PowerPoint®, and Excel® consecutively

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