University of Nevada, Reno

Computer Literacy, Effective Training, and Technology: A Comparison of In-Person and Computer-Based Behavior Skills Training of Practical Assessments and Software Utilization

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Psychology

by

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Abstract

An initial group study investigated the relationship between pre-existing computer-use skills and acquisition following computer-based instruction (CBI) in the form of a computer-based behavior skills training (BST). Findings suggest that when learning a software skill, participants' computer skills prior to the training did correlate with observed learning measures; most participants did demonstrate improvement following training, but greater improvement was observed in those with better computer skills. However, due to limitations resulting from both an inability to complete within-subject comparisons and participants being trained on only one skill, conclusions could not be drawn. An additional study investigates the correlation between pre-existing skills and acquisition while also directly comparing training delivery methods (live versus CBI) for different types of skills being taught (software and practical/hands-on). This study taught each participant four skills, two via computer-based BST (one software skill and one practical skill) and two via in-person BST (also one software skill and one practical skill). Results indicate that both in-person and computer-based BST are effective training modalities across multiple tasks. Additionally, correlations are observed between computer proficiency and learning gains when the skills are learned via computer-based training. This could lead to conclusions regarding the effectiveness of CBI versus more traditional training methods and the skills an individual should demonstrate if he or she is expected to learn effectively from CBI. Implications for the ongoing utilization of computer-based training in organization are discussed.

Keywords: behavior-skills training, computer-based instruction, staff training, software training, skill training

Dedication

To my parents, Greg and Melissa Sexton, and family, who always supported and encouraged my goals, believing that I already was everything I hoped I could be.

To my wonderful husband Wes, who is my partner in everything, my sympathetic ear, and my soft place to land. I love you for so many reasons, one being all you've done to help me get here. I did it, the way you always said I would; you get a point!

To my beautiful daughters, to whom I hope to be a role model and an inspiration. Being your mom is my favorite role, and I love you both to pieces. You are my heart and my joy, and I only hope to make you a fraction of how proud I am of each of you every day.

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In virtually every industry, (e.g. human service, manufacturing, advertising, engineering, medical research, athletics, etc.) a single shared variable has sweeping effects on the outcome quality of any product or service provided: the work of the staff. Thus, it is crucial to the ongoing success of any organization to have staff working in an environment that supports the skills necessary for fulfilling responsibilities and producing a high-quality product or service. Staff training programs are a primary tool of organizational settings that accomplish this goal by teaching employees the skills to engage in accurate, efficient work that will ultimately decrease variability in product quality and help to assure continued consumer support (Frazier, 1972). Frazier recognized that "…making a large scale impact on consumers require(s) effective training of support staff," (Parsons, Rollyson, & Reid, 2012, p.2). In service of this goal, Behavior Analysts began investigating and developing staff training approaches, attempting to optimize them. This line of research branched into many fields, such as industry, government, and education, and has yielded data on the mostly widely applicable and effective components of staff training that have been studied to date.

There are multiple variables to consider when developing a staff training program, but ideally, it should be both appropriate and easy to access. An appropriate training protocol must be equipped to meet a variety of needs; Walker (2002) states that the challenge in this case is "…finding training materials that are suitable for a wide range of staff skills and education levels," (as cited in Harrington & Walker, 2002, p. 39). Related to ease of access, staff training should be offered frequently to protect the organization from productivity losses following changes in organizational procedures, skill degeneration following some period of absence, or ever-present staff turnover. Benson (2000) notes that training which is not offered frequently enough may fail to keep up with either staff or market demands. Wagner and Flannery (2004) argue that to "…enable competent human performance…and to continually update their skills and remain competent in the performance of their jobs, employees must be able to access training on demand," (p. 383). These training characteristics are even more important in the presence of high turnover or rapidly changing requirements, because poor training can lead to a combination of detrimental outcomes (e.g. loss of compliance, inability to maintain production of a quality product or outcome, and resultant loss of income) that effect the organization's ability to function as a whole (Walker & Harrington, 2003). Finally, the above-mentioned requirements should be met using a training protocol that facilitates the most efficient acquisition of new skills. Efficiency is important, because while "…there are many areas in which training and education are needed, there is little time left in the day for training," (Walker & Harrington, p. 477). It is difficult to carve out time for training from schedules generally optimized for maximum revenue generation, especially when training requires an organization to pay staff for non-revenue-generating hours.

Training needs become more complex when organizations integrate technology into everyday practices, which has been occurring more frequently in the last 20 years. Technology is changing continuously, and when "…customer satisfaction can mean the difference between success and bankruptcy, every company must keep its employees up to date," (Heathman & Kleiner, 1991). Whereas these changes are meant to improve the efficiency of an organization, the logistics of training staff and implementing software use as a mainstay of people's employment has been difficult to manage effectively. Marler, Liang, and Hamilton Dulebohn (2006) elaborate on this point, stating that:

> In attempts to create "seamless" integrated information environments, companies have invested heavily in sophisticated enterprise-wide information technology since the mid-1990s (Davenport, 2000; Friedman, 2005). The success rate of complex information technology implementations, however, is not high. Information technology implementation failures are quite common and are frequently attributed to failure to manage the effects of the new technology on other organizational elements (Dulebohn, 2003; Scott & Vessey, 2002), as well as to employees' resistance and failure to effectively use the new technology (Marler & Dulebohn, 2005). (p. 721-722)

Training is considered the most important factor in the successful implementation of software and other information systems (Cheney, Mann, and Amoroso, 1986; Zmud and Lind, 1985, as cited in Harp, Taylor, & Satzinger, 1998), increasing both the frequency and accuracy of use of the new technology (Nelson & Cheney, 1987; Olfman & Bostrom, 1991). According to Klein, Hall, and Laliberte (1990), an effective organization-wide training should achieve two things: it should facilitate learning to use the newly-integrated system and should positively affect staff attitudes about the program to decrease possible resistance to change.

Whereas it is obvious that staff training contributes to the success of any given organization, not all approaches are equally effective, and all have associated challenges. The most commonly applied training approach, an in-service, lecture-based training, is as widely used as it is generally ineffective (Nosik, 2010; Nosik & Williams, 2011). This approach is easy to schedule and arrange, but "…does not yield satisfactory levels of trainee skill acquisition," (Nosik, p. 2). Though instruction is considered to be an important part of a protocol (Nosik; Ward-Horner & Sturmey, 2012), it alone cannot address the challenges inherent in staff training. There are other options, including behavior skills training (BST), which is a basic skill-training protocol developed by Behavior Analysts working in various areas of human service which "Includes various combinations of a core set of procedures including: verbal instructions, written instruction, performance modeling, performance practice, and feedback," (Nosik & Williams, 2011, p. 1695; Parsons & Rollyson, 2012; Ward-Horner & Sturmey). While this procedure has been shown to be effective for participants learning varied skills across multiple environments (Homlitas, Rosales, Rocio, & Candel, 2014; Lafasakis & Sturmey, 2007; Lavie & Sturmey, 2002; Miltenberger et al., 2004; Nabayama & Sturmey, 2010; Palmen, Didden, & Korzilius, 2010; Parsons & Rollyson; Sarokoff & Sturmey, 2004; Shayne & Miltenberger, 2014; Ward-Horner & Sturmey), the administration of BST often requires a skilled trainer who can design the training, provide the instruction, and serve as, or train, a manager to provide practice and feedback opportunities. Such services can be expensive and time-consuming, which may deter an organization from applying BST in favor of a more expedient, but likely less effective, training technique.

In general, the cost of training can be prohibitive. Specifically, there are substantial costs associated with technology implementation; "…computer software training continues to take a larger and larger portion of the human resource development budget as people struggle to keep their computer skills in pace with the rapid changes in computer technology," (Harp, Taylor, & Satzinger, 1998, p. 271). A survey of Fortune 500 companies conducted in the early nineties suggests that some organizations dedicate as much as five percent of their information systems budgets to training of new software or other computer-use skills (Harris & DeSimons, as cited in Harp et al.). By 2006, Schultz and Schultz report that this equates to an overall employer expenditure of roughly 55 billion dollars per year for formal training programs and another 180 billion dollars a year for informal, on-the-job training (as cited in Johnson & Rubin, 2011, p. 55).

In light of the extensive cost of training, the difficulties inherent in the implementation of new technologies, and the importance of an informed and capable workforce to the ongoing functioning of an organization, it is clear that cheap, effective training approaches, specifically with respect to technology use, are needed. As previously mentioned, Behavior Analysts have a long history of investigating and refining staff training approaches in human services (Parsons, Rollyson, & Reid, 2012); it stands to reason that such a research base would be generally applicable to organizations in other areas as well. Indeed, there is an entire discipline within Behavior Analysis, Organizational Behavior Management (OBM), whose focus is measuring and evaluating ways to maximize human performance in professional and societal contexts. However, informal review of articles published in the relevant publication, the *Journal of Organizational Behavior Management*, between 2003 and 2007 reveals that only four of 65 articles, or just slightly over 6%, cover sophisticated behavioral training methodologies (Johnson & Rubin, 2011). This suggests that current work and research in OBM is either not meeting this need, or the data are not being reported. Johnson and Rubin state that "This area represents an important opportunity for OBM practitioners to deliver a product that is highly requested by the business community, which can then be possibly followed by practitioners selling more behavioral solutions for other business problems and needs (that may be less requested, but just as needed)," (p. 56). In this way, focusing on analyzing, developing, and delivering the types of training that organizations want and need could be instrumental in a more widespread dissemination of behavioral principles of organizational and staff management.

Computer-Based Instruction

Computer-based instruction (CBI), or any training program administered primarily via a computer, is a training option that deserves consideration for several reasons. First, it can help to control costs of training, assuming that the approach is effective in helping staff to acquire new skills. Omitting salary costs, since they occur regardless of the type of training provided, Benson (2000) reported that in-person training costs an average of $32 to $38 each hour to develop and deliver where computer-based training costs only about $7, generating a savings of 66% to 78%. Additionally, this delivery provides variation, allowing training to be adjusted in order to best fit the learner's needs and the environment in which they work. As early as 1968, Skinner was writing about the advantages inherent in using machines to supplement teaching, citing their flexibility, efficiency, adaptability to self-pacing, and capability in offering varied practice opportunities and immediate performance feedback. Such benefits have already led to widespread use of CBI in organizations such as Ford Motors, Federal Express, and IBM (Heathman & Kleiner, 1991). Given that many companies are already using CBI, it is important to further identify the variables that could influence the success or failure of such training protocols.

Components of CBI. Many variables exist in protocols classified globally as CBI. However, not all training that employs a similar delivery method is therefore equally effective, and there is some research identifying components that are present in successful CBI. Generally, Milheim (1993) suggests that CBI should focus on emphasizing the practical applications of the skills being trained, increasing perceived usefulness and, as a result, the likelihood of staff acceptance of the new skill as an important part of his or her job (Wagner & Flannery, 2004). Behaviorally, training should focus on identifying for staff how these new skills will change the contingencies currently in place and result in greater access to reinforcing consequences. For example, perhaps response effort will be decreased by a program that bills automatically, or maybe improved outcomes will be achieved and lead to greater profit and, ideally, profit sharing. In this way, management can increase the buy-in of the staff and decrease the chances of counter control (Delprato, 2002).

Research suggests that, along with a focus on practical application, successful CBI protocols should be designed with consideration of both staff skill levels as well as the inclusion of generally effective components. Such a protocol is likely to lead to success, and motivate learners to continue the training and implement the skills learned (Ewing et al., 1986). The issue with this, however, is the limited amount of research supporting certain components as generally effective, or investigating those components with respect to the skill levels of the targeted learners. The literature has made only preliminary suggestions regarding beneficial training components, which means that more research is needed to identify best practice given varying circumstances and populations.

Given this caveat, there has been some research suggesting possible characteristics of effective CBI. Manteuffel (1982) and Kopcha and Sullivan (2008) report that allowing learners to control the amount of instruction they receive can improve outcomes for those who already have a strong foundation in the topic matter. In a study by Kopcha and Sullivan, 99 sixth- and seventh-grade students were taught integer operations via a training that was broken into eight separate mathematical objectives. Participants were split into two groups, one whose members were required to watch all examples (three per objective) and engage in all practice opportunities (four per objective) following initial instruction (program control), and one whose members were allowed to skip over all but the first example and practice question, if desired (learner control). Though giving learners control did not unilaterally improve performance as measured by a pretest-posttest design, the authors hypothesize that this may be due in part to pre-existing skill levels; those with less prior knowledge of the subject matter (in this case, basic math) may benefit less from self-directed training than those who are more familiar with that same subject matter.

Pacing of CBI has also been found to be important; appropriate pacing is important to achieving skill acquisition (Fine, 1991; Milheim, 1993). For example, in 2003, Walker and Harrington attribute the effectiveness of their applied CBI program over a wide range of participants with varying backgrounds to self-pacing. However, though self-pacing within training is generally considered effective, there are currently no direct comparisons between self-pacing and computer-pacing, thus it is unclear which results in greater learning (Johnson & Rubin, 2011). Regardless of its overall effectiveness, Johnson and Dickinson (2012) report that there are some identified issues with self-pacing, including the possibility of fast but inaccurate responding and the tendency of individuals to rush through self-paced training. To address this issue while still employing self-pacing, CBI could introduce specific behavioral procedures, such as post-feedback delays or response cost protocols. Post-feedback delays specifically have been found to be beneficial for learning; Johnson and Dickinson report that a 5-second delay following feedback was both effective and preferred over utilizing incentives/disincentives for rushed completion of the training protocol.

Providing practice opportunities within CBI is encouraged (Milhelm, 1993), as additional practice improves performance (Brothen & Wambach, 2004). Given that practice of an actual skill may be difficult in the context of CBI (with the exception of trainings focusing on computer-use skills), most practice takes the form of quizzing. Active responding, or real-time participation with the program, has also been shown to improve outcomes as long as the responses required are demonstrative of learning in the context of what is being taught; for example, quiz questions or identification of terms would likely improve outcomes, but simply interacting to advance through material would not (Ewing et al., 1986; Johnson & Dickinson, 2012, p. 485-486). The form of the responses required of learners also seems to be significant; Johnson and Rubin (2011) reviewed the CBI literature and found that four of the five studies running direct comparisons observed improved performance following overt responding, and all three of the studies comparing different quizzing modalities found that open-ended responding (composition) was superior to selecting a pre-formed response (discrimination). Miller and Malott (2006) disagree with the findings stated by Johnson and Rubin regarding the most advantageous form of quiz question, stating that discrimination and construction responding are equitable. However, they also state that construction may be more effectual when topics are unfamiliar, which suggests that quiz question type may be a component whose effect on learning could be related to the pre-existing skillset of the learner.

Following practice opportunities with feedback has also been shown to improve learning outcomes. In 1993, in his review of the literature up to that point, Milhelm identified that adult learners benefit from the provision of useful feedback and reinforcement, and adding these components to CBI helps to yield positive results. In 2011, Johnson and Rubin's review noted that the most useful form of feedback for adult learners is evaluative and involves "…comparisons between answers learners selected with answers that should have been selected," (p. 70) rather than just simply providing a summary of whether or not the learner answered correctly. Additionally, there is some evidence that exposing the learner to meaningful feedback has more positive effects on learning than either repeated opportunities or correct responding during practice. In 1995, Morrison, Ross, Gopalakrishnan, and Casey conducted a study on feedback and incentives with a group of 246 undergraduates and found that informing the learners of the correct answer following the initial trial, regardless of which answer they chose, was more effective than requiring a correct response, sometimes after multiple trials, prior to presenting the relevant feedback to the learner.

In addition to control, pacing, practice, and feedback, there are other design components correlated with improved outcomes. While more research is necessary, in 2007, a study by Green, Eppler, Ironsmith, and Wuensch conducted with 80 undergraduates found that branching formats that included supplemental materials, which learners were exposed to upon making errors, were more effective than less interactive, more linear training protocols. In 2011, a review by Johnson and Rubin reported that adult learners' outcomes improve when audio prompts are recorded in a human voice and when visual prompts are animated rather than static. Additionally, they state that integrating graphics and text improved performance over either component on its own. Johnson and Rubin also report that the inclusion of a mastery criteria improves learning, as does the addition of incentives for specific levels of performance. Finally, contrary to a common sense approach, the addition of supplemental materials like training manuals may actually result in less learning than just receiving CBI without those materials. In 1996, Cerpa, Chandler, and Sweller evaluated the effects of CBI both with and without supplemental materials with groups of 8th grade girls and 9th grade boys and concluded that training should be complete; supplemental materials that just present the same information as is provided via CBI actually hinder learning rather than support it. While possible that supplemental materials containing novel information omitted from the CBI would be helpful, additional research is needed.

To conclude their review of CBI, Johnson and Rubin (2011) suggest that, given the research, there are certain components that have enough support currently to be recommended as best practice. In terms of design, a CBI should include scripted interactions, auditory narration, many practice items, and should integrate visuals and graphics. With respect to the requirements of the learners, a CBI program should evoke overt responses, require composition during practice, and only provide incentives contingent upon performance standards, if they are used at all.

Advantages and disadvantages/obstacles. CBI is becoming more prominent as a training modality, largely as a result of one of its most salient benefits to organizations; it is incredibly cost-efficient (Heathman & Kleiner, 1991; Johnson & Dickinson, 2012; Milheim, 1993; Mulder, Spitholt, & Barents, 1991). As an example of just how much money can be saved through the replacement of in-person training with CBI, Mulder, Spitholt, and Barents report that when the Dutch Post implemented their CBI program aimed at training counter personnel at Post Offices, they saw a deficit of 2.7 million guilders, which equates to just over 1.5 million US dollars, grow to a surplus of 2.3 million guilders, or just under 1.3 million US dollars, in the four year period following implementation. Adjusted for inflation, the implementation of CBI saved about 5.1 million US dollars.

Cost effectiveness aside, there are many other reasons that organizations are choosing to train using CBI. Generally, it is less likely for CBI to evoke similar, and possibly negative, responses that a learner may have to more traditional learning preparations because there are fewer stimuli shared between typical learning environments and CBI than those environments and lecture and classroom-based trainings; the absence of these possible emotional reactions could do its part to improve acquisition (Milheim, 1993). However, a lack of familiarity could also increase resistance. In 1986, Ewing, Ewing, London, and Ponce stated that, "Many adults feel a certain amount of frustration at having to learn a subject that seems foreign to their prior experience by means of an unfamiliar tool of instruction – the computer," (p. 21). This suggests that familiarity with computers may be beneficial to overall learning following CBI.

CBI can achieve consistent overall quality, which can result in reduced training time (Milheim, 1993); in a study completed by the US Department of Defense, learning via CBI occurred 30% faster than in a traditional classroom (Heathman & Kleiner, 1991). Consistency in the training module provides consistent responses, regardless of the personal characteristics of the learner (Johnson & Dickinson, 2012; Milheim). CBI is useful for training large groups at the convenience of the organization, accommodating learners in geographically diverse locations and administering training in ways that minimize work loss (Ingvarsson & Hanley, 2006; Heathman & Kleiner, 1991; Johnson & Dickinson; Walker & Harrington, 2003). Additionally, new staff can be trained immediately upon hire, rather than waiting for a training group to be scheduled (Harrington & Walker, 2002). If basic training is needed before more specialized training can be administered, CBI can be used for easy implementation and rapid acquisition (Heathman & Kleiner). A specialized trainer is not needed, and data collection can be more efficient if the CBI data is collected automatically. Training via CBI may also be more motivating and can increase retention over traditional training modalities (Benson, 2000; Harrington & Walker; Milheim; Walker & Harrington).

The inclusion of CBI is not entirely beneficial; some disadvantages and obstacles to implementation of such training protocols have been identified. Regarding preparation, up-front development time and effort for CBI is high, and may require the expertise of a programmer and a content expert, which delays implementation (Heathman & Kleiner, 1991; Johnson & Rubin, 2011). Logistically, while CBI can be convenient, it can also be restrictive when the physical resources of an organization limit the number of staff who can be trained at one time (Harrington & Walker, 2002). Additionally, some content is not suited for CBI, and acquisition may not be observed at acceptable levels (Johnson & Rubin), especially if that content would be better taught in a way that provides opportunities for physical rehearsal of skills (Harrington & Walker); for example, CBI may be inappropriate for teaching certain aspects of hands-on manufacturing. This may also be true for complex chains of behavior; in such cases, computer programming may be insufficient to evaluate complex learned behavior in a meaningful way (Johnson & Rubin). Finally, regarding learners, CBI may be unsuitable for staff who are unfamiliar with computers (Harrington & Walker).

Researchers investigating CBI also analyze implementation in terms of acceptance; when something new is being introduced to a workplace, the success of training and ultimate utilization depends in some ways on what is referred to as acceptance, but what would more behaviorally be referred to as buy-in. As mentioned previously, it is important that staff be aware of how the new skill will either decrease response effort on the job, increase access to reinforcing consequences, or both, prior to beginning training. Wagner and Flannery (2004) note that perceived ease and usefulness influence learners' behavior; if a learner can use the new technology effectively, they are more likely to engage with it and use it following training. It is important to design a training that is accessible and appropriate for the skill level of the learners using the new technology; if the training is too difficult, it is less likely that the employees will accept, learn, and use, the new technology. Milheim (1993) suggests that adult learners should be involved in organizing the content of training, increasing buy-in by making sure that the staff sees the training as valuable and relevant. Additionally, Wagner and Flannery suggest that age, education, and prior experience with the content may improve the perceived ease of use of a new technology; evaluating these external variables prior to the development or implementation of training may improve outcomes.

Given what is known about the advantages and disadvantages of the use of CBI, Milheim (1993) suggests criteria for its use in organizations. He suggests that CBI is best utilized in an environment where computer use is not actively resisted by the learners. He argues that CBI is particularly well-suited for content that remains stable for fairly long periods of time and in which standardized outcomes are very important. Additionally, CBI is appropriate for organizations or disciplines in which there is high turnover, staff tend to be geographically dispersed, and there are large numbers of employees that need training.

Computer-Based Instruction as Compared to Other Methods of Instruction

Research has been conducted comparing CBI to more traditional forms of instruction, and the findings have been largely positive. As early as 1986, CBI was found to result in higher final exam scores and similar learning outcomes in only 71% of the time it took to achieve the same levels using in-person instruction methods (Kulik, Kulik, & Schwalb). In 1991, Mulder, Spitholt, and Barents report that supervisors of staff trained to work at the post office via CBI were generally satisfied with the performance of those staff as compared to others trained traditionally; supervisors reported that those who received CBI demonstrated improved client service and equipment handling, but were less capable regarding infrequent job activities or administrative routines. In 1998, a survey comparing in-person, CBI, and video-based training reported similar findings with respect to the satisfaction of trainees' supervisors with their job performance following training, noting that CBI was equally effective (Harp, Taylor, & Satzinger). However, none of these studies report actual performance data or information on the components included in the CBI; while they provide information on general perception of effectiveness, evidentiary support for these conclusions is lacking.

More recently, there have been studies reporting more specific information regarding comparisons made and the performance of CBI against other forms of instruction. In 2002, Harrington and Walker evaluated a CBI protocol in a group design utilizing pre- and post- testing as objective measures and found that groups who received CBI performed better than the control group and equitably with the in-person training group. In 2003, Walker and Harrington found that, when compared to in-person training, CBI was at least as effective at providing injury prevention training, and even resulted in better scores on a few measures while still managing to be faster and require fewer resources. In 2006, Graham compared test scores of students who completed computer-based tutorials, equipped with a programmed accuracy requirement and branching feedback, with those who had access to the same materials in printed form and found that those who contacted the electronic materials scored an average of 13% higher than those with the printed materials; the authors suggest that CBI forces contact with the content, which could be the cause of its observed benefit (as cited in Green et al., 2007). Rehberg, Diaz, & Middlemas (2009) reported that for training cardio-pulmonary resuscitation (CPR), while the knowledge of the learners following CBI was at the same level as those who took an in-person training, the ability of the learners to actually perform CPR was much higher for those who learned the skill in the classroom. In this study, though learners were allowed to practice the physical skills of CPR during both training approaches, feedback was only available in the classroom training. Conversely, in an evaluation of the training of a physical task that was conducted in 2007, Malmskold, Ortengren, Carlson, & Nylen reported that, "…computer based training, as performed, combined with motor skill training given from the production of vehicle batches in the pre-series phase has given operators similar assembly skill as the operators that have traditional training," (p. 471). They found that when rehearsal and feedback components remain constant, no quality differences were observed between groups and a positive learning rate was observed following CBI. These findings indirectly support what Harrington and Walker (2002) reported previously; some skills are better acquired when actual physical rehearsal and in-person feedback is available. They also suggest that, when a physical task is taught, the addition of in-person practice and feedback following CBI could result in more equitable performance of learners. Finally, there is some evidence that CBI is superior in terms of the retention of learners, as well; in 1991, Fine reported a retention rate three to four times higher following CBI than lectures and written testing and Walker and Harrington (2003) note that "Studies have found a 40% better retention for [computer-based] vs. instructor-led training," (p. 478), which they hypothesize is related both to the ease of material review and the typical inclusion of immediate feedback.

The more general findings reported by Johnson and Rubin (2011) state that "…interactive CBI was found to be at least as good as, if not better, than instructional alternatives 95.2% of the time," (p. 64). Specifically, five of six studies comparing CBI to text-based training found CBI superior, and the same was found for eight of the 10 studies that compare CBI to lecture-based training preparations. The authors conclude that, "…interactive CBI is an effective and recommended method for delivery of training materials, one that is very likely to produce superior learning outcomes over other approaches such as non-interactive CBI, textbook instruction, and lecture instruction," (p. 71).

Effects of Pre-Existing Skills on Acquisition following Computer-Based Instruction

Some research has been conducted on other pre-existing skills, besides skills specifically related to computer proficiency and literacy, which can have effects on outcomes of CBI. Perhaps not surprisingly, prior knowledge of the training subject has been shown to improve learning outcomes. Other hypotheses indicate that certain characteristics of training, such as control over content speed, may only benefit learners with greater prior knowledge of the subject matter (Klein & Keller, 1990; Kopcha & Sullivan, 2008; Moos & Azevado, 2009; Reisslein, Sullivan, & Reisslein, 2007). Additionally, more experienced users generally prefer CBI over both in-person and video-based training techniques (Harp, Taylor, & Satzinger, 1998). Research has also demonstrated that general mental ability can affect outcomes, as well; in 1990, Klein and Keller assessed the general mental ability of 75 7th-grade students prior to CBI, reporting that higher scores on a psychological test measuring mental ability, the Henmon Nelson Test of Mental Ability, was associated with both better performance on the skill trained and higher motivation post-training.

With respect to effects related more specifically to pre-existing computer skills, Grant, Malloy, & Murphy define computer proficiency as the "…knowledge and ability to use specific computer applications," (2009, p. 142). Increased levels of computer proficiency positively impacts overall computer literacy (Grant, Malloy, & Murphy), which is defined as "…an understanding of computer characteristics, capabilities, and applications, as well as an ability to implement this knowledge in the skillful, productive use of computer applications suitable to individual roles in society," (Simonson, Mauer, Toradi, & Whitaker, p. 233). Given that job placements often require personnel to have at least some level of familiarity with computers and their operation to fulfill their occupational responsibilities (Grant, Malloy, & Murphy), it is likely that individuals with more established levels of computer proficiency, and therefore computer literacy, would perform computer-related job tasks more effectively and develop new computer use skills more efficiently. However, there is very little evidence, supportive or otherwise, for this conclusion.

Self-efficacy, or "…the self-perception of one's capabilities to meet demands based on current states of motivation, course of actions needed, and cognitive resources," (Moos & Azevedo, 2009, p.578), has been shown to be related to performance following CBI. It is hypothesized that ratings of self-efficacy are related to learning history; learners who have had more contact with stimuli and contingencies inherent in the skills being taught will generally rate themselves as more capable at learning new and related skills (i.e. they would have higher self-efficacy) whereas learners who have had less contact with them will engage in verbal behavior that suggests skepticism at their ability to learn and engage in the same new skills (i.e. they would have low self-efficacy).

In his review of the literature, Milheim (1993) suggests that learners who are insecure in their ability to either learn the skill or interact with the training may suffer a disadvantage; according to Yang, Zhao, Zhang, and Pruessner (2013) when engaging in a difficult task as compared with an easy one (e.g. easy versus difficult math problems), learners with low self-efficacy could experience more negative emotional responses, as measured using event-related auditory or visual evoked brain potentials, and may even interpret the task as threatening. If this is the case, the anxiety or other related emotional responses experienced by someone with low self-efficacy could feasibly hinder acquisition following CBI. Overt statements from learners regarding their abilities have been observed to be sensitive to feedback, as well; though most students assessed by Grant, Malloy, and Murphy (2009) initially engaged in verbal behavior that suggested higher levels of computer proficiency than were actually demonstrated, participating in the assessment decreased statements of high proficiency, indicating lower self-efficacy for some participants, likely due to recent contact with actual performance during the testing. This means that any job or class that first assesses learners could actually be hurting their ability to acquire those skills by decreasing their self-efficacy. Further support for this idea comes from the suggestion that the correlation between self-efficacy ratings and improved levels of performance may become less pronounced as a knowledge based is acquired (Moos & Azevedo, 2009); this relationship suggests that, as knowledge is acquired, self-efficacy is no longer necessary for positive performance because the training is less likely to evoke emotional responses that would need to be tempered by confidence. In terms of training appropriateness, Moos and Azevedo note that behavioral training methods have been shown to be beneficial to computer self-efficacy, stating that:

> One line of experimental research has examined the relationship between training methods and computer self-efficacy and has generally found that behavioral modeling is more strongly related to positive computer self-efficacy when compared to the traditional method of instruction-based training. In addition,

> research also suggests that the administration of both feedback and strategy instruction are positively related to computer self-efficacy. (p. 587)

Only a single study, conducted by Ownby, Czaja, Loewenstein, & Rupert in 2008, evaluated performance following CBI with any respect to specific pre-existing computer skills. They tested many variables, including age, education, visual discrimination speeds, and short-term visual memories in addition to computer experience, and observed that computer skills were related to outcomes following CBI. However, these findings are vague, and specific skill levels and their relationship to observed outcomes was not elaborated on. Regardless of this, they report that:

> This finding has implications for training programs and suggests that it may be important to assess trainees' baseline computer skills and provide for additional training when necessary. This may be critical prior to actually training job candidates on specific tasks. Failing to do so, we speculate, might decrease trainees' willingness or ability to complete training. (p. 179)

Despite this, no current research exists that focuses on identifying any specific computer skill levels or deficits that affect a learner's ability to acquire skills following CBI.

Behavior Skills Training

As mentioned previously, BST is a training technique that contains the following specific components: instruction, modeling, rehearsal, and feedback (Nosik & Williams, 2011; Parsons & Rollyson, 2012; Ward-Horner & Sturmey, 2012), which has been shown to be effective for a variety of skills (Hogan, Knez, & Kahng, 2014). Research has been conducted on this utility of each of these components individually and their specific effects on outcomes following training, as well as their effects on training various skills when applied as a package.

Instruction. Verbal instructions are generally included in BST, and typically serve the purpose of introducing the subject matter and content to the learner. On its own, verbal instruction has been shown to be, at best, minimally effective. In 1980, Krumus and Malott reported that instruction was completely ineffective when other components did not accompany it. In 1989, instruction was found to be just marginally more effective by Feldman, Case, Rincover, Towns, and Betel, who reported that verbal instruction had only a slight effect on parental responsiveness when delivered on its own; the rate only improved following the addition of modeling, rehearsal, and feedback. While the effects of instruction can be enhanced by some additional supportive stimuli, such as a performance checklist or an accompanying written description of the skill being taught (Parsons and Rollyson, 2012), the research indicates that instruction is an ineffective training tool when presented on its own.

Modeling. Modeling is the act of physically showing the learner the skill that is being taught by acting it out in front of them; generally, the instructor models the task by completing it himself/herself while the learner observes. Also called "learning through observation" (Gena, Couloura, & Kymissis, 2005), modeling has been shown to be equally effective both in-person and via video (Gena, Couloura, & Kymissis; King, Radley, Jenson, Clark & O'Neill, 2014). Generally, modeling is considered a useful component to a training program, as it has been shown to improve learning outcomes. Effective delivery of modeling can occur in multiple formats (Nosik, 2010), and across a variety of skills (Hogan, Knez, & Kahng, 2014; Krumus & Malott, 1980). In a component analysis completed by Ward-Horner and Sturmey (2012), adding modeling to instruction resulted in increased performance for some subjects during certain phases of the training, but the results were inconsistent. While the learning histories (e.g. pervious exposure to modeling, previous exposure to training in general, level of proficiency with the subject matter prior to training, etc.) of the participants in this analysis could be the reason for observed inconsistencies between learners, this study did not report any differences among the learners that could account for this finding.

Practice/Rehearsal. Practice generally involves some form of performing the task that is being taught. The form of this practice is varied, and can include actual practice of the skills or practice of similar skills using an analog environment (rehearsal) and/or answering questions related to the engagement in the skills being targeted for acquisition (practice). The research on the benefits of rehearsal as compared with practice is inconsistent, but it is clear that both are beneficial to training outcomes. In 2012, Parsons and Rollyson state that, though this step is often omitted, rehearsal is necessary and should be required in any program whose aim is to "produce effective performance," (p. 4). However, Miller and Malott (2006) report that the form of the practice does not need to be the same form as the response being taught; including quiz questions does improve performance over just providing content. This was further supported in 2012 by Ward-Horner and Sturmey, who suggested that rehearsal may be unnecessary, and that removing it from training programs might enhance social acceptability without compromising the performance of learners following training.

Feedback. Feedback is the process of giving a learner information regarding the effectiveness of their behavior on a particular skill or set of skills following training or performance (Alvero, Bucklin, & Austin, 2001; Balcazar, Hopkins, & Suarez, 1985; Prue & Fairbank, 1981). Generally, feedback is provided following rehearsal or practice to reinforce the components of the skillset that were completed as instructed and to correct the errors that the learner was observed to make, so that the learner does not build a history of incorrect responding (Fine, 1991). Though the most consistent effects are observed when feedback is used in combination with other procedures (Alvero, Bucklin, & Austin), feedback can improve the skills being evaluated in both those giving and receiving it, even when it is applied with no other training components (Alvero & Austin, 2004; Harrison, as cited in Nosik, 2010). Indeed, in a component analysis completed by Ward-Horner and Sturmey in 2012, the authors note that, “Feedback, and to a lesser extent modeling, were the most effective components of BST,” (p.89). The addition of feedback increased learner performance to mastery levels, regardless of training phase. The research suggests that, following instruction and modeling, practice and feedback should be repeated until the learner achieves the determined mastery criterion (Ewing et al., 1986; Parsons & Rollyson, 2012).

Effectiveness of BST. BST as a package has been shown to be effective in a variety of settings and teaching a variety of skills. Ward-Horner and Sturmey (2012) report on a study conducted by Hudson in 1982, in which:

> Parent teaching skills and the number of programs mastered by the children were significantly greater for the BST group than the other treatment groups [instructions & instructions with behavioral descriptions]. The author concluded that modeling, feedback, and rehearsal were necessary components of the training. (p. 76).

In 1989, another study targeting parenting skills showed significant gains following BST that were maintained by most of the participants for up to 18-months after the training (Feldman et al.). BST has also been shown to improve staff performance in a human service setting. Though improvement was only observed in skills directly targeted by the applied BST, meaning generalization to other relevant skills did not occur, the observed improvements were maintained over time, and led to positive outcomes for the consumers receiving services (Palmen, Didden, & Korzilius, 2010). Parsons and Rollyson (2012) also used BST to train teachers and teacher assistants working with disabled adults to implement a most-to-least prompting hierarchy for a sign-language program and found that the training was effective; learners acquired the skills being taught and those skills generalized across environments, resulting in overall improvements in job performance.

Other benefits of BST have also been reported. Retention of a skill or set of skills tends to be good following BST (Feldman et al., 1989). Taylor, Russ-Eft, and Chan (2005) state that both "…skills and trained job behavior were clearly sustained over time after [BST] training," (p. 703). Additionally, the general acceptance of the method is high; participants typically report liking this training method and feeling confident in using the skills that were targeted (Parsons & Rollyson, 2012).

As with all training methods, there are a few characteristics of BST that need to be considered when selecting a training program for use in an organization, especially if that organization will be training the use of a new software program. First, BST tends to be time consuming, both in preparation and delivery (Parsons & Rollyson, 2012). This can be an issue for many organizations, as training can quickly become a costly process.

However, Parsons and Rollyson note that there has not been another training preparation developed that is both faster and results in similar or better outcomes for learners, and suggest that the focus should be on increasing the efficiency of BST rather than finding or developing other training methods. Also, some researchers have observed that generalization following BST is less than ideal, unless the program is designed to specifically target it as a goal (Feldman et al., 1989). Given that this is not always so, it is possible that the amount of generalization that is observed following training could be related to other untested variables, such as the type of skill being taught or characteristics of the learning history of the learner. Finally, BST may be better suited for certain skills than others. In a review on BST effects in 2005, it was noted that "Training effects of the development of procedural knowledge-skills for technical skills training were slightly larger than for interpersonal skills training," (Taylor, Russ-Eft, & Chan, 2005, p. 699). This means that for skills during which learners are expected to interact with objects or tools rather than people, BST is very well-suited to the task, but for skills that require interaction with other people or groups of people, BST may be somewhat less useful. While this supports the assertion that BST would be appropriate for teaching software-use skills, too, whether this is true or not remains unclear; reported outcomes were limited in the studies reviewed that pertained to the effectiveness of BST in teaching the use of software (Taylor, Russ-Eft, & Chan).

Computer-Based Behavior Skills Training

In an effort to follow the advice of Parsons and Rollyson (2012) and improve the efficiency of the delivery of BST, some researchers have recently begun creating and evaluating computer-based BST protocols and related variables. In the limited research that has been done in this area to date, computer-based BST has been shown to be generally effective. In 2011, Nosik and Williams provided and entire training via computers, including feedback, which was video-taped and automated for learners; this protocol was shown to improve the trained behavior outside of the training environment. Then in 2013, a computer-based training targeting discrete-trial training skills was developed and tested; in this case, the training led to improvement for all participants, but the most marked improvements occurred in those participants who had some background in Applied Behavior Analysis (Nosik, Williams, Garrido, & Lee). The authors suggest that knowledge regarding the subject of training may actually be necessary for acquisition following computer-based training, stating that "…while there are successful components to the computer based instruction program, the experience and history of the participant might need to be further investigated as a variable when using this type of training," (Nosik, Williams, Garrido & Lee, p. 467).

Conclusion

It is clear that organizations continue to need more efficient and effective methods of training staff, and that utilizing CBI for this purpose is an ongoing trend. However, it is unclear if there are types of skills for which CBI is better suited, or for which learners with which pre-existing skill sets this training delivery method is effective. With their history studying the components and consumers of staff training and developing steadily improving methodologies, including BST, Behavior Analysts are uniquely qualified to help find these answers. The purpose of the first study presented here is to extend the current research on computer-based BST by evaluating its effectiveness at teaching a novel software skill, and to report those learning outcomes with respect to the pre-existing computer skills of the participants. Extending from those findings, the follow-up study directly compares in-person and computer-based BST for a set of both software-use and practical skills, and interprets the results with respect to the computer-use skills of the participants.

Study One

Method

The initial project was focused on identifying whether or not computer-based BST resulted in acceptable levels of acquisition, and whether or not those observed levels of acquisition could be related to each participants' pre-existing computer skills prior to the onset of the study. A single-subject pretest-posttest design was used to test the effectiveness of the computer-based BST and group measures were employed to identify relationships between pre-existing skill and observed acquisition. The independent variables included (a) scores and rate of completion obtained on various computer-skills tests and (b) exposure to the computer-based BST module. Progress was measured using the pre- to post- differences in the number of completed actions that were correct, percent correct overall (accuracy), and the rate, in seconds, of correct actions made.

Participants and setting. Participants in the pilot study consisted of both male and female volunteers across age groups, ranging from 18 to 65. All who volunteered were 18 or more years of age, unfamiliar with the software program being taught, and were able to speak and read English fluently participated. Many were recruited through the university research recruitment system, but as a varied sample of employment-aged individuals was ideal, others were recruited via in-person and internet-based recruitment methods, such as posting fliers at local gyms and community centers and posting ads on online message boards serving populations local to Reno and Sparks, Nevada. Participants were offered both credit, for those to whom it applied, and raffle entries for the possibility of winning one of two $25 gift cards as compensation for their time. Of the 16 participants that completed the pilot protocol, ten of those data sets were included in the analysis; the others were excluded due to changes made in the protocol or equipment failure that led to incomplete data sets. The study was conducted at the public library in the Reno or Sparks area that the participant chose as most convenient for them.

Materials and apparatus.

Computer skills assessments. Participants were exposed to four skills assessments that were meant to test their general level of skill and comfort using computers. The first assessment was a survey developed by the researcher that listed the component skills that would be tested in the following assessments and allowed the participants to self-evaluate their ability to complete each task using a behaviorally-anchored rating scale. (See Appendix A for a copy of this survey). Participants completed typing tests using a program called “Typing Trainer ®”, which was downloaded from typingtest.com for use in this study. This program provided both rate and accuracy measures of typing skills and saved them under the participants’ identification number for later review, when needed. The final two assessments given were the “Basic Computer” and the “Windows 7®” assessments developed by the Northstar Digital Literacy Project (https://www.digitalliteracyassessment.org). These assessments were developed as a way to “…assess and quantify digital literacy knowledge among lower-skilled adults, as well as for displaced workers who might lack such skills,” (“History and Purpose”, 2014). This effort led to the development of a series of assessments that are available to both employers and prospective employees as a way to test and attest to a certain skill level using computers and software. These assessments were chosen by the researcher after a literature review failed to identify any standard way to test for computer skills; in the absence of a standard, the use of a readily-available pre-employment test for computer skills seemed appropriate for use considering the staff-training goal of the training being evaluated. All assessments were completed on a Sony Vaio® laptop computer.

Pretest and posttest. For the pretest and posttest, participants were given a packet of materials that included an instruction sheet, a basic learning program, and set of mock-data, which they were asked to enter into the software being tested, the Applied Behavior Analysis Software Environment, or ABASE. This software was developed as part of a grant (Williams & Szabo, 2006) and is not currently available for wide usage, making it an ideal choice for use here due to its novelty. This software was hosted on the developer's server and was accessed by the participants via the same Sony Vaio® laptop that was used for the computer skills assessments.

Computer-based BST. The computer-based BST was developed using the video-editing software Camtasia Studio 8, and consisted of video modeling in the form of screen recordings accompanied by instructions, presented both audibly through voice-over and visually through animated instructions, arrows, or other highlighting techniques (Johnson & Rubin, 2011). Practice was achieved through embedded multiple-choice questions relevant to the material just previously presented in the training; there were eight total questions presented to each participant, presented in four groups of two questions each, separated by periods of instruction and modeling. After each question was answered, feedback was given on what the correct answer was and why that answer was correct (Appendix B). If the participant answered incorrectly, specific information as to why his or her answer was incorrect was not provided due to the limitations of the video-editing software, which did not allow for answer-dependent feedback. The complete training was just under 16 minutes long. This training was also presented via the Sony Vaio®laptop.

Data collection. During both assessment and testing, the screen of the Sony Vaio® computer was recorded using free-access software (CamStudio®), which records a video of the actions completed on the screen of the computer. Additionally, a click-counter was used to help identify when actions in the software program were taken, given the absence of sound in the videos and the inability to hear clicks as they occur. These videos were used to record the assessment scores and evaluate the pre- and posttest performance of the participants.

Procedure. Upon arrival, each participant was given a summary of the study and was told what was being testing and generally what they would be asked to do and how long it would take. Then the participant was given an information sheet that explained these details, the risks and rewards, and other characteristics of the study in more detail. Once the participant reviewed this information, if he or she still wished to participate, the active portion of the study began.

Participants were first given the researcher-generated Computer Comfort Survey and asked to complete it to the best of their ability. Each skill being self-evaluated was rated at some level between one and five, and those numbers were added together to generate a score for the assessment. Once the survey was complete, participants were asked to complete three two-minute typing tests consecutively. After each test was complete, the results were recorded and the average observed speed and accuracy were generated. Then the participant completed the basic computer skills test followed by the Windows 7® test; after completing each test, the scores were recorded.

Upon completion of the computer skills assessments, the participant was given the packet of information pertaining to the tasks they would be learning to complete in the novel software, ABASE. This packet contained brief directions, a learning program, and mock data for the month of February, 2014. The participant was first instructed to log into ABASE and attempt to enter the information from the packet into the program prior to receiving any instruction in order to achieve baseline measures of performance and capability. Participants were told that they could continue to try and complete this task until each finished the task, though they finished the task, or told the researcher that they no longer wished to continue the attempt; there were no specific time-limits assigned.

When the pretest was completed, the researcher closed ABASE and opened the computer-based BST. The participant watched the training and answered the embedded quiz questions as they became available. Once the training was complete, the participant was given a second packet of information, which was similar to the first in content but with the specifics changed to control to some degree for practice effects, and asked again to enter the information into ABASE. This posttest was identical in procedure to the pretest.

Participants were also asked to take a social validity survey, to evaluate their opinions on the strength and weaknesses of the training program, their preferences regarding computer-based and in-person training preparations, and their feedback as to the components that would improve the process to which they had just been exposed.

After completing this survey, participants were free to go and their involvement in the experiment ended.

Data collection and Inter-observer Agreement (IOA). Data on the computer skills assessments were collected by the researcher as they were completed by each participant and were recorded on a data sheet. Pretest and posttest data were collected via the screen recordings of the participants' performance. Data sheets were prepared that outlined the steps in each of the tests, and data were recorded for each step that the participant was required to complete. Data were collected on the time of completion of each step, correct actions, missed actions, and extraneous actions made within ABASE. For the purposes of this study, an action was defined as any behavior (clicking, pressing enter, pressing tab) that created a change in the program, such as navigating through pages, bringing up menus, or saving progress. The exception to this was typing; instead of recording each character typed, actions only included clicking on the entry field to make it available for use. The data were coded this way to correct for typing errors, which were not a target in this study. A correct action was defined as an action that was necessary to complete the task. A missed action was defined as any action that should have been completed in order to finish the task as assigned, but was forgotten or skipped by the participant altogether. An extraneous action was defined as any action that was competed in the program that was not necessary to the completion of the task as assigned; examples could include repeating the same movement multiple times, navigating to incorrect places in the program, or completing unnecessary steps.

Total count inter-observer agreement (IOA) data were collected for four out of 10 sessions. Agreements and disagreements were calculated by adding together the total number of each type of response (correct, missed, extraneous) for each recorder and comparing them. For example, if recorder one recorded 100 correct responses and recorder two recorded 105 correct responses, that would mean there were 100 agreements and five disagreements. The total IOA was then calculated by dividing all agreements by agreements plus disagreements and then multiplying by 100 to gain a percentage. This process was completed for each type of action coded as well as overall. Total overall IOA was 97%, and ranged from 95%-100% agreement for correct actions, 82%-100% agreement for extraneous actions, and 98%-100% agreement for missed actions.

Results

Pre-existing skills. Of the 10 participants included in the analysis, nine of them rated themselves as very capable at most or all of the skills being asked about, granting themselves from 93 to 105 of 105 total available points, or 89-100%. The tenth participant rated himself only slightly less capable in some areas, at 79 of 105, or 75%. Typing speed averages ranged from 31 words per minute to 84 words per minute, with nine of out ten participants performing at 44 words per minute or below. Typing accuracy average scores ranged from 78% to 95% for all participants.

The range of performance observed on the computer skills and Windows tests was more variable. The computer skills test accuracy ranged from 68-95% correct, while the time to complete the test took between 250 seconds (two minutes and 10 seconds) and 661 seconds (11 minutes and one second). The Windows skills test showed similar results, with accuracy ranging from 72-97% correct and time to completion taking from 156 seconds (one minute and 36 seconds) to 388 seconds (six minutes and 28 seconds). Please see Table 1 for the results for each individual participant.

Training. With the exception of one participant, every participant improved to some degree following the computer-based BST. Every participant completed more correct actions following the training, and for eight of those 10, a greater percentage of the number of actions completed was correct, too. For participant 267, this pattern does not stand because during the pretest, the participant completed very few actions, most of which were correct, which artificially inflated his percentage; following the training, he engaged in many more responses, so the percentage of those responses which were correct was smaller. However, Participant 267 did improve in overall percent correct (accuracy) from the pretest to the posttest. Participants improved anywhere from 18% to 88% over their pretest accuracy following training, and in doing so decreased their time spent completing each correct action by a range of three to 105 seconds. Participant 875 was the only participant observed that did not seem to improve following training; between the pretest and the posttest, this participant completed a smaller ratio of correct actions and was less accurate on the posttest, and even increased his time per correct action slightly, by one second per correct response. See Table 2 for the results for each individual participant.

On average, participants engaged in 79 more correct actions following training, which equates to 27% more of the observed responses being correct (rather than extraneous). Additionally, participants' total accuracy, as measured by percent correct, improved an average of 47% and the time per correct response decreased by an average of 45 seconds from pretest to posttest. These data are reported visually in Figure 1.

Observed correlations. The skill assessment data were plotted on scatter plots with the acquisition data in order to visually show relationships between acquisition following training and computer-skill assessment scores (Figures 2-5). Upon visual inspection, there is at least some minimal trending and grouping of the measures observed and actual performance changes for most of the relationships being evaluated, with the exception of Windows skill accuracy and rate of correct actions and Typing accuracy and the percent of completed actions that would be coded as correct, which seem to be unrelated (Figures 2 and 5).

Correlation coefficients were then calculated to more clearly identify possible relationships between pre-existing computer skills and acquisition following the computer-based BST. As the sample size is so small, only moderate to high correlation coefficients (less than -.5 or more than .5) will be considered here. Using these criteria, the percentage of completed actions that were coded as correct is positively correlated with the accuracy measures on both computer skills tests as well as negatively correlated to the rate of completion of the basic computer skills test. Overall accuracy from pretest to posttest is positively correlated with the achieved accuracy on the Windows skills test and negatively correlated with the rate of completion of the basic computer skills test, but shows a weaker relation to the accuracy achieved on that assessment. Finally, typing accuracy, but not speed, is negatively correlated with the improvement in the rate of correct actions completed. The full reporting of calculated correlations can be found in Table 3.

Social validity. The social validity measures reported by the participants were generally high, as every participant liked the computer-based BST, and 81% (9 out of 11) of those participants went further and would describe computer-based BST as generally better than in-person training. All the individually rated components of the training were rated at least three out of five in terms of helpfulness, with the majority of ratings (85%) being fours or fives. However, though the participants report liking the computer-based BST, they did not report themselves to be completely comfortable with the task after training. On a scale of 1 (not comfortable) to 4 (very comfortable), when asked if they thought they could complete the task again, complete it as a job requirement, complete it without mistakes, or teach the task to someone else, the average rating for each question was between 2.1 and 2.7, indicating that the participants overall were only somewhat comfortable with the task following training. More specifically, if you consider a 3 or a 4 rating high levels of comfort, 54% of participants thought he/she could complete the task again or complete it as part of his/her job, only 45% of participants believed they could do so without mistakes, and just 36% of participants felt comfortable saying they could teach the task to a new learner.

Discussion

The data suggest that computer-based BST is effective to differing degrees, given that that the skill being taught is a computer-related skill. Following trainings, most participants were better able to navigate ABASE and complete the task being requested of them than they had been prior to training. However, while all participants demonstrated some skill gain following the training implementation, the amount of gain observed varied, and only some participants were actually able to complete the task. Those who did not demonstrate acquisition following training, specifically Participant 875, generally did well on the task during the pretest, and made very specific errors; these errors were made again following the training. It is possible that some of those participants who are the most capable and/or confident at computer-use actually attended less to the training, which could have had an effect on acquisition. This is unclear from the data collected, but could be made clearer if each participant were taught multiple skills so that within-subject analyses could occur.

Though variable, the gains observed to seem to be correlated, to some degree, with participants' performance on several measures aimed at assessing basic computer skills and comfort. While this suggests that testing the basic computer skills of an employee prior to assuming that computer-based BST would be an effective method for teaching new skills may be warranted, there are several confounds present that need to be addressed prior to making such a recommendation. First, the relationship between pre-existing computer skills and acquisition following a computer-based BST was only tested here with a software skill, which means that any observed results may be due to the type of task being taught rather than the training format provided. In other words, those participants who are less comfortable with computers may have demonstrated less learning following training simply because the task itself was also computer-based, rather than because the training was presented via a computer. Similarly, only the relationships between pre-existing computer skills and acquisition following a computer-based BST were explored, so it is possible that the correlations observed would exist no matter what type of training (computer-based or in-person) was provided. If that were the case, that would suggest that these assessments are less useful for testing specific computer skills and computer-use readiness than they are for assessing more general training readiness, and ongoing research would be needed to understand their function in that context.

Study Two

Study two focuses on correcting the issues observed in the initial protocol that were outlined above by conducting a direct comparison of computer-based and in-person BST for both software skills and practical skills. The purpose of this study is to compare computer-based BST to more traditionally presented in-person BST for a variety of skills, evaluating the effectiveness of each compared to the other. Additionally, by taking measures on pre-existing computer skills prior to testing, the study may also identify whether general computer-use skills correlate with acquisition observed following training. A mixed-design was used, where participants were separated into two groups and taught four skills via two different types of training. All participants were measured using a pretest-posttest design, before and after each of the four trainings, similar to the design of the initial experiment. The independent variables include (a) scores and rate of completion obtained on various computer-skills tests and (b) exposure to each of four trainings, two conducted as in-person lecture and two conducted on the computer. Progress was measured using the pre- to post- differences in the proportion of completed actions that were correct, incorrect, and extraneous, percent correct overall (accuracy), and the rate of correct actions made per second. This method allowed each participant to contact each training-task combination and serve as his/her own control, highlighting differences in learning gain across conditions that were then analyzed with respect to assessed computer competency.

Method

Participants and setting. Participants consisted of both male and female volunteers across age groups, ranging from 18 to 45. All who volunteered were over 18 years of age, were unfamiliar with either the software program or the assessments being taught, and were able to speak and read English fluently. Recruitment occurred through the university research recruitment system. Attempts were made to obtain a more varied sample by recruiting via internet-based recruitment methods, but ultimately no participants were recruited in this way. Participants were offered both university course credit, for those to whom it applied, and raffle entries for the possibility of winning one of two $25 gift cards as compensation for their time. A total of 26 people participated, 13 in each of the two groups being run. The study was conducted in a two-room suite in a university clinic, each measuring about 75 square feet.

Materials and apparatus.

General. Computer-based portions of the study were completed using one of three available desktop computers. Each computer had access to a local server hosting ABASE, the software taught. Additionally, each computer was equipped with screen recording software, CamStudio®, and headphones. Training videos were edited using the same software described above, Camtasia Studio 8, but the computer-based trainings and quizzes were generated using Adobe Captivate 8 due to its more versatile quizzing platform. In-person portions of the study were recorded as needed using a digital video camera, which was posted on a tripod and arranged in the lab as unobtrusively as possible. Also, any visual instruction materials or video models that were shown as part of the in-person training protocols were projected onto the wall of the lab for the participants to watch.

Training/assessment specific.

Computer skills assessments. The skills assessments completed here were identical to those completed in the pilot, except that the participants only took a single typing test rather than repeating it three times.

ABASE trainings. Both the trainings that took place on modules within ABASE required the participant to receive a packet of materials, and each packet included a page of directions as well as the mock-data that the participant was instructed to enter into the program. This mock data consisted of either a face sheet (a sheet containing the personal identifying information about a client – See Appendix C) or a habilitation plan (a sheet outlining a program that would be implemented with a client, meant to help them learn or maintain a functional skill – See Appendix D).

Practical skill trainings. Participants learned to conduct two behavioral assessments: a paired-choice preference assessment (Fisher et al, 1992), which ranks items to inform the likelihood that they many function as reinforcers for the tested learner, and Level 4 of the Assessment of Basic Learning Abilities (ABLA) (DeWiele, Martin, Martin, Yu, and Thomson, 2012), an assessment aimed at determining the types of discriminations a learner can currently make. For the preference assessment pretest and posttest, participants were provided with a data sheet and directions (Appendix E), an array of snack items to test, a roll of paper towels, and a writing utensil. For the ABLA pretest and posttest, participants were provided with the direction sheet and the data sheet for Level 4 of the assessment from *The Kerr Meyerson Assessment of Basic Learning Abilities Revised: A Self Instruction Manual, Second Edition* (See Appendices F-G). Additionally, the participant was given a large and a small yellow can, a large and a small red, striped box, a snack food to be provided as the edible reinforcer, and a writing utensil.

Procedure. Depending on scheduling, participants were run individually or in groups of as many as three at a time (one for each computer available). When a participant arrived, the study was explained and the consent forms for both participation and the use of video-taping for data collection were presented. The participant had time to review the forms and ask the researcher questions; if he or she decided to participate, he or she was asked to sign and return the forms so that the research procedure could begin.

Once consent was obtained, the participant (or group of participants) was assigned to a group using random number assignment. First, a random number generator placed the participant/group in either Group 1 or Group 2; then, a second query was run to assign the participant/group to conditions 1 through 4. Each group received a specific set of four training-task pairings, counterbalanced across groups so that all eight possible training-task pairings were tested. The four pairings were presented to the participant in one of four possible orders (conditions), which were included and counterbalanced to control for possible order effects of completing multiple trainings in the same session. At least three participants experienced the pairings in each of the four conditions, for a total of 13 participants in each group. Though there were technically eight possible orders for these four conditions, only four were deemed necessary to include due to the very different tasks being taught; because it is unlikely that learning a computer skill would have had an effect on the acquisition of a practical skill, or vice versa, it did not seem prudent to include additional conditions in which these tasks were interspersed. Please see Figure 6 for a flow chart illustrating the assignment process and Table 4 for a specific outline of each Groups' task-training pairings and the orders in which they were presented.

Once assigned to a group, participants were asked to complete the computer skills assessments and computer comfort survey described above. When these assessments were complete, each participant was exposed to the four training-task conditions to which they were assigned, which will took roughly 20-30 minutes each. Each training-task pairing consisted of a pretest during which the participant was asked to complete the task to the best of their ability without yet having been trained, training, and a posttest where the participant repeated the pretest after training occurred. Written directions for the practical skills were built in to the data sheets (see Appendices E and F) for those skills, while the directions for the software based skills were attached to the information packets given to the participants (see Appendices H and I). The participant was given five minutes to complete the pretest and the posttest, unless he or she decided to forfeit before the five minutes had elapsed; if that occurred, the participant stopped at the point he or she designated. Following the completion of each of the four training-task pairings, the participant was asked to evaluate the training and process using a social validity survey. Once this was completed the participant was done and free to go.

Training types.

Computer-based BST. Computer-based BST took place on a computer that contained instruction via voice-over, modeling of the skill via video of that skill being completed, rehearsal of the skill in the form of quiz questions of various formats (fill in the blank, ordering, multiple choice, etc.), and feedback on the correct answers to those questions.

In-person BST. In-person BST took place in-person, and the investigator followed the same instructional script as that spoken in the computer-based BST. Instruction was provided verbally by the researcher and visually via a Powerpoint® presentation, and then the same video model as used during the computer-based BST was shown. Quiz sheets were then provided with the same questions that were present in the computer-based BST; feedback given about the answers was also scripted and yoked to that provided via the computer for other participants. See Appendices J and K for examples of the training and feedback scripts.

Task types.

Practical skill 1 (PS1). Participants were taught to conduct a paired-choice preference assessment with edible items, in which the participant must learn to systematically pair prescribed combinations of edible items and present them to a confederate in the correct placement and order to assess preference rank for those items.

Practical skill 2 (PS2). Participants were taught to conduct an ABLA Level 4, in which the participant must learn to assess a confederate's discrimination abilities by presenting specific stimuli in a prescribed way and recording the responses of the confederate.

Software skill 1 (SS1). Participants were taught to enter a new individual into ABASE, for which a participant must learn to take a paper face sheet and enter the information from it into the correct area of the software system so that the entry can be edited later.

Software skill 2 (SS2). Participants were taught to enter a habilitation plan into ABASE, for which a participant must learn to enter an on-paper habilitation plan into the correct area of the software system so that the entry can be edited and utilized later.

Data Collection. Data on the computer skills assessments were collected by the researcher from the screen recordings produced for each participant. For all tests, speed and accuracy measures were recorded. Pretest and posttest data were collected via either screen recordings or video tapes of the participants' performance. Data sheets were prepared that outlined the steps in each of the tests, and data were recorded for each step that the participant was required to complete.

Data were collected on whether a step was completed correctly, incorrectly, or missed entirely. Additionally, extraneous actions were recorded. For the purposes of this study, an action was defined as any behavior that created a change in either the program, such as navigating through pages, bringing up menus, or saving progress, or the environment related to the assessment, such as packing stimuli in the correct orientation or providing the discriminative stimulus to the learner. The exception to this was typing; instead of recording each character typed, actions only included clicking on the entry field to make it available for use; the data were coded this way to control for typing errors, which were not a target in this study.

A correct action was coded when a participant completed a step completely and correctly, while an incorrect action was coded when a participant completed a step incorrectly or incompletely. A missed action was defined as any action that should have been completed in order to finish the task as assigned, but was forgotten or skipped by the participant altogether. An extraneous action was defined as any action that was competed that was not necessary to the completion of the task as assigned; examples could include repeating the same movement multiple times, navigating to incorrect places in the program, or completing unnecessary steps.

Data was analyzed visually using graphic depictions of the performance gains made across trainings. Patterns observed within conditions and within groups were identified and assessed. Some descriptive statistics, such as mean differences and Cohen's D effect sizes were calculated describe and compare the groups' performance (Keppel, G. & Wickens, T.D., 2004). Additionally, correlations between the computer-skills assessments and acquisition measures were analyzed visually using scatter plot graphs and numerically by calculating the correlation coefficients.

Inter-observer Agreement (IOA). IOA was collected for 37.5% of total sessions conducted, or 36 total sessions, nine from each of the four task assignments. Exact count per interval IOA was collected for correct, incorrect, and missed actions. Due to the nature of extraneous actions, total count IOA was utilized for this measure; as they can happen at any time and are not necessarily specifically related to a specific step of a task/interval, it was not possible to code them by interval. Totals were then calculated by adding the total number of interval agreements (correct, incorrect, and missed) to the total number of extraneous agreements and then dividing that sum by the sum of interval agreements, interval disagreements, extraneous agreements, and extraneous disagreements. This number was then multiplied by 100 to gain a percentage. IOA was 91% overall, ranging from 85% to 95% agreement across tasks. Within tasks, agreement ranged from 74% to 100%.

Program Integrity. Program integrity data were coded using a checklist that identified any instance in which any additional information was given to participants who received in-person BST when compared to the script used for computer-based BST. Program integrity data were collected for 42% of in-person trainings and during those sessions, the script was adhered to an average of 94% of the time. More specifically, the training script was followed 100% of the time, while the quiz feedback scripts were followed 88% of the time.

Results

Pre-Existing Skills.

Computer Comfort Survey. Participants' self-scores on the Computer Comfort Survey range from 72 to 105, or from 69% to 100%, with an average of 91%. Of the 26 participants included in the analysis, 19 of them gave themselves scores of 90% or better while six of the remaining seven participants rate themselves at 80% or better. The remaining participant self-scored at 72, or 69%. See Table 5 for a full account of the scores.

Typing Skills. Of the 24 participants for whom typing speed data are available, scores range from 23 to 89 words per minute (WPM), while the average typing speed of the group is 45.6 WPM. Though some participants scored at the high or low ends of the range, over half of the participants type between 30 and 50 WPM.

The variability observed in WPM scores is less apparent in the accuracy scores, which are available for 20 of the participants and range from 79% to 100%. Of those, 17 participants were over 90% accurate on their typing test. Of the remaining three participants, two were between 83 and 88% accurate, and a single participant was 79% accurate. See Table 5 for a full account of the typing scores.

Basic Computer Skills. Participants' scores on the "Basic Computer" skills test (https://www.digitalliteracyassessment.org) range from 83 to 100% correct, with an average of 92% correct for 25 participants. This test, which had 40 total questions/tasks, was completed in somewhere between 245 seconds (4 minutes and 5 seconds) and 464 seconds (7 minutes and 44 seconds), meaning participants were answering between 5 and 9 questions per minute during the assessment. See Table 5 for a full account of the scores and rate of completion of the "Basic Computer" skills test.

Windows Operating System Skills. Of the 25 participants who took the "Windows 7®" skills test (https://www.digitalliteracyassessment.org), only a single participant scored lower than 83%, earning a 59% correct. The remaining 24 participants scored at least 83%; 20 of them achieved scores above 90%, including three participants who earned perfect scores. The average accuracy score earned by the group is 91% when all participants are included in the analysis; this number increases to 93% when the single low outlier is removed. Time needed to complete this 29 question test ranged from 136 seconds (2 minutes and 16 seconds) to 360 seconds (6 minutes); participants were answering between 4 and 12 questions per minute of the assessment. See Table 5 for a full account of the scores and rate of completion of the "Windows 7®" skills test.

Individual Effects of Training.

Group 1. Thirteen total participants are included in Group 1. While data for all 13 participants are included in the analyses of the practical skill trainings, due to screen recording software failure, only 12 of these data sets are included in the analyses of the software task trainings. There are three data sets each in Conditions 1-3 (Figures 7-12), and four data sets in Condition 4 (Figures 13 and 14).

Condition 1. With the exception of Participant 6819, all participants demonstrated a greater proportion of correct actions out of total actions made following training for all four of the tasks they were taught, regardless of training type (Figure 7). Gains range from 0 to 72%, with an average gain of 41%. While Participant 6819 did engage in more correct actions during the preference assessment posttest (from 2 to 25 correct actions), he did not show improvement on the proportional measure due to a ceiling effect; 100% of the actions completed during the pretest were correct, leaving no room for improvement during the posttest.

Incorrect actions were observed during the pretest for all three participants when exposed to the ABLA and for two of the participants when exposed to the preference assessment (Figure 7). For these tasks, the percentage of completed actions that were incorrect decreased from pretest to posttest. Losses range from 7% to 72%, with an average loss of 16%.

With the exception of Participant 9785, all participants demonstrated a decrease in the proportion of extraneous actions out of total actions made for any task during which extraneous actions were made during the pretest (Figure 7). Losses range from 0 to 64%, with an average loss of 25%. The remaining participant, 9785, terminated the pretest early, performing only 8 total actions for the whole of the pretest, none of which were extraneous. As a result, the 3% of extraneous actions that occurred during the posttest amounts to a small gain.

With respect to accuracy and rate, all participants across all tasks performed with increased accuracy in less time following exposure to training, regardless of the type of training (Figure 8). Participants' accuracy increased an average of 34% following training, ranging from 9% up to 70%. Additionally, participants completed from 0.05 to 0.332 more correct actions per second, or from 3 to 19.95 more correct actions per minute after training. The average participant demonstrated a gain of 0.131 more correct actions per second, or 7.88 more correct actions per minute on the posttest.

*Condition 2***.** With the exception of Participant 3186, all participants demonstrated a greater proportion of correct actions out of total actions made following training for all four of the tasks they were taught, regardless of training type (Figure 9). Data range from a loss of 8% to a gain of 61%, with an average gain of 43%. The final participant, 3186, demonstrated a decrease in the percentage of total actions completed that were correct when learning how to perform the ABLA. When looking at the raw numbers, this participant did engage in more correct actions following the training on this task, from 17 correct actions during the pretest to 70 correct actions during the posttest. However, due to an accompanying increase in extraneous actions, the overall proportion of correct actions completed was less during the posttest than it was during the pretest, which accounts for the observed loss.

Incorrect actions were observed during the pretest for all three participants when exposed to the ABLA and the preference assessment, while only a single participant demonstrated any incorrect actions on the pretest for both the habilitation plan and the entry of a new focus person into ABASE (Figure 9). Where incorrect actions were observed, the percentage of completed actions that were incorrect decreased from pretest to posttest for all participants. Losses range from 9% to 51%, with an average loss of 16%.

With the exception of Participant 3186, all participants demonstrated a decrease in the proportion of extraneous actions out of total actions made from pretest to posttest (Figure 9). Data range from a gain of 9% to a loss of 57%, with an average loss of 27%. Participant 3186 engaged in more actions in general during the posttest (an increase from 23 to 107 total actions). During the posttest, more extraneous actions were completed (an increase from 4 to 28) along with the increase in opportunities, resulting in a greater proportion of the actions completed being extraneous during the posttest than during the pretest. As reported previously, this also affected the percent of total actions that were correct for this participant.

With respect to accuracy and rate, all participants performed with increased accuracy in less time following exposure to training, regardless of the type of training or the task being taught (Figure 10). Participants' accuracy increased an average of 38% following training, ranging from 14% up to 65%. Additionally, participants completed from 0.03 to 0.283 more correct actions per second, or from 1.8 to 17 more correct actions per minute after training. The average participant demonstrated a gain of 0.14 more correct actions per second, or 8.415 more correct actions per minute on the posttest.

Condition 3. All participants in Condition 3 completed a greater proportion of correct actions out of total actions following training across tasks and training types (Figure 11). Gains range from 7% to 75%, with an average gain of 36%.

Incorrect actions were observed during the pretest for all three participants when exposed to the ABLA and the preference assessment, and two of the three participants engaged in incorrect actions on the pretest prior to the ABASE habilitation plan training (Figure 11). Where incorrect actions were observed, the proportion of total completed actions that were incorrect decreased from pretest to posttest for all participants. Losses range from 3% to 50%, with an average loss of 11%.

All participants demonstrated a decrease in the proportion of extraneous actions out of total actions made from pretest to posttest (Figure 11). Losses range from 0 to 75%, with an average loss of 25%.

Additionally, all participants performed with increased accuracy at an increased rate following exposure to training, across tasks and training types (Figure 12). Participants' accuracy increased an average of 36% following training, ranging from 13% up to 84%. Additionally, participants completed from 0.044 to 0.243 more correct actions per second, or from 2.64 to 14.6 more correct actions per minute after training. The average participant demonstrated a gain of 0.141 more correct actions per second, or 8.453 more correct actions per minute on the posttest.

Condition 4. With the exception of Participant 4664, all participants demonstrated a greater proportion of correct actions out of total actions made following training for all four of the tasks they were taught, regardless of training type (Figure 13). Gains range from 0 to 89%, with an average gain of 39%. While Participant 4664 did engage in more correct actions during the posttest on the preference assessment (from 20 to 64 correct actions), he did not show improvement on the proportional measure due to a ceiling effect; 100% of the actions completed during the pretest were correct, leaving no room for improvement during the posttest.

Incorrect actions were observed during the pretest for all three participants when exposed to the ABLA and the preference assessment, while only a single participant demonstrated any incorrect actions on the pretest for both the habilitation plan and the entry of a new focus person into ABASE (Figure 13). Where incorrect actions were observed, the percentage of completed actions that were incorrect either decreased or remained stable from pretest to posttest for all participants with the exception of Participant 1173, who engaged in a greater number (from 17 to 24 incorrect actions) and proportion of incorrect actions during the posttest. The average participant engaged in10% less incorrect actions following training, with an overall range spanning a gain of 3% to a 61% loss from pre- to posttest.

All participants in Condition 4 demonstrated a decrease in the proportion of extraneous actions out of total actions made from pretest to posttest (Figure 13). The average participant engaged in 29% less extraneous actions during the posttest, with a range of 4% to 83% loss following training.

With respect to accuracy and rate, all by Participant 1173 performed with increased accuracy in less time following exposure to training, regardless of the type of training or the task being taught (Figure 10). In contrast, Participant 1173 performed slightly less accurately (a 4% decrease) at a slightly decreased rate (0.003 less responses per second) during the posttest, essentially performing at the same level for both tests. Overall, participants' accuracy increased an average of 36% following training, ranging from a loss of 4% up to a gain of 69%. Participants completed from 0.003 less to 0.317 more correct actions per second, or from .18 less to 19 more correct actions per minute after training. The average participant demonstrated a gain of 0.164 more correct actions per second, or 9.83 more correct actions per minute on the posttest.

Group 2. Thirteen total participants are included in Group 2. For this group there were no data collection failures, so there are full sets of data for each participant. There are three data sets each in Conditions 1, 3, and 4 (Figures 15-16 and 19-22), and four data sets in Condition 2 (Figures 17 and 18).

*Condition 1***.** All participants except Participant 1066 demonstrated a greater proportion of correct actions out of total actions made following training for all four of the tasks they were taught across training types (Figure 15). Data ranges from a loss of 20% to a gain of 80%, with an average gain of 43%. Participant 1066 did not show improvement on this measure from pre- to posttest when learning to enter a new focus person into ABASE; he engaged in only one more correct action during the posttest (from 30 to 31 correct actions) while engaging in many more extraneous actions (from 8 to 21 extraneous actions), which increased the total number of actions he made while decreasing the proportion of them that were correct.

Incorrect actions were observed during the pretest for all three participants when exposed to the ABLA and the preference assessment and for a single participant when learning to enter a new focus person into ABASE (Figure 15). For these tasks, the percentage of completed actions that were incorrect decreased from pretest to posttest. Losses range from 0 to 47%, with an average loss of 17%.

With the exception of Participant 1066, participants demonstrated a decrease in the proportion of extraneous actions out of total actions made for any task during which extraneous actions were made during the pretest (Figure 15). Observed changes in this measure across participants range from a gain of 20% to a loss of 80% of observed extraneous actions, with an average loss of 26%. The remaining participant, 1066, engaged in more extraneous actions during the posttest for two of the tasks, the ABLA (from 8 to 32 extraneous actions) and the entry of a new focus person into ABASE, as described previously.

With respect to accuracy and rate, two of three participants performed with increased accuracy in less time following exposure to training, regardless of the type of training or the task being taught (Figure 16). Participant 1066 demonstrated a small loss in accuracy while also failing to demonstrate an increase in the rate of correct actions following training on entering a new focus person into ABASE; accuracy decreased from 56% to 54% correct and the rate of correct responses per second remained static at 0.103. Overall, participants' accuracy increased an average of 35% following training, ranging from a 2% loss up to a 68% gain. Additionally, participants completed from 0 to 0.213 more correct actions per second, or from 0 to 12.8 more correct actions per minute after training. The average participant demonstrated a gain of 0.116 more correct actions per second, or 6.941 more correct actions per minute on the posttest.

Condition 2. Three of four participants demonstrated a greater proportion of correct actions out of total actions made following training for all four of the tasks they were taught, regardless of training type (Figure 17). For the group, data range from a loss of 14% to a gain of 80%, with an average gain of 46%. The final participant, 7411, demonstrated a decrease in the percentage of total actions completed that were correct when learning how enter a new focus person into ABASE. This participant did engage in more correct actions following the training on this task, from 30 correct actions during the pretest to 38 correct actions during the posttest, but due to an accompanying increase in extraneous actions, the overall proportion of correct actions completed was less during the posttest than it was during the pretest, which accounts for the observed loss.

Incorrect actions were observed during the pretest for all three participants when exposed to the ABLA and the preference assessment (Figure 17). Where incorrect actions were observed, the percentage of completed actions that were incorrect decreased from pretest to posttest for all participants. Losses range from 0 to 47%, with an average loss of 17%.

As discussed previously, Participant 7411 demonstrated an increase in both the number (4 to 13) and the proportion (12% to 25%) of extraneous actions during the posttest for new focus person entry into ABASE. Participant 3220 also demonstrated very small increase in the proportion of extraneous actions following preference assessment training, from 11% to 12%. The participants demonstrated a decrease in the proportion of extraneous actions out of total actions made from pretest to posttest on the remaining tasks taught (Figure 17). Data range from a gain of 14% to a loss of 80%, with an average loss of 26%.

With respect to accuracy and rate, all participants performed with increased accuracy in less time following exposure to training, regardless of the type of training or the task being taught (Figure 18). Participants' accuracy increased an average of 35% following training, ranging from 12% up to 64%. Additionally, the average participant demonstrated a gain of 0.152 more correct actions per second, or 9.14 more correct actions per minute on the posttest. Participants completed from 0.026 to 0.32 more correct actions per second, or from 1.56 to 19.2 more correct actions per minute after receiving training.

Condition 3. All participants in Condition 3 completed a greater proportion of correct actions out of total actions following training regardless of task or training type (Figure 19). Gains range from 1% to 75%, with an average gain of 37%.

Incorrect actions were observed during the pretest for all three participants when exposed to the ABLA and the preference assessment (Figure 19). Where incorrect actions were observed, the proportion of total completed actions that were incorrect decreased from pretest to posttest for all participants. Losses range from 0 to 68%, with an average loss of 15%.

All participants demonstrated a decrease in the proportion of extraneous actions out of total actions made from pretest to posttest (Figure 19). Losses range from 5% to 68%, with an average loss of 22%.

Participants performed with increased accuracy at an increased rate following exposure to training, with the exception of Participants 4957 and 5915, who each demonstrated an improved rate of correct responding but whose accuracy did not improve on a single training each (Figure 20). Participant 4957 was 100% accurate when entering a new habilitation plan into ABASE during the pretest, which left no room for improvement with respect to accuracy. Participant 5915 did technically perform more accurately during the posttest, engaging in one more correct action (from 29 correct actions during the pretest to 30 correct actions during the posttest), but this was not enough improvement to affect the overall accuracy percentage, which remained at 53% for both opportunities. Overall, participants' accuracy increased an average of 32%

following training, ranging from 0 up to 73%. Additionally, participants completed from 0.003 to 0.393 more correct actions per second, or from 0.18 to 23.58 more correct actions per minute after training. The average participant demonstrated a gain of 0.148 more correct actions per second, or 8.891 more correct actions per minute on the posttest.

Condition 4. With the exception of Participant 1553, all participants demonstrated a greater proportion of correct actions out of total actions made following training for all four of the tasks they were taught, regardless of training type (Figure 21). Participant 1553 demonstrated a decrease in this measure when trained on the preference assessment; while he did engage in many more correct actions during the posttest (from 2 to 22), the actions he engaged in during the pretest were both correct, creating a ceiling from which he could not improve during the posttest. For the group, data range from a loss of 21% to a gain of 81%, with an average gain of 44%.

Incorrect actions were observed during the pretest for all three participants when exposed to the ABLA and the preference assessment and for a single participant each during the pretests for both the habilitation plan and the entry of a new focus person into ABASE (Figure 21). Where incorrect actions were observed, the percentage of completed actions that were incorrect either decreased for all participants with the exception of Participant 1553, who engaged in a greater proportion of incorrect actions during the posttest for both the preference assessment and the ABLA. In both posttests, Participant 1553 engaged in many more actions, both correct and incorrect, during the posttest than during the pretest, which affected the proportion of incorrect actions to total actions made. With respect to the group, the average participant engaged in 13% less incorrect actions following training, with an overall range spanning from a gain of 21% to a 55% loss from pre- to posttest.

All participants in Condition 4 demonstrated either stability or a decrease in the proportion of extraneous actions out of total actions made from pretest to posttest (Figure 21). The average participant engaged in 31% less extraneous actions during the posttest, with a range of 0 to 75% loss following training.

With respect to accuracy and rate, all participants performed with increased accuracy in less time following exposure to training, regardless of the type of training or the task being taught (Figure 22). Overall, participants' accuracy increased an average of 37% following training, ranging a gain of 10% up to 74% during the posttest. Additionally, participants completed from 0.023 less to 0.389 more correct actions per second, or from 1.38 to 23.34 more correct actions per minute after training. The average participant demonstrated a gain of 0.146 more correct actions per second, or 8.78 more correct actions per minute on the posttest.

Momentary Analysis. Condition 3 from both Group 1 and Group 2 were coded by minute as well, as a sample of change over time. With respect to percent correct, gains are greater and faster for each participant during the posttests, which is visually depicted via a line with a steeper slope (Figure 23). When looking at the rate of correct actions per second, improvement is observed from the beginning of the posttest, suggesting that participants performed more quickly from the onset of the posttest than they did during the pretest (Figure 24).

Computer-Based BST Versus In-Person BST.

ABLA. The average gains and losses observed across all measures were similar for both training types (Figure 25). The scores on the ABLA pretest differ an average of 6.75% across training types. The pretest measure for incorrect actions was the least similar across groups, where a maximum difference of 14% was observed. Following training, the scores obtained by the participants were similarly alike, differing an average of only 1.5% across measures and between training types. Overall average gains and losses (the difference in the measures from pretest to posttest) were similar across measures, as well, ranging from a 3% to 13% difference between the two training modalities (Table 6). The standard deviation of both accuracy and rate is similar across groups, as well; 16% and 0.07 for in-person training as compared to 17% and 0.09 for computer-based training. Additionally, effect sizes as measured by Cohen's D show that computer-based training has no effect on the accuracy or rate of correct responding, small positive effects on the proportion of correct actions gained and extraneous actions lost, and a medium positive effect on incorrect actions lost (Table 7).

Preference Assessment. For both training delivery methods tested, the average pretest and posttest scores across measures were similar (Figure 26). The scores on the preference assessment pretest show an average difference of 5.5% and no more than a 9% difference between training types. Posttest scores earned by the participants were also similar, differing an average of only 3% across measures and between training types. Overall average gains and losses were small, ranging from a 2% to 5% difference between the two training types (Table 6). The standard deviation of both accuracy and rate is similar across groups; 9% and 0.059 for in-person training as compared to 9% and

0.063 for computer-based training. Also, effect sizes as measured by Cohen's D show that delivering training via the computer has no effect on the proportion of correct actions gained or extraneous actions lost and small positive effects on the remaining measures (Table 7).

ABASE New Entry. For both training types, the average pretest and posttest scores across measures differ no more than 7% (Figure 27). The scores on the ABASE new entry pretest show an average difference of 3.3% between training types across measures. The difference between the posttest scores for the tested training modalities maxes out at 6% and averages 4.667% across measures. Changes observed in the average gains or losses observed following training range from a 1% to an 8% difference between the two training types (Table 6). The standard deviation of both accuracy and rate are almost identical across groups; 13% and 0.025 for in-person training as compared to 13% and 0.024 for computer-based training. Effect sizes as measured by Cohen's D show that delivering computer-based BST has no effect on the proportion of incorrect actions lost and small effects on the remaining measures (Table 7).

ABASE Habilitation Plan. Again, the average pretest and posttest scores across measures differ very little between training delivery methods (Figure 28). The scores on the ABASE habilitation plan entry pretest show an average difference of 3% between training types across measures, ranging from 2% to 4%. The average difference between the posttest scores for the tested training types is just 2.25% across measures. Additionally, the average gains or losses observed between computer-based and in-person training of the ABASE habilitation plan entry range from 2% to 9% (Table 6). The standard deviation of both accuracy and rate is similar across groups, as well; 16%

and 0.031 for in-person training as compared to 19% and 0.03 for computer-based training. Finally, effect sizes as measured by Cohen's D show that delivering the training on the ABASE habilitation plan entry via the computer has no effect on gains in accuracy, a small effect on the proportion of correct actions gained, rate of correct actions, and a medium effect on the proportion of extraneous actions made and incorrect actions lost (Table 7).

Averaged Momentary Analysis. When grouped by averages per minute, the momentary data generated for Condition 3 from both groups further support minimal change with respect to the delivery method used for training. There is little separation or differentiation observed for either percent correct or rate of correct actions per second (Figure 29).

Power Analysis. Calculations regarding power for accuracy and rate measures suggest that the study would require between 256 and 3276 participants to attain power measures of at least .90, reducing the risk of making a Type II error to 10% or less. With the much smaller number or participants included in this study, calculations of statistical power were very low, ranging from 0.059 to 0.17. See Table 8 for a full report of power and sample size calculations.

Order Effects.

When looking at the average gains in accuracy and rate from pretest to posttest for the practical skills (Figure 30), participants improved more on both skills taught when the in-person training was offered before the computer-based BST. In contrast, if computer-based BST was offered first, than the gains on both trainings decreased. This pattern holds regardless of which skill is taught in-person; whether teaching the preference assessment or the ABLA, when the participant is exposed to the in-person training first, he or she will likely do better during the subsequent computer-based training, as well. The difference in accuracy gains for these skills range from 3% to 10% while the increased rate ranges from 0.012 to 0.048 more correct actions per second.

When looking at the same gains for the software skills (Figure 31), participants improved more on a skill when it was presented first, regardless of whether that skill was taught via computer-based BST or in-person BST. This pattern was observed in both groups across training types. For these skills, the difference in accuracy gains range from 4% to 14% while the increased rate ranges from 0.004 to 0.027 more correct actions per second.

Observed Correlations.

Correlation coefficients were calculated to identify any possibly significant relationships between scores obtained by participants on measures of computer literacy and proficiency and learning observed, as measured by the changes in measures from pretest to posttest. In general, any coefficient at or above 0.5 or at or below -0.5 warrants further investigation (Hanna & Dempster, 2012, p. 166), so that is the criteria used here. Any relationship with a coefficient that met these criteria was also graphed to allow for a visual inspection of the data, as well.

Group 1. For participants who received computer-based training on conducting a preference assessment, there are positive correlations between improvements in accuracy and rate of correct actions completed and both typing accuracy and Windows® operating system use skills, as well as a negative correlation between these measures the rate at which the Windows® operating system test was completed (Figure 32). For participants who were trained to enter a new focus person into ABASE via a computer, there are positive correlations between improvements in accuracy and rate and general computer skills (Figure 33).

Fewer correlations were observed for the in-person trainings completed by the participants of Group 1. For those who received the in-person training on the ABLA, negative correlations were observed between the proportion of correct actions completed and both words typed per minute and the score obtained on the Windows operating system skills assessment. Additionally, there were positive correlations between gains in both accuracy and rate of correct responding and the time in seconds that it took to complete the Windows skills test (Figure 34). No correlations were observed between any of the acquisition measures and computer proficiency measures of those who received in-person training on entering a habilitation plan into ABASE. A full report of the correlation coefficients observed for Group 1 can be found in Table 9.

Group 2. For participants who received computer-based training on conducting an ABLA, there are positive correlations between improvements in accuracy and rate of correct actions completed and general computer skills, as well as a negative correlation between these measures the rate at which the Windows® operating system test was completed. Additionally, there are negative correlations between the proportion of correct actions made and the rate of completion of both the general computer skills and Windows operating system skills assessments (Figure 35). For participants who were trained to enter a habilitation plan into ABASE via a computer, first, there is a negative correlation between the proportion of correct actions made and typing speed. Second, there are negative correlations between accuracy and both typing speed and accuracy on the computer skills test and positive correlations between accuracy and the rate of completion of both the general computer skills and Windows operating system skills assessments. Finally, there is a positive correlation between changes in the rate of correct actions made and general computer skills and a negative correlation between this measure and the rate of completion of both the general computer skills and Windows operating system skills assessments (Figures 36 & 37).

Only one correlation was observed for the in-person trainings completed by the participants of Group 1. For those who received the in-person training on the administration of a preference assessment, a negative correlation was observed between the proportion of correct actions completed and words typed per minute (Figure 38). No correlations were observed between any of the acquisition measures and computer proficiency measures of those who received in-person training on entering a new focus person into ABASE. A full report of the correlation coefficients observed for Group 2 can be found in Table 10.

Cost Analysis.

A cost analysis was completed where the cost of computer-based BST was compared to the cost of in-person BST for a small business (100 employees), a medium business (1000 employees), and a large business (10,000 employees). Additionally, these comparisons were calculated with respect to a short training (one half hour) and a long training (two full hours). For this analysis, the following assumptions were made: An in-person training took 5x the training administration time to develop while a computer-based training took 10x the administration time to develop, the trainer was paid $100/hr, the employees were paid $10/hr, the organization makes $20/hr for each hour of work completed by each employee, all employees would be trained initially, training groups were a maximum of 33 people, and 33% of employees would need to be trained/re-trained each quarter. For a short training over a 3-year administration, an organization would save between $451 and $15,451, depending on the size of the business. For a long training over a 3-year administration, an organization would save between $1,806 and $61,806, depending on the size of the business. See Table 11 for a full comparison of these costs.

Social Validity.

All participants completed social validity surveys for each of the four modules to which they were exposed, which means that a total of 104 social validity surveys are included in this analysis. When rated on a scale of one to five, one being unnecessary to acquisition and five being necessary to acquisition, all of the components of training (instruction, modeling, quizzing, and feedback), regardless of the skill taught or the delivery type, were considered on average to be between somewhat helpful and necessary (range of 3.556 to 4.679) (Table 10).

Comfort with the task after training was evaluated using a four-point scale, ranging from not comfortable (one) to very comfortable (four). The average participant would be comfortable both completing the trained task again as part of his or her job with minimal mistakes and training another person to complete the task (range of 2.824 to 3.395). Ratings on capability to make few mistakes and train the skill to others were slightly lower for the practical skills when compared to the same average ratings for the software-based skills (Table 12).

When asked to evaluate the difficulty of each skill, 89 surveys, or 87%, rated the tasks either “easy” or “somewhat difficult”. When analyzed by training type, participants rated tasks taught via a computer at basically the same level as tasks taught in person, with 24 ratings each for “easy” and 21 and 20 ratings for “somewhat difficult”, respectively. While there is no difference between the perceived difficulty of the tasks related to the training modality, participants did rate the practical skills as generally more difficult than the software based skills; the practical skills were rated as “easy” 15 times and “somewhat difficult” 26 times, while the software skills were rated as “easy” 33 times and “somewhat difficult” 15 times. Additionally, trainings on the practical skills were the only ones that were rated by any participant as “very difficult” to complete (Table 12).

When asked what supplemental materials they felt would improve outcomes on these trainings, 46% said that a chance to interact with the task as part of the training, rather than just during the testing, would be helpful. An additional 29% felt that the ability to ask and have questions answered would be helpful, and 15% felt that being required to answer the quiz questions correctly before moving on would be beneficial. Only a few people (5% each) felt that a written manual or more quiz questions would make the training easier (Table 12).

Overall, 91% of the participants viewed the trainings favorably. Computer-based trainings and in-person trainings were perceived equitably, with 46 ratings each, or 90%, stating that they liked each training type. This is true for each task taught as well; between 22 and 24 participants (or 88% and 96%) stated that they liked the training for each task regardless of the type of training that was employed. However, while the participants liked both trainings, more surveys stated that they would have preferred an in-person training (61) than a computer-based training (41). This opinion is particularly true for practical skills, for which 66% of raters would have preferred in-person to computer-based BST (Table 12).

Discussion

The data presented here provide additional support for the conclusion that in-person and computer-based BST can be equally effective, and could remain so even when employed to teach very different skills (Nosik, 2010; Nosik & Williams, 2011; Nosik, Williams, Garrido, & Lee, 2013). Though research has been conducted on many possible components of computer-based training and their utility, this study demonstrates that a simple computer-based BST containing only the few basic components that have been subjected to enough research to be considered best practice (scripted instruction, audio narration, practice items that evoke overt responses, the addition of visuals and graphics) functions as an effective training tool and fosters acquisition in trainees (Johnson & Rubin, 2011).

Looking at the single-subject data, especially when focusing on the overall accuracy and rate of correct actions made as the most significant indicators of learning from pretest to posttest, it is clear that learning occurred for most participants following training. Of the four separate trainings that each of 13 participants per group were exposed to, equaling a grand total of 104 skills taught to 26 people, only three participants failed to perform both more quickly and more accurately following training, meaning that 101 of the 104 trainings administered, or 98%, improved performance on a variety of skills across both tested delivery methods.

Each of the participants whose averages failed to show improvement from pretest to posttest, Participant 1066, Participant 5915, and Participant 1173, failed to demonstrate learning on only a single task, rather than all four tasks to which they were exposed. Further, they each failed to demonstrate learning on the same task, entering a new focus person into ABASE, even though this task was presented via two different training types. While this may be the fault of the training, it is possible that this failure to improve is due less to training inadequacy than it is to the task and how it was measured. Entering a new focus person into ABASE does not require much navigating within the software program, meaning that if an individual happens to navigate to the correct entry form without making many mistakes initially, then the majority of the pretest time can be spent entering the focus person's data into the program. Additionally, as much of this task is simply typing personal information into a form, and typing speed is unlikely to improve for any given participant from pretest to posttest, the only way to gain time and improve accuracy and rate of responding by completing more actions correctly overall during the assessment period would be to spend less time initially navigating to the entry form. It may be then that these participants did not demonstrate improvement not because the training was ineffective, but because they performed as well as they could have during the pretest, leaving themselves no room to improve. It is also possible that the pre-post data may not be sensitive enough to detect changes on this task. The momentary data sample generated for Participant 5915 suggests that there was some improvement from pretest to posttest that was masked by averaging; the participant performed a greater number of correct actions more quickly during the posttest (Figures 23 & 24).It is possible that the remaining two participants who did not show improvement via the pre-post data would have demonstrated learning in this way, as well. Keeping this in mind, future studies of this kind might benefit from a more expansive use of by-minute data display, increasing the sensitivity of the measures and allowing for more in-depth analysis.

The group data bear this conclusion, as well. The average pretest scores on each reported measure are roughly the same across groups, suggesting that the groups were fairly homogenous prior to training and that, as a result, any observed differences between the posttest scores would be due to the training type and not selection bias. That said, the observed differences are minimal; for each of the four skills introduced to participants, the pretest to posttest change for both in-person and computer-based BST are nearly identical (Figures 25-28). When focusing specifically on accuracy and rate changes, the average gains and losses for all four tasks taught differed by no more than 5% across training modalities, meaning that the average participant will show about the same amount of acquisition relative to their pre-test score regardless of whether the participant was exposed to training via an instructor or a computer. Additionally, the standard deviation of the accuracy and rate scores obtained for each training type and task range from 9% to 19% overall, with no more than 3% difference between training types within any single task. As it has been established that the means across groups are similar, these low standard deviations suggest that the data in general are grouped closely to those means; there are few if any outliers and most of the participants performed similarly across training types and tasks. Were there differences in the effectiveness of the training delivery methods, you would expect differences between the means, measures of standard deviation that suggest more spread among the data following certain training types, or both, but neither of these circumstances are observed here.

Taking into account the size and distribution of effect sizes also suggests that the training types are fairly equally effective across tasks, at least to the degree that they produce similar outcomes. Using the standard evaluation criteria for effect size using Cohen's D described above, 18 out of 20 of the comparisons for which this measure was calculated show that computer-based BST has either a small effect (11) or no effect at all (6) when compared to the same outcomes following in-person BST for the tested tasks. There are only three measures, incorrect actions for the ABLA and incorrect and extraneous actions made when entering a new habilitation plan into ABASE, that suggest that computer-based BST has a medium effect, and no measures for which a large effect is observed. Additionally, there does not seem to be any pattern in the effect sizes (particularly the only two medium effects) related to the task type specifically. Instead, the effects are equally distributed across the practical and computer-based skills. For example, if you look at the eight accuracy and rate comparisons, half of them suggest that computer-based BST has a small effect on outcomes; however, these effects are present not in either the practical skills or the software-based skills, but instead in one of each. This suggests that there may be other, unspecified and untested variables affecting these effect sizes besides whether the task being taught is practical or software-based, such as the number of conditional discriminations required to do it correctly or how often participants engaged in orienting responses to the task and/or training. Based on these data, there may be some small differences in outcomes following computer-based BST. Practically though, any effect of using a computer-based BST would likely be small;

depending on the skill being trained, the difference in outcomes would be functionally the same and/or negated by the cost-savings that an organization would benefit from when utilizing computer-based training (Table 10).

It is possible that not all the observed effects were due only to the training; there is some evidence that the order in which the trainings and/or tasks are presented has a small effect on outcomes, as well. With respect to practical skills, having been exposed to an in-person BST first seems to slightly improve outcomes on any following computer-based BST; these data show an improvement in the performance of whichever practical skill was taught via computer-based BST when it was presented after in-person training, as compared to those who were exposed to the computer-based BST first. This relationship was not observed when analyzing the order effects of different training types on the acquisition of software skills, however. In the latter case, rather than exposure to in-person training being predictive of better outcomes following computer-based BST, participants improved more on the skill that was taught first, regardless of which training modality was used to teach that skill.

There are a few components that could be contributing to this difference. First, if a participant has never been exposed to BST before, an initial exposure in-person may be more effective at orienting learners to the components of the training, especially if learners attend more to a live person than a disembodied voice and/or the teacher's presentation of the instruction is altered in some way beneficial to the learner by non-vocal communication occurring between the learner and the teacher. Whether this is the case probably has to with a combination of the histories of the learner as a listener and audience member and the teacher as a speaker. In *Verbal Behavior (1957),* Skinner notes that an audience serves several functions, including as a discriminative stimulus and a conditioned reinforcer and/or punisher for the behavior of the speaker; responses on the part of the audience, such as eye contact, note-taking, or other indicators of engagement and/or enjoyment shape the behavior of the speaker (pp. 172-175). In the case of live BST, audience behavior has the opportunity to shape the speaker's behavior, making the training more responsive to the learner's needs and maybe even more effective. It is possible that exposing someone to in-person training first shapes their behavior as a listener and consumer of BST, skills which then generalize to subsequent experiences with BST, even if those experiences occur via a computer rather than a teacher. However, it seems that this priming may only be effective with certain types of tasks and/or tasks with certain characteristics, as this effect was only present for the trainings teaching practical skills. For the software task training, data indicate that the order effects observed have less to do with the type of training that was utilized and more to do with exposure to the program; participants performed better on the task they were taught second as a result of having already been exposed to the software during the first training. This exposure allowed the participants to contact different parts of the program as well as how to navigate through and utilize particular components of ABASE that would generalize across the two skills taught, leading to better pretest scores, and less overall gain, on the measures taken during the second task.

It is unclear from these data whether or not the pattern noted for the software-skill trainings would emerge if a participant were taught software skills from two independent, novel software programs rather than a single program. Additionally, the practical skills taught in this preparation do not share many stimuli, and as such, learning to administer one of these assessments may not lead to the acquisition of skills that would generalize to the second assessment that was taught. While both are trial-based assessments that are conducted with a single individual and involve the use of edible items, they are otherwise very different. The ABLA is a skill assessment, while a preference assessment aims not to evaluate skills but identify stimuli that might function as reinforcers. As a result, the ABLA requires the participant to make many more conditional discriminations in order to run it correctly (i.e. "If the individual answers incorrectly, I will need to conduct a correction trial," or "If the individual answers correctly, I will need to put a check in the test trial column in the correct box"), whereas the preference assessment trials are presented in the same way regardless of how the individual responds to the edible stimuli. It is possible that the positive effect of exposure to in-person training first would be negated if the practical tasks being taught were more similar, like two levels of the ABLA or a paired choice and a multiple-stimulus preference assessment. This could allow for more generalization across trainings and lead to a pattern similar to the one observed here for software skills, where more improvement is observed in the task presented first. While it would be useful to conduct research on these variables and identify specifically which task characteristics affect order effects in what ways, the very small differences seen in the data related to order of exposure are not big enough to contradict the overall effectiveness of both computer-based and in-person BST.

While the data indicate that both tested training types are effective to some degree, the results with respect to the correlation of outcome measures to pre-existing computer skills are less clear. Overall, outcomes following computer-based BST are more frequently and highly correlated to outcomes measures than those same measures following in-person training. Of the 28 calculated correlation coefficients that were found to be significant, 22 of them occurred following computer-based training, and 19 of those occurred between computer proficiency scores and accuracy and/or rate of correct actions completed. Correlations are not present to the same degree for software skills unless those skills were taught via computer-based training; in fact, the outcome measures for the two software skills that were taught in-person were not significantly correlated with any of the computer proficiency measures. These data suggest that computer proficiency does have an effect on outcomes when a skill is taught via a computer, regardless of whether that skill is itself computer-based (software) or not (practical). However, it is less clear what measures of computer proficiency specifically might be predictive of this effect; there is no discernable pattern related to either task or training type for which computer proficiency scores are correlated with which outcomes. Some of the computer proficiency measures collected are more frequently correlated with outcomes following computer-based training, such as percent correct on the "Basic Computer" test (https://www.digitalliteracyassessment.org), which is correlated with 50% of the outcomes, or the rate of completion in seconds of the "Windows 7®" test (https://www.digitalliteracyassessment.org), which is correlated with 42% of the outcomes. Though these measures are frequently correlated, the available information does not allow for a hypothesis to be made as to why; this analysis was not molecular enough to allow for the identification of the relevant component(s) that could aid in the predictability of these correlations. It is also possible that the proficiency measures used in this preparation are insufficient as well; given a goal of identifying proficiency measures that are or could be predictive of learning outcomes following different types of training, more sensitive measures of computer-use skills would be necessary.

Besides those already discussed, there are some additional limitations to this study and, as a result, its findings. First, the population sampled for this study was primarily college students, most of whom were between the ages of 18 and 25. Also, the size of the sample, while larger than most single-subject designs, is fairly small when taking into consideration the group measures and descriptive statistics that were used to describe them. This small sample size has several effects. First, there was likely less variability in computer proficiency in the sample than would be present in the general population, which could significantly affect calculated correlations between computer proficiency and outcomes, as it is difficult to identify correlations when there is little to no variability between measures. However, it is unlikely that an addition of more varied participants would negate the correlations identified in these data; other correlations may be identified, some of the existing correlations could be strengthened, and the data could become more orderly as a result, but the finding that computer proficiency is related to outcomes following computer-based BST would remain true. Second, such a narrow, small sample affects the generalizability of the findings; it is possible that the training delivery types would not have been as equally effective had the sample population been more diverse. However, practically, the utilization of this age group makes sense because these are the individuals who are going to make up the next generation of workers; while generalizability to the current population may be negatively affected, generalizability to the current and future populations that will be more frequently contacting computer-based training systems should be fairly widespread. Also, the very small differences found across group measures as well as the absence of many outliers confirmed by the small calculated standard deviations of those groups suggest that the findings would have been similar even with a larger sample. Had the obtained sample been highly variable, then the argument could be made that a larger sample would be needed to fill in gaps in the data and draw an informed conclusion, but these data do not suggest that this is necessary. Finally, the small sample sizes led to a study that has little to no statistical power, meaning that if there is a difference between these two groups, it is unlikely to be detected; the likelihood of making a Type II error (failure to reject the null hypothesis) is very high. This study attempted to address this issue by utilizing a single-subject design over many replications in addition to descriptive statistics, but a replication with more participants and, therefore greater power, would be a welcome addition to the growing literature in this area.

It is also of note that while both of the tested training types led almost universally to gains following training, suggesting that both trainings effectively foster acquisition, it is unclear whether or not these trainings led to enough improvement that the skills taught could be considered mastered. This preparation required a fixed amount of time be provided for the pretest and posttest, so many participants' failure to finish the task could have been due simply to time constraints. Future research could address this issue by providing enough time for participants to finish the tasks they are taught, allowing researchers to investigate whether the improvements observed here would extend through the completion of the task. If these training preparations do produce participants who can successfully engage in the tasks they were taught, then the trainings can be considered appropriate. However, if not, then researchers could help to identify additional components, such as providing supplemental written materials or having a subject matter expert available to answer questions, that would improve outcomes and increase the chances that a given participant will master the skill being trained.

Future research could aim to improve upon this preparation in a number of other ways, as well. First of all, replications with a variety of other task types would be beneficial in helping to identify which, if any, characteristics of the task being learned are related to observed order effects, outcomes following training, or correlations between outcomes and computer proficiency. Such replications would need to take into account the complexity of the skills taught in terms of the discriminations that need to be made in order to complete the task correctly; as previously discussed, as task like the ABLA, which requires the administrator to make multiple conditional discriminations, is inherently more complex than tasks like the PA, which does not require the administrator to behave with respect to any if-then relations. Additionally, direct comparisons of different and possibly more sensitive computer proficiency measures and how each directly correlates with outcomes could aid in the identification of pre-training assessments with predictive utility that could be administered prior to training. Again, a larger, more representative sample could be used to verify that the conclusions supported by these data generalize to more diverse populations. Additionally, a large enough sample could allow for a more in-depth, possibly inferential, statistical analysis, providing more information on whether or not there is a significant difference in outcomes following either in-person or computer-based BST. Finally, while this study focused on comparing trainings that had the exact same content in an attempt to avoid confounds, comparing the two trainings presented more naturally (repeated exposure to computer-based BST if desired, the ability to ask questions in in-person BST, etc.) would be a valuable next step in evaluating the usefulness of each.

Conclusion

Behavior Skills Training is one of the most effective technologies available for helping people learn new skills. However, effectiveness does not always lead directly to wide application. While there are likely many reasons for this, one of the more significant of these is the cost of providing in-person training, especially as compared to the generally lower cost of presenting the same information via a computer (Table 10). Until now, very little research has been done on using computer to administer BST, and that which has been done did not take into account either the pre-existing computer skills of the learners or the characteristics of the task being taught.

In analyzing acquisition with respect to task and training type, this study has not only replicated previous studies which concluded that computer-based BST is indeed effective, but has extended them by running multiple replications across tasks. In doing so, the data support the supposition that not only is computer-based BST effective, but may be as effective as in-person BST when each is presented with the same information and components. Additionally, this remains true even when the tasks being trained are very different from each other. Finally, those who take these trainings overwhelmingly report that they not only like them but feel as though they can capably complete the skill following training, suggesting that computer-based BST may bolster buy-in to both the training delivery method and the task/skill being added to the employee's repertoire (Delprato, 2002; Wagner & Flannery, 2004).

Taken as a whole, these findings demonstrate empirically that computer-based BST could be a viable option to any organization that wants to provide high quality training while keeping costs relatively low. This provides a foundation from which Behavior Analysis can prove itself useful in organizations and industries that have yet to apply behavioral techniques to their day-to-day practices. Using technology, Behavior Analysts can develop effective, affordable staff trainings while simultaneously highlighting the broad usefulness of the study of human behavior in a business setting.

This study has also produced preliminary data suggesting that a learner's history with respect to computers could affect his or her ability to learn to complete a task via computer-based BST, and that this remains true whether the task being taught is a software-based skill or a practical skill. Though more research is needed to specify which measures of computer proficiency might be predictive of possible training difficulties, it was previously unknown that such an analysis might even be valuable. As such, these data open up an avenue of research for which the goal would be to identify any measures for or components of computer proficiency that predict acquisition following computer-based training.

In 1968, Skinner wrote of teaching machines, citing the usefulness of "Film projectors, television sets, phonographs, and tape recorders…" (p. 29) in environments aimed at aiding learning. He championed technology as a tool that would interrupt a trend in which learners were becoming "…more and more…mere passive receiver(s) of instruction," by encouraging them to instead "…take an active role in the instructional process,"(p. 30). In the nearly 50 years that have passed since that time, technology has grown and evolved into tools that have the capability and flexibility to achieve this goal when coupled with empirically-supported instructional design. From this perspective, behavioral research aimed identifying the best and most efficient ways to train skills while utilizing today’s ubiquitous technology is necessary in order to increase usefulness, maintain relevance, and aid in the dissemination and acceptance of these techniques.

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Table 1

Participant Computer Skills Assessment Scores (Pilot)

Participant Number	Computer Comfort Score	Typing Test Speed (WPM)	Typing Test Accuracy	Basic Computer Skills Accuracy	Basic Computer Skills Time	Windows Skills Accuracy	Windows Skills Time
515	88%	39	95%	88%	388	93%	240
156	92%	33	78%	90%	661	79%	388
116	100%	84	93%	95%	250	97%	137
236	90%	43	91%	83%	[a]	93%	278
267	89%	43	89%	68%	562	72%	368
875	99%	44	93%	85%	395	90%	156
776	99%	34	89%	90%	374	93%	220
376	99%	33	84%	88%	440	90%	282
405	79%	32	85%	85%	423	83%	267
818	99%	44	94%	88%	367	90%	211

[a] The time to completion of this assessment for this participant is unavailable, as the video-recording of his performance began after the completion of the basic computer skills assessment rather than before.

Table 2

Participant Gains/Losses following Computer-Based BST (Pilot)

Participant Number	Correct Actions (#) – Gain	Correct Actions (%) – Gain [a]	Percent Correct (Accuracy) – Gain [a]	Time/Correct Actions – Loss in Seconds [a]
515	93	12%	53%	22
156	32	26%	21%	83
116	157	52%	78%	22
236	137	61%	88%	105
267	27	34% Loss	18%	1 second Gain
875	15	9% Loss	10% Loss	3
776	127	48%	84%	53
376	35	15%	24%	61
405	37	35%	26%	80
818	133	66%	88%	27

[a] Unless otherwise stated

Table 3

Correlations Between Computer-Skills Assessment Scores and Acquisition Measures (Pilot)

	Computer Comfort Score	Typing Speed	Typing Accuracy	Computer Skills Test (Accuracy)	Computer Skills Test (Time)	Windows Skills Test (Accuracy)	Windows Skills Test (Time)
% of completed actions that were Correct	.20	.21	.08	.65	-.58	.61	-.35
Overall Percent Correct (Accuracy)	.23	.32	.39	.36	-.63	.59	-.30
Rate (S)/Correct Actions Completed	-.31	-.39	-.58	.24	-.27	.06	.38

Table 4

Groups, Task-Training Pairings, and Conditions

	Group 1				Group 2			
	Training-Task Pairings				Training-Task Pairings			
	A	Computer-Based BST for ABLA			A1	Computer-Based BST for PA		
	B	In-Person BST for PA			B1	In-Person BST for ABLA		
	C	Computer-Based BST for Face Sheet			C1	Computer-Based BST for Learning Plan		
	D	In-Person BST for Learning Plan			D1	In-Person BST for Face Sheet		
Order	Condition 1	Condition 2	Condition 3	Condition 4	Condition 1	Condition 2	Condition 3	Condition 4
1st	A	B	C	D	A1	B1	C1	D1
2nd	B	A	D	C	B1	A1	D1	C1
3rd	C	D	A	B	C1	D1	A1	B1
4th	D	C	B	A	D1	C1	B1	A1

Table 5

Participant Computer Skills Assessment Scores

Participant	Computer Comfort Score	WPM	Accuracy	Computer Skills Test	Time to Complete (s)	Windows Skills Test	Time to Complete (s)
1066	100%	56	95%	98%	334	93%	253
1078	90%	36		93%	371	90%	239
1173	93%	29	91%	90%	398	93%	261
1553	94%	36	94%	83%	536	90%	360
3062	80%	40	91%	95%	272	90%	148
3186	94%	40	94%	88%	316	97%	226
3220	87%	57	96%	88%	449	83%	329
3338	95%	64	-- [a]	95%	253	100%	136
3600	100%	23	95%	90%	455	86%	248
4119	90%	32	-- [a]	100%	354	93%	229
4242	94%	-- [a]	-- [a]	95%	321	93%	263
4346	87%	47	-- [a]	90%	-- [a]	93%	-- [a]
4664	99%	76	-- [a]	98%	-- [a]	97%	-- [a]
4957	97%	89	99%	100%	245	97%	138
5915	97%	46	100%	88%	328	93%	293
6066	96%	41	100%	90%	403	100%	257
6819	97%	56	97%	95%	301	97%	338
7411	82%	29	98%	93%	419	90%	264
8157	90%	32	96%	93%	346	100%	222
8176	91%	36	79%	93%	453	86%	256
8231	98%	48	96%	95%	306	97%	170
8411	92%	69	94%	93%	334	93%	218
8856	84%	36	98%	85%	361	86%	294
9227	86%	36	88%	95%	447	86%	273
9665	90%	55	96%	98%	464	97%	257
9785	69%	30	83%	85%	439	59%	291

[a] Video not available

Table 6

Average Gains and Losses Observed from Pretest to Posttest, Organized by Training Type

		In-Person BST	Computer Based BST	Difference
ABLA	**Correct Actions**	26%	34%	8%
	Incorrect Actions	-14%	-27%	13%
	Extraneous Actions	-13%	-7%	6%
	Percent Correct (Accuracy)	46%	49%	3%
	Correct Actions/Second	0.236	0.247	0.01
Preference Assessment	**Correct Actions**	46%	42%	4%
	Incorrect Actions	-38%	-33%	5%
	Extraneous Actions	-7%	-9%	2%
	Percent Correct (Accuracy)	24%	22%	2%
	Correct Actions/Second	0.151	0.134	0.017
ABASE New Entry	**Correct Actions**	24%	32%	8%
	Incorrect Actions	-1%	0	1%
	Extraneous Actions	-24%	-32%	8%
	Percent Correct (Accuracy)	19%	24%	5%
	Correct Actions/Second	0.04	0.049	0.009
ABASE Habilitation Plan	**Correct Actions**	60%	66%	6%
	Incorrect Actions	-3%	0	3%
	Extraneous Actions	-57%	-66%	9%
	Percent Correct (Accuracy)	51%	49%	2%
	Correct Actions/Second	0.126	0.12	0.005

Table 7

Cohen's D Measure of the Effects of Computer-Based BST when compared to In-Person BST

		Effect Size	Designation [a]
ABLA	**Correct Actions**	0.342	Small
	Incorrect Actions	0.726	Medium
	Extraneous Actions	0.385	Small
	Percent Correct (Accuracy)	0.185	No Effect
	Correct Actions/Second	0.131	No Effect
Preference Assessment	**Correct Actions**	0.205	No Effect
	Incorrect Actions	0.284	Small
	Extraneous Actions	0.099	No Effect
	Percent Correct (Accuracy)	0.217	Small
	Correct Actions/Second	0.232	Small
ABASE New Entry	**Correct Actions**	0.324	Small
	Incorrect Actions	0.126	No Effect
	Extraneous Actions	0.338	Small
	Percent Correct (Accuracy)	0.385	Small
	Correct Actions/Second	0.408	Small
ABASE Habilitation Plan	**Correct Actions**	0.381	Small
	Incorrect Actions	0.655	Medium
	Extraneous Actions	0.539	Medium
	Percent Correct (Accuracy)	0.113	No Effect
	Correct Actions/Second	0.328	Small

[a] A variable is considered to have no effect when the effect size is between -0.2 and 0.2, a small effect when the effect size is between -0.5 and -0.2 or 0.2 and 0.5, a medium effect when the effect size is between -0.8 and -0.5 or 0.5 and 0.8, and a large effect when the effect size is lower than -0.8 or higher than 0.8.

Table 8

Statistical Power and Sample Size with Respect to Accuracy and Rate

		Power (n=26)	Sample Size Needed (.90 Power)
Accuracy	ABLA	*0.074*	*1230*
	PA	*0.083*	*892*
	New Focus Person	*0.156*	*288*
	Hab Plan	*0.059*	*3276*
Rate	ABLA	*0.062*	*2448*
	PA	*0.088*	*788*
	New Focus Person	*0.17*	*256*
	Hab Plan	*0.126*	*394*

Table 9

Correlation Coefficients between Acquisition Measures and Computer Proficiency Measures for Group 1

		Computer Comfort	*Typing Test WPM*	*Accuracy*	*Computer Skills Test*	*Time to Complete (s)*	*Windows Skills Test*	*Time to Complete(s)*
CBT PA	% of Correct Completed Actions (Gain)	0.090	-0.027	0.230	0.110	0.203	0.147	-0.437
	Percent Correct (Accuracy) Gain	0.391	0.092	0.525	0.339	-0.205	0.514	-0.559
	Rate (S)/Correct Action	0.402	0.122	0.520	0.294	-0.229	0.522	-0.591
CBT FP	% of Correct Completed Actions (Gain)	-0.134	-0.238	-0.128	0.188	0.042	-0.373	0.238
	Percent Correct (Accuracy) Gain	0.102	0.295	0.165	0.545	0.097	-0.016	0.127
	Rate (S)/Correct Action	0.102	0.305	0.167	0.539	0.101	-0.014	0.121
Live ABLA	% of Correct Completed Actions (Gain)	-0.471	-0.551	-0.352	-0.494	0.434	-0.616	0.444
	Percent Correct (Accuracy) Gain	-0.144	-0.259	-0.036	-0.052	0.635	-0.103	0.431
	Rate (S)/Correct Action	-0.203	-0.280	-0.115	-0.122	0.676	-0.203	0.470
Live Hab	% of Correct Completed Actions (Gain)	0.104	-0.255	0.009	0.054	0.471	0.090	0.201
	Percent Correct (Accuracy) Gain	0.091	-0.073	-0.054	-0.319	0.085	-0.114	0.012
	Rate (S)/Correct Action	0.012	0.350	-0.057	0.282	0.036	0.217	-0.281

Note: Items highlighted in green are highly correlated.

Table 10

Correlation Coefficients between Acquisition Measures and Computer Proficiency Measures for Group 2

		Computer Comfort	*Typing Test Average*	*y Average*	*Computer Skills Test*	*Time to Complete (s)*	*Windows Skills Test*	*Time to Complete(s)*
CBT ABLA	% of Correct Completed Actions (Gain)	-0.018	0.137	0.173	0.445	-0.611	0.445	-0.737
	Percent Correct (Accuracy) Gain	-0.274	0.255	0.077	0.532	-0.458	0.184	-0.705
	Rate (S)/Correct Action	-0.226	0.306	0.098	0.541	-0.472	0.218	-0.722
CBT Hab	% of Correct Completed Actions (Gain)	-0.303	-0.797	-0.274	-0.206	0.188	-0.046	-0.095
	Percent Correct (Accuracy) Gain	0.007	-0.645	-0.339	-0.513	0.546	-0.250	0.616
	Rate (S)/Correct Action	-0.111	0.383	0.257	0.576	-0.807	0.407	-0.827
Live PA	% of Correct Completed Actions (Gain)	-0.354	-0.509	-0.190	0.313	-0.222	-0.045	-0.198
	Percent Correct (Accuracy) Gain	0.128	-0.321	0.102	0.219	-0.370	0.291	-0.287
	Rate (S)/Correct Action	0.111	-0.322	0.092	0.245	-0.392	0.293	-0.309
Live FP	% of Correct Completed Actions (Gain)	-0.202	-0.307	-0.363	-0.101	0.168	0.143	0.031
	Percent Correct (Accuracy) Gain	-0.408	-0.039	-0.030	0.041	0.052	0.123	-0.158
	Rate (S)/Correct Action	-0.358	0.074	0.011	0.112	-0.024	0.158	-0.240

Note: Items highlighted in green are highly correlated.

Table 11

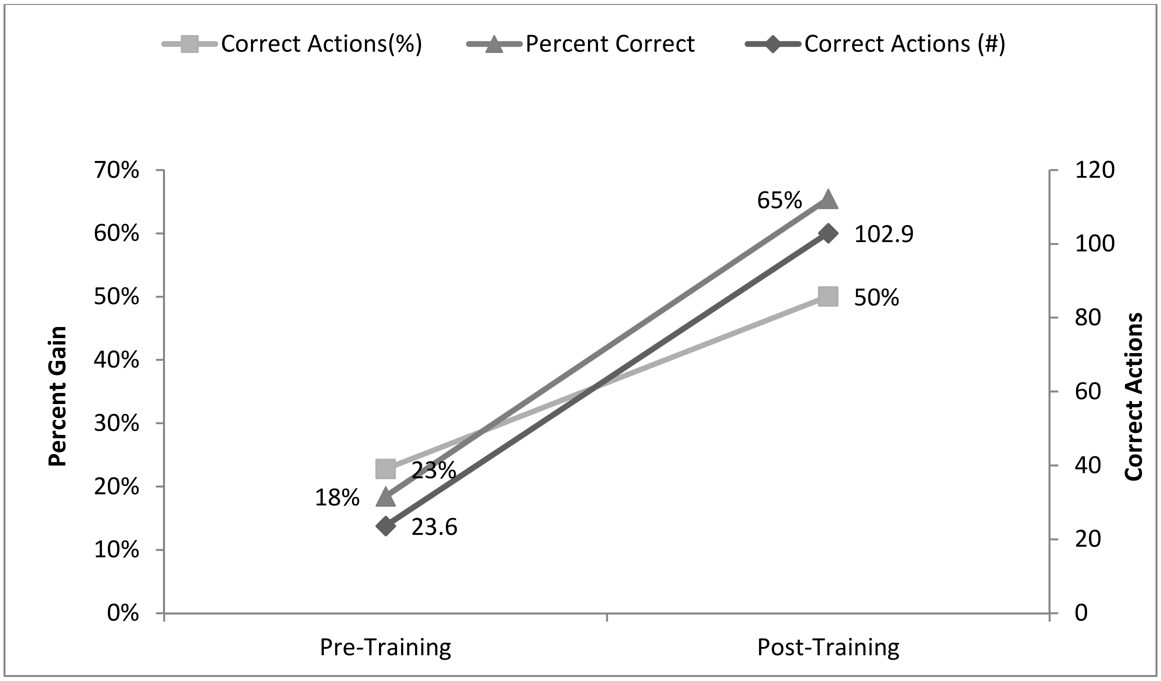
Cost Comparisons For Computer-Based Versus In-Person BST

		Small Business		Medium Business		Large Business	
		Computer-Based	In-Person	Computer-Based	In-Person	Computer-Based	In-Person
Short Training	Training Dev Time	5	2.5	5	2.5	5	2.5
	Hrly Dev Cost	100	100	100	100	100	100
	Training Admin Time	0.5	0.5	0.5	0.5	0.5	0.5
	# of Training Groups	n/a	3.030303	n/a	30.3030303	n/a	303.030303
	Hrly Instructor Cost	n/a	100	n/a	100	n/a	100
	Hrly Employee Cost	10	10	10	10	10	10
	# of Employees	100	100	1000	1000	10000	10000
	Hrly Profit per Employee	20	20	20	20	20	20
	30% Retrained/Qrtr	33	33	33	33	33	33
	Dev Cost	$500.00	$250.00	$500.00	$250.00	$500.00	$250.00
	Initial TR Cost	$500.00	$651.52	$5,000.00	$6,515.15	$50,000.00	$65,151.52
	Initial TR Loss	$1,000.00	$1,000.00	$10,000.00	$10,000.00	$100,000.00	$100,000.00
	Re-TR Cost	$165.00	$215.00	$165.00	$215.00	$165.00	$215.00
	Re-TR Loss	$330.00	$330.00	$330.00	$330.00	$330.00	$330.00
	TR Cost after 1 year	$1,495.00	$1,546.52	$5,995.00	$7,410.15	$50,995.00	$66,046.52
	Total Loss after 1 year	$1,990.00	$1,990.00	$10,990.00	$10,990.00	$100,990.00	$100,990.00
	Total Cost after 1 year	$3,485.00	$3,536.52	$16,985.00	$18,400.15	$151,985.00	$167,036.52
	Total Cost after 3 years	$9,435.00	$9,886.52	$31,935.00	$33,750.15	$256,935.00	$272,386.52
		Computer-Based	In-Person	Computer-Based	In-Person	Computer-Based	In-Person
Long Training	Training Dev Time	20	10	20	10	20	10
	Hrly Dev Cost	100	100	100	100	100	100
	Training Admin Time	2	2	2	2	2	2
	# of Training Groups	n/a	3.030303	n/a	30.3030303	n/a	303.030303
	Hrly Instructor Cost	n/a	100	n/a	100	n/a	100
	Hrly Employee Cost	10	10	10	10	10	10
	# of Employees	100	100	1000	1000	10000	10000
	Hrly Profit per Employee	20	20	20	20	20	20
	30% Retrained/Qrtr	33	33	33	33	33	33
	Dev Cost	$2,000.00	$1,000.00	$2,000.00	$1,000.00	$2,000.00	$1,000.00
	Initial TR Cost	$2,000.00	$2,606.06	$20,000.00	$26,060.61	$200,000.00	$260,606.06
	Initial TR Loss	$4,000.00	$4,000.00	$40,000.00	$40,000.00	$400,000.00	$400,000.00
	Re-TR Cost	$660.00	$860.00	$660.00	$860.00	$660.00	$860.00
	Re-TR Loss	$1,320.00	$1,320.00	$1,320.00	$1,320.00	$1,320.00	$1,320.00
	TR Cost after 1 year	$5,980.00	$6,186.06	$23,980.00	$29,640.61	$203,980.00	$264,186.06
	Total Loss after 1 year	$7,960.00	$7,960.00	$43,960.00	$43,960.00	$403,960.00	$403,960.00
	Total Cost after 1 year	$13,940.00	$14,146.06	$67,940.00	$73,600.61	$607,940.00	$668,146.06
	Total Cost after 3 years	$37,740.00	$39,546.06	$127,740.00	$135,000.61	$1,027,740.00	$1,089,546.06

Table 12

Social Validity Measures

		Training Type		Skill Type		
		CBI	In-Person	Practical	Software	Overall
Components	Instruction	4.375	4.183	4.513	4.045	4.279
	Video Model	4.530	4.460	4.647	4.343	4.495
	Animations	4.2	4.126	4.157	4.17	4.163
	Quiz	3.829	3.841	3.942	3.727	3.835
	Feedback	3.883	3.878	4	3.761	3.881
Comfort	Completing Task	3.341	3.449	3.223	3.568	3.395
	Task as Job	3.17	3.289	2.909	3.550	3.229
	Making no Mistakes	2.859	3.003	2.614	3.249	2.931
	Teaching Others	2.78	2.867	2.595	3.053	2.824
Difficulty	Easy	24	24	15	33	48
	Somewhat Difficult	21	20	26	15	41
	Difficult	5	5	8	2	10
	Very Difficult	1	1	2	0	2
Supplements	Manual	4	4	3	5	8
	More Quiz Questions	4	5	3	6	9
	Interaction with Task	37	39	37	39	76
	Q & A	25	23	33	15	48
	Accuracy	15	10	15	10	25
Like it?	Yes	46	46	46	46	92
	No	5	4	5	4	9
Preference	Computer-Based	22	19	11	30	41
	In-Person	29	32	40	21	61



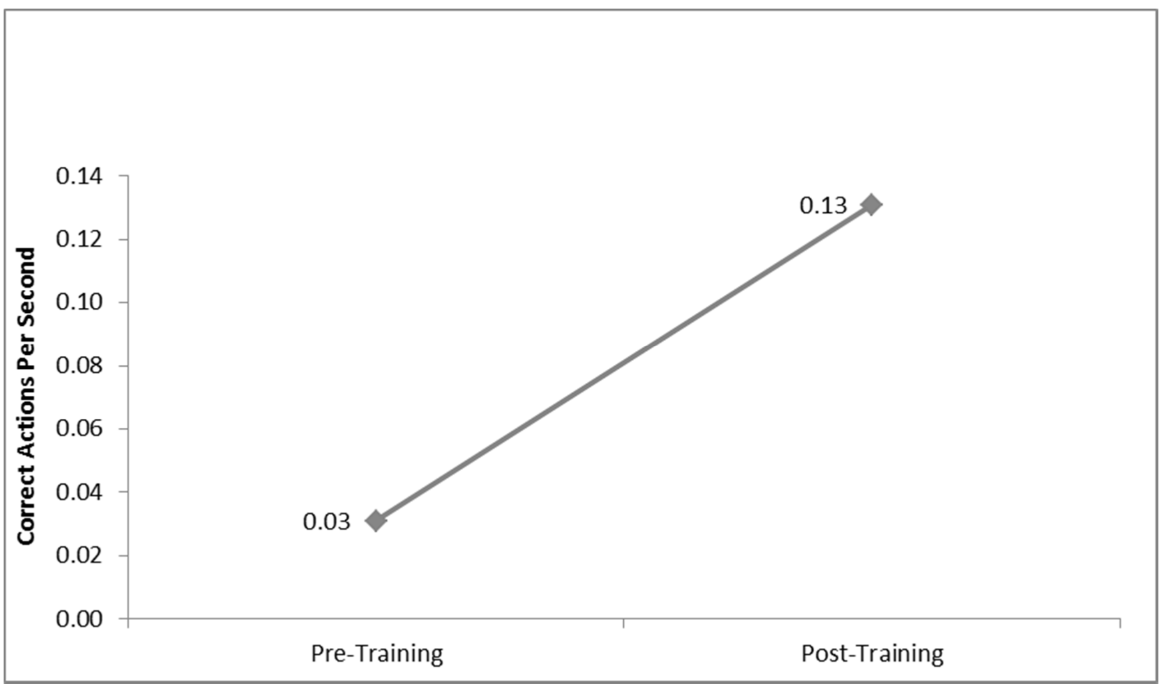


Figure 1. Average gains in the dependent variables observed before and after computer-based BST was implemented (n=10).

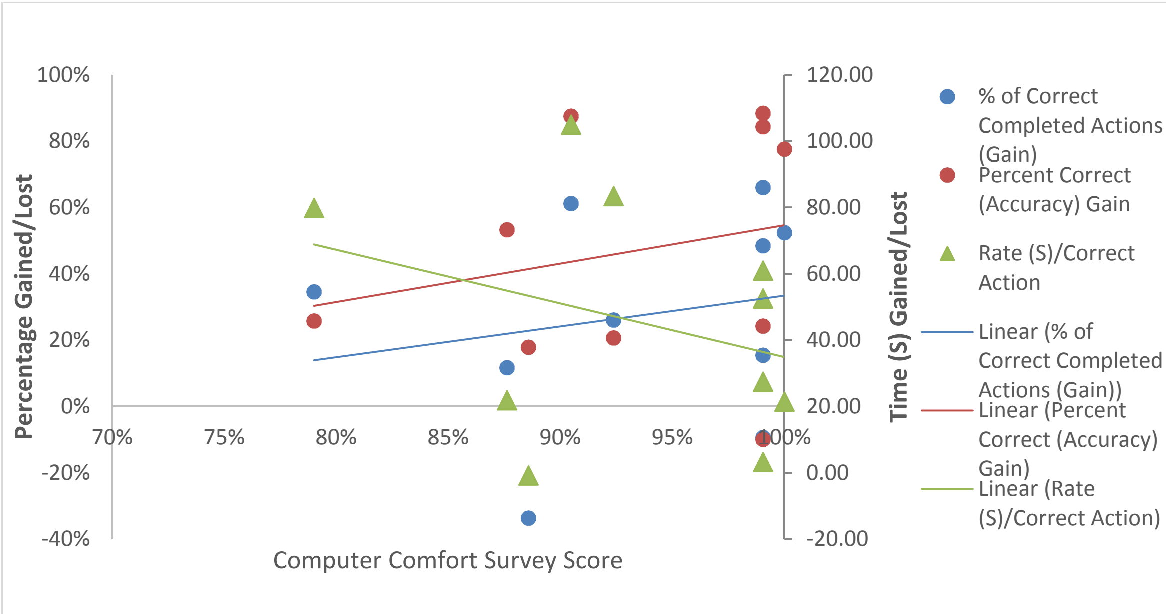


Figure 2. Scatter plot depicting the relationship between each participants' score on the Computer Comfort Survey and the acquisition measures, including the change in the percentage of actions completed that would be coded as correct, the change in overall percent correct (accuracy), and the change in time in seconds taken to complete each correct action from pretest to posttest.

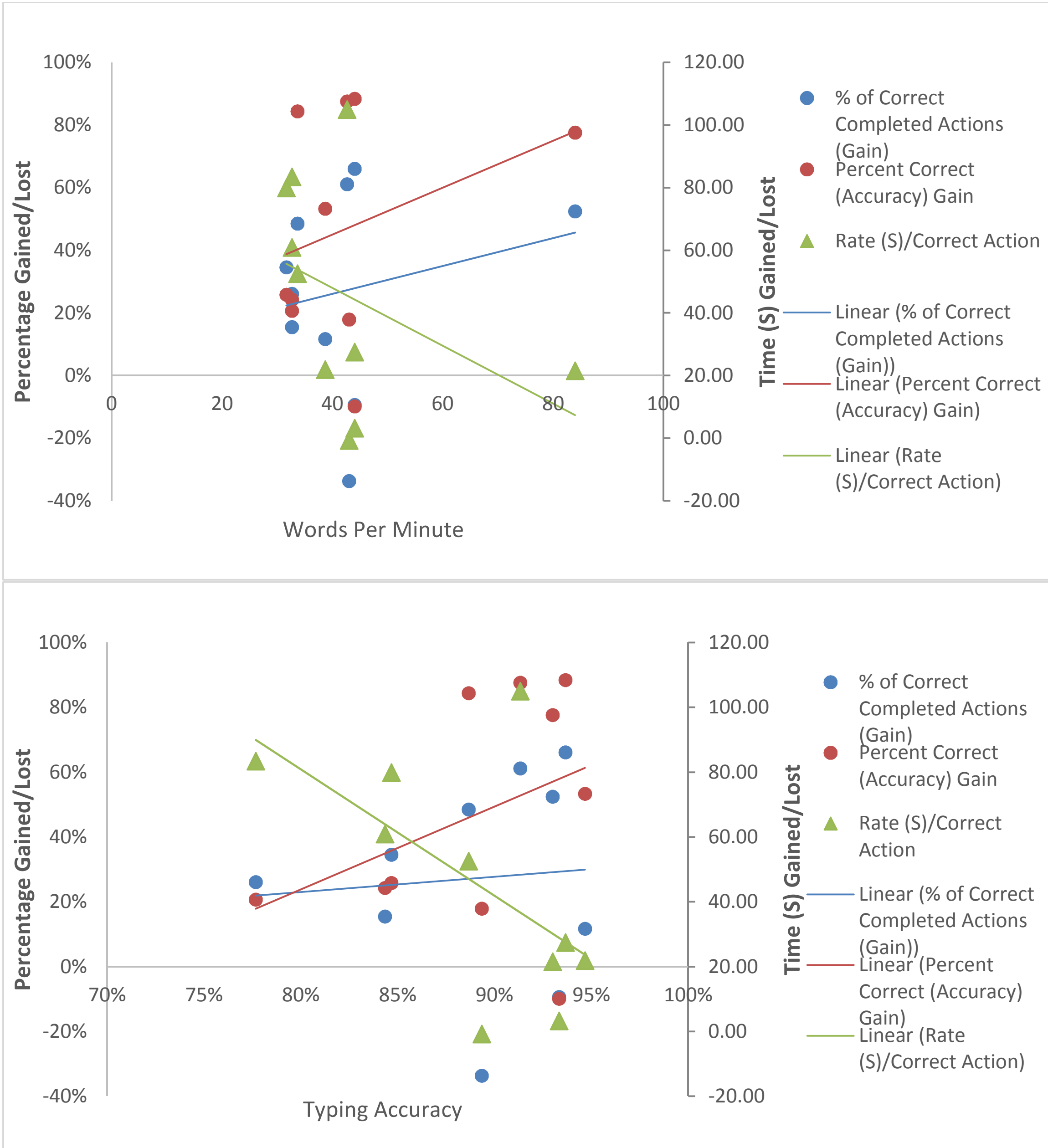


Figure 3. Scatter plot depicting the relationship between each participants' score on the typing tests (speed in the top panel, accuracy in the bottom) and the acquisition measures, including the change in the percentage of actions completed that would be coded as correct, the change in overall percent correct (accuracy), and the change in time in seconds taken to complete each correct action from pretest to posttest.

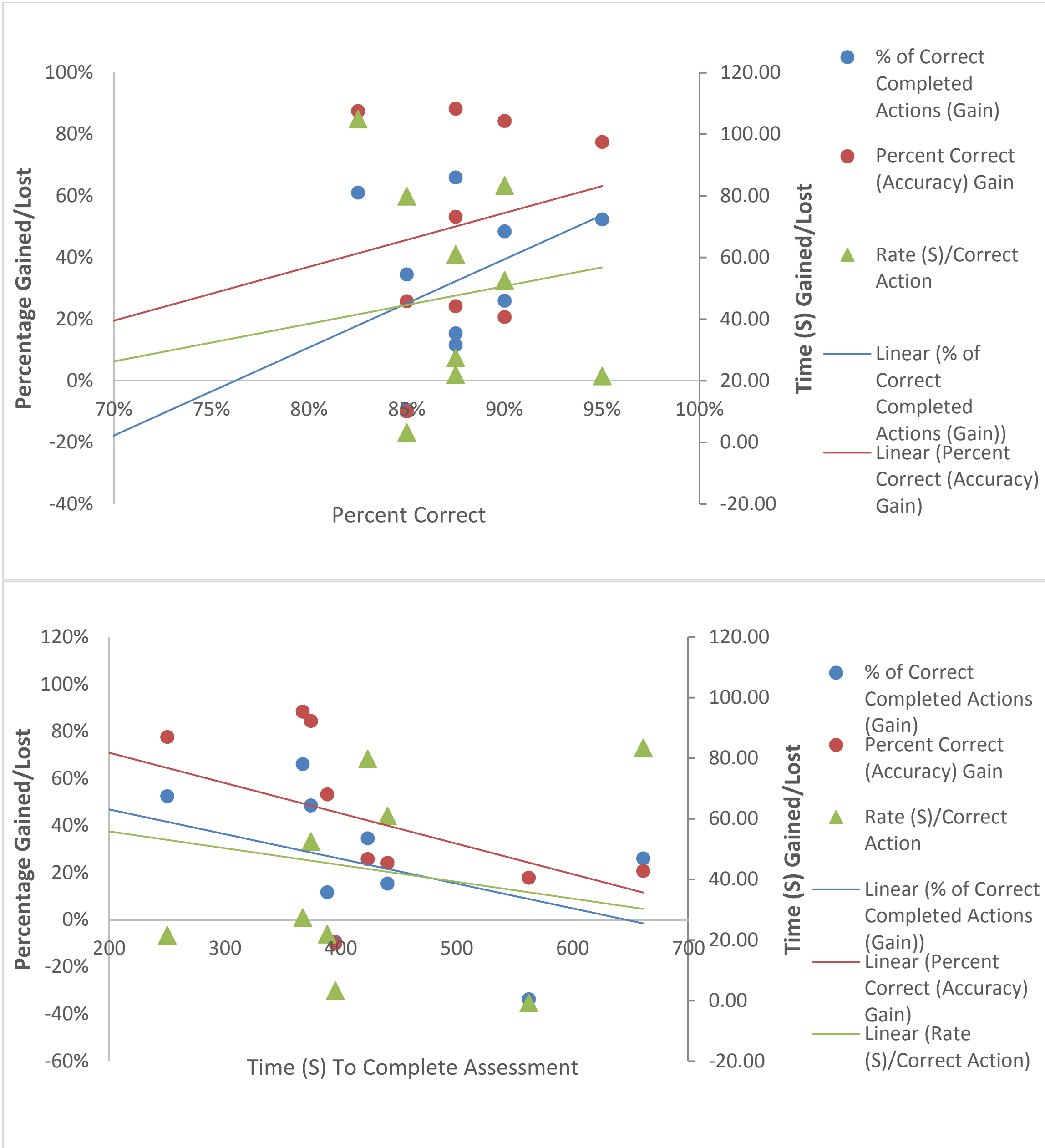


Figure 4. Scatter plot depicting the relationship between each participants' score on the basic computer skills test (accuracy in the top panel, speed in the bottom) and the acquisition measures, including the change in the percentage of actions completed that would be coded as correct, the change in overall percent correct (accuracy), and the change in time in seconds taken to complete each correct action from pretest to posttest.

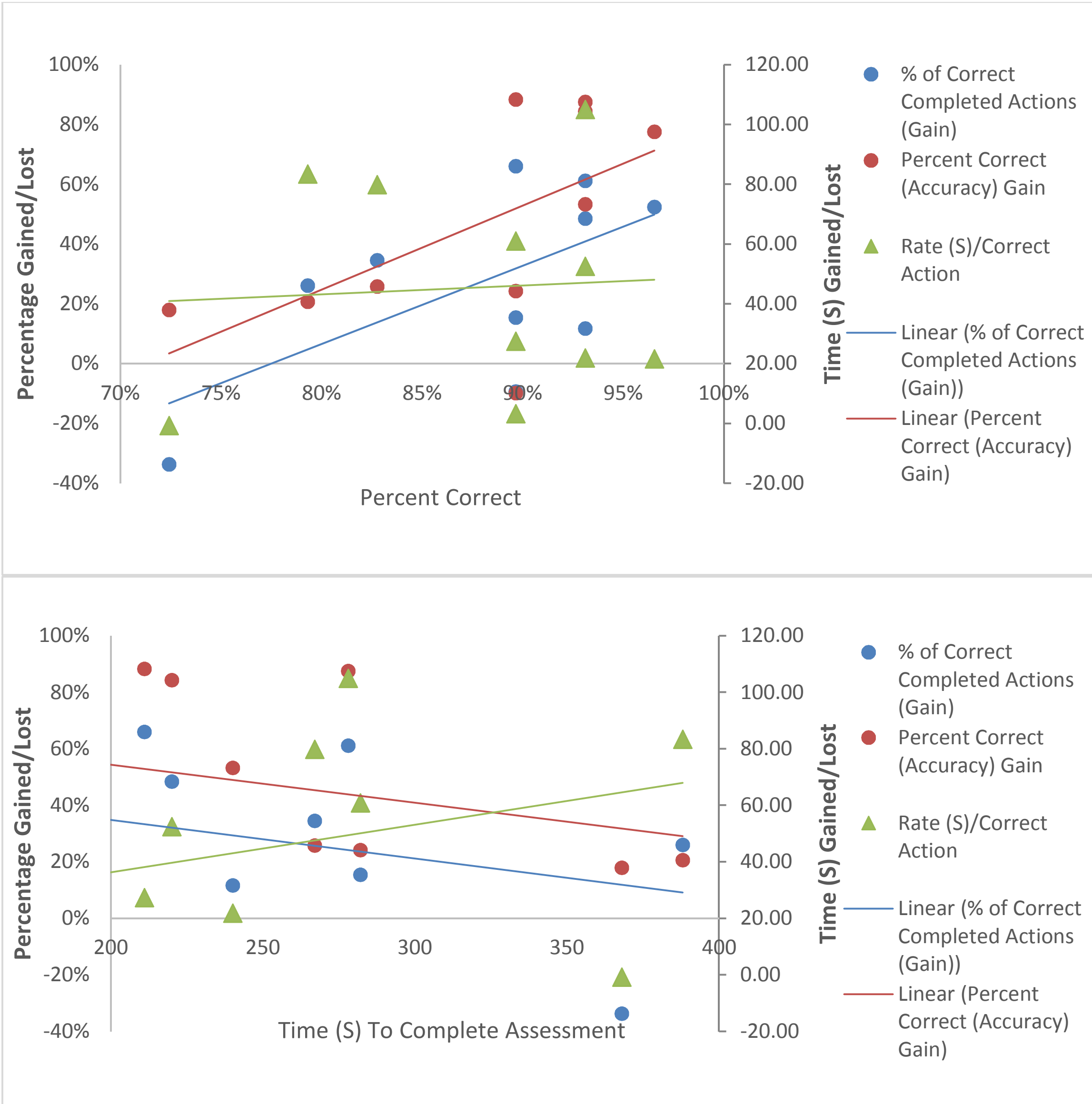


Figure 5. Scatter plot depicting the relationship between each participants' score on the Windows skills test (accuracy in the top panel, speed in the bottom) and the acquisition measures, including the change in the percentage of actions completed that would be coded as correct, the change in overall percent correct (accuracy), and the change in time in seconds taken to complete each correct action from pretest to posttest.

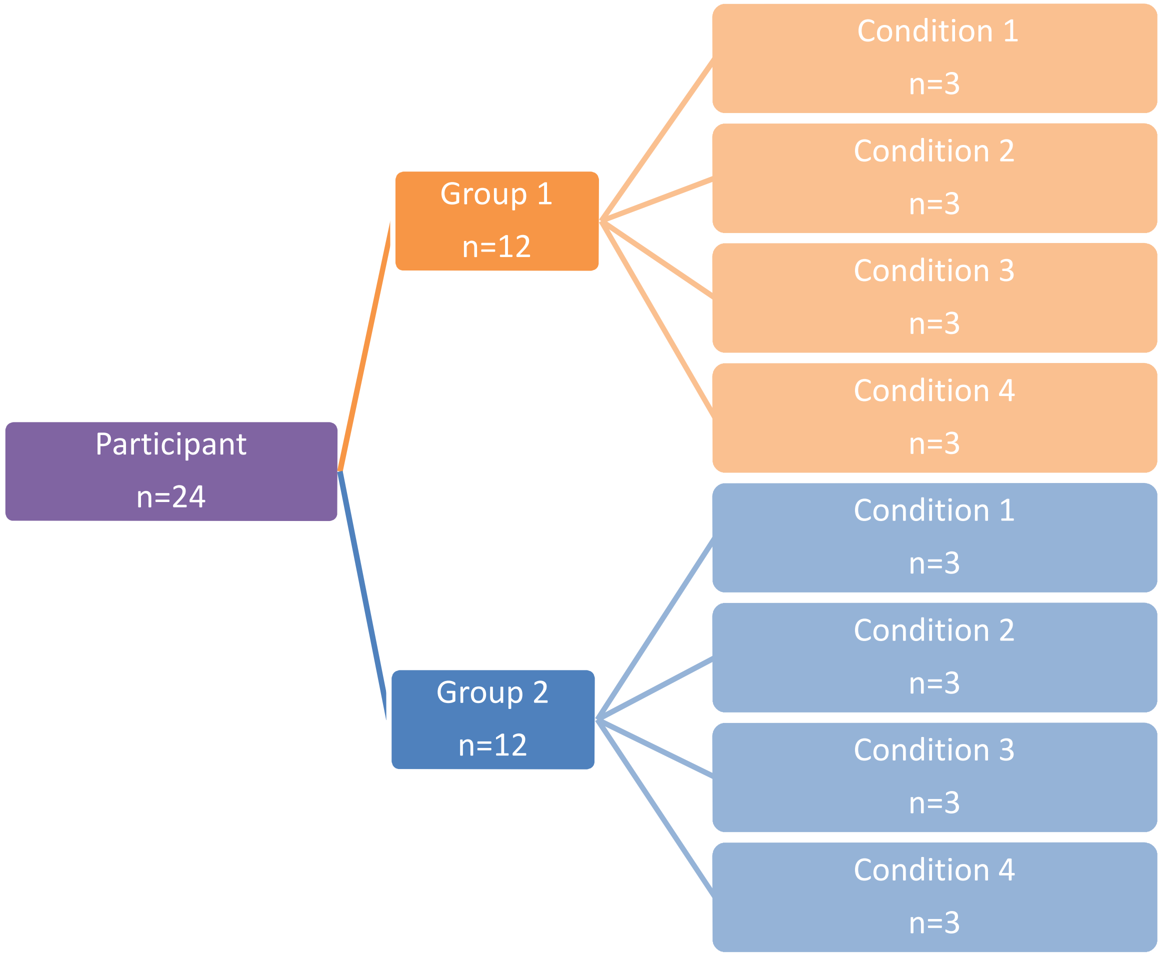


Figure 6. Flow chart depicting the movement through groups of a participant, as well as the number of participants that will be included in each group and condition.

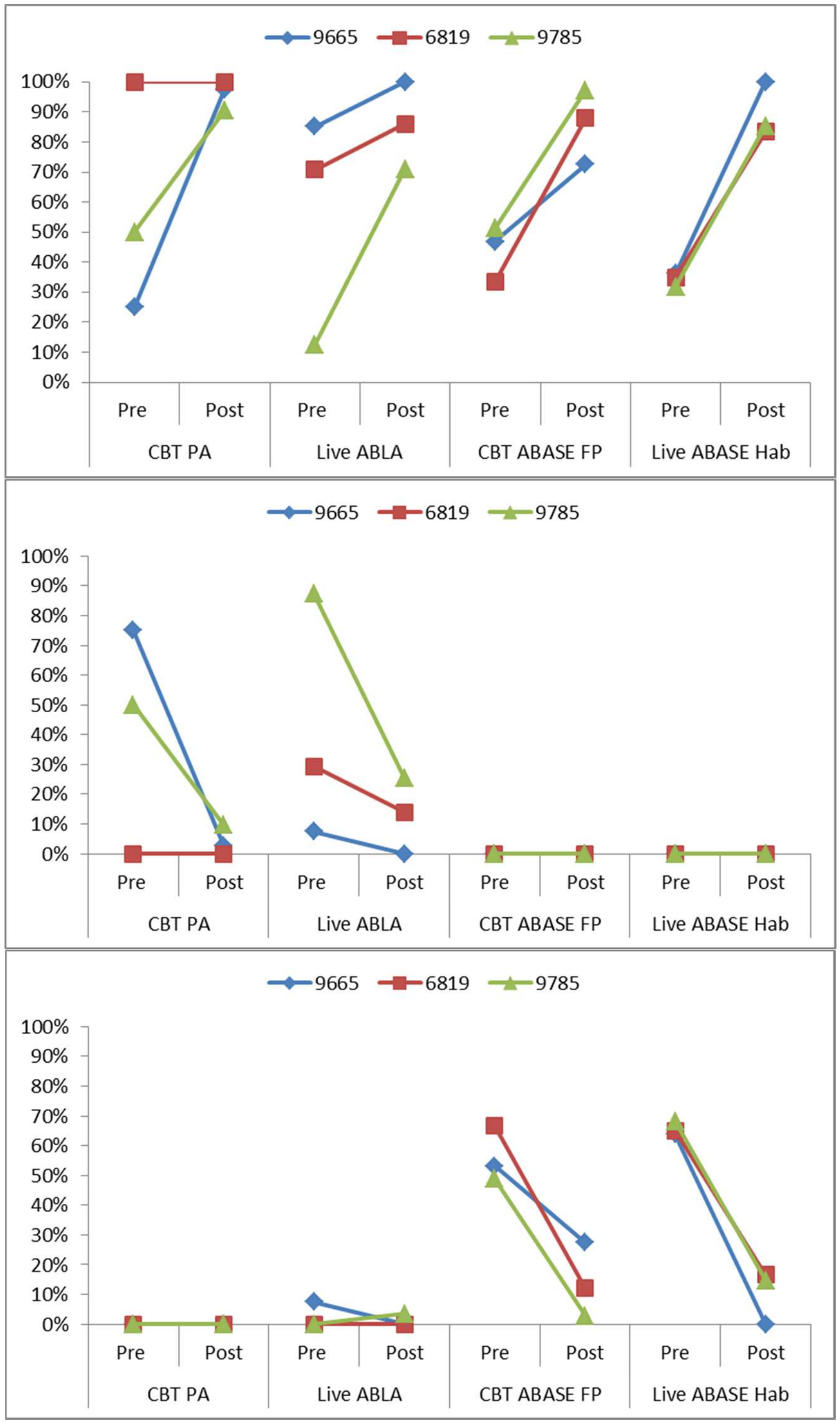


Figure 7. Change in total percentage of actions completed that were correct (top panel), incorrect (middle panel), and extraneous (bottom panel) across all tasks for the participants in Group 1, Condition 1.

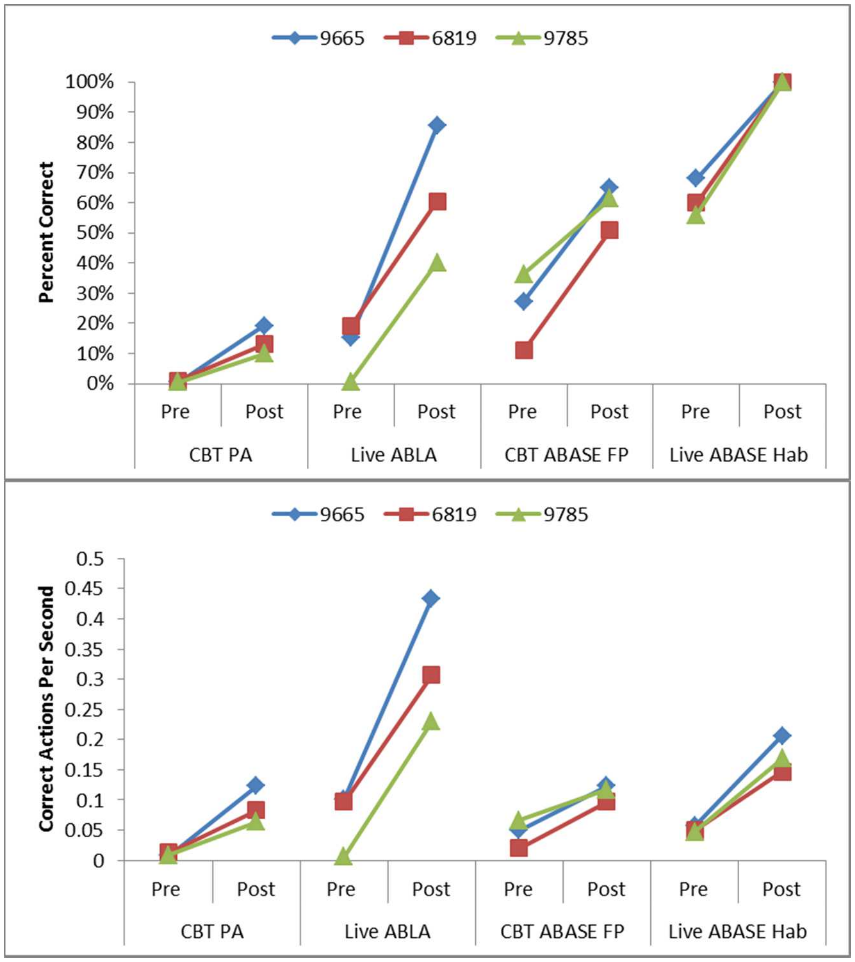


Figure 8. Change in accuracy (top panel) and the rate of correct actions (bottom panel) across all tasks for the participants in Group 1, Condition 1.

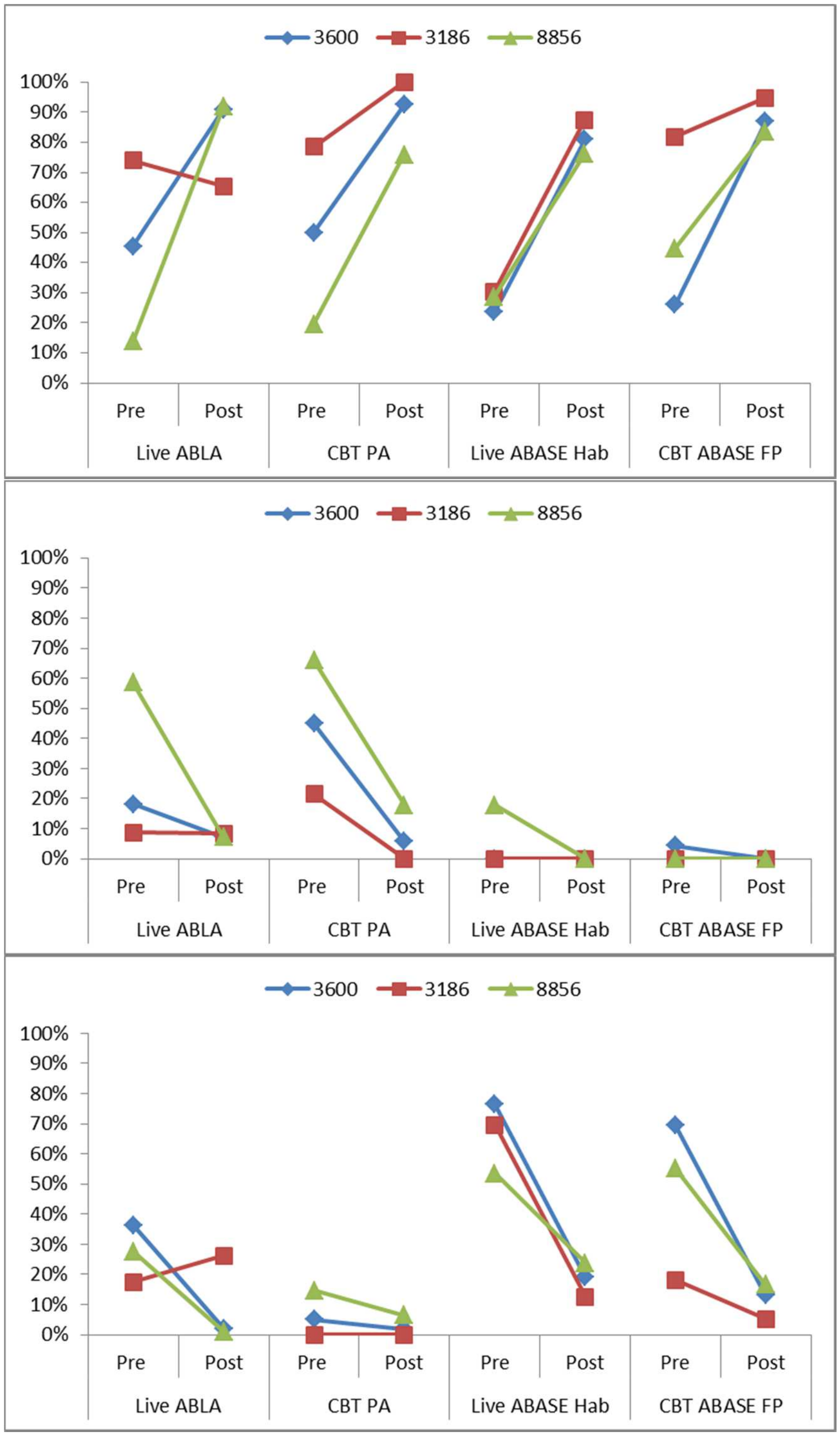


Figure 9. Change in total percentage of actions completed that were correct (top panel), incorrect (middle panel), and extraneous (bottom panel) across all tasks for the participants in Group 1, Condition 2.

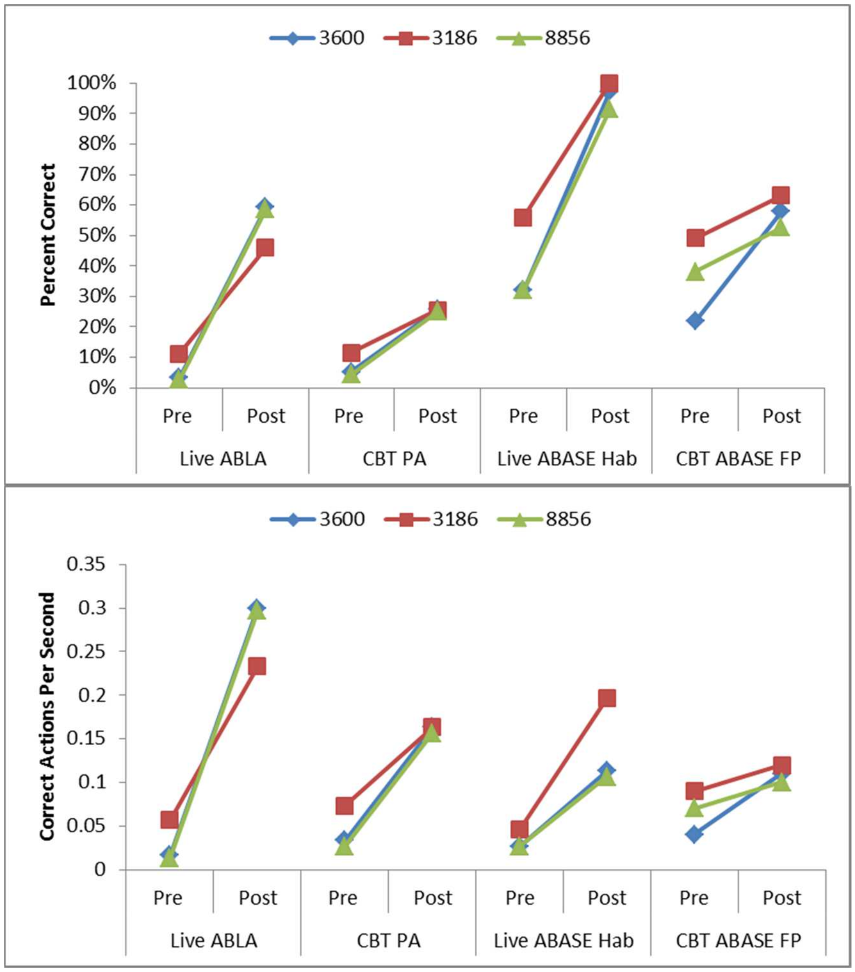


Figure 10. Change in accuracy (top panel) and the rate of correct actions (bottom panel) across all tasks for the participants in Group 1, Condition 2.

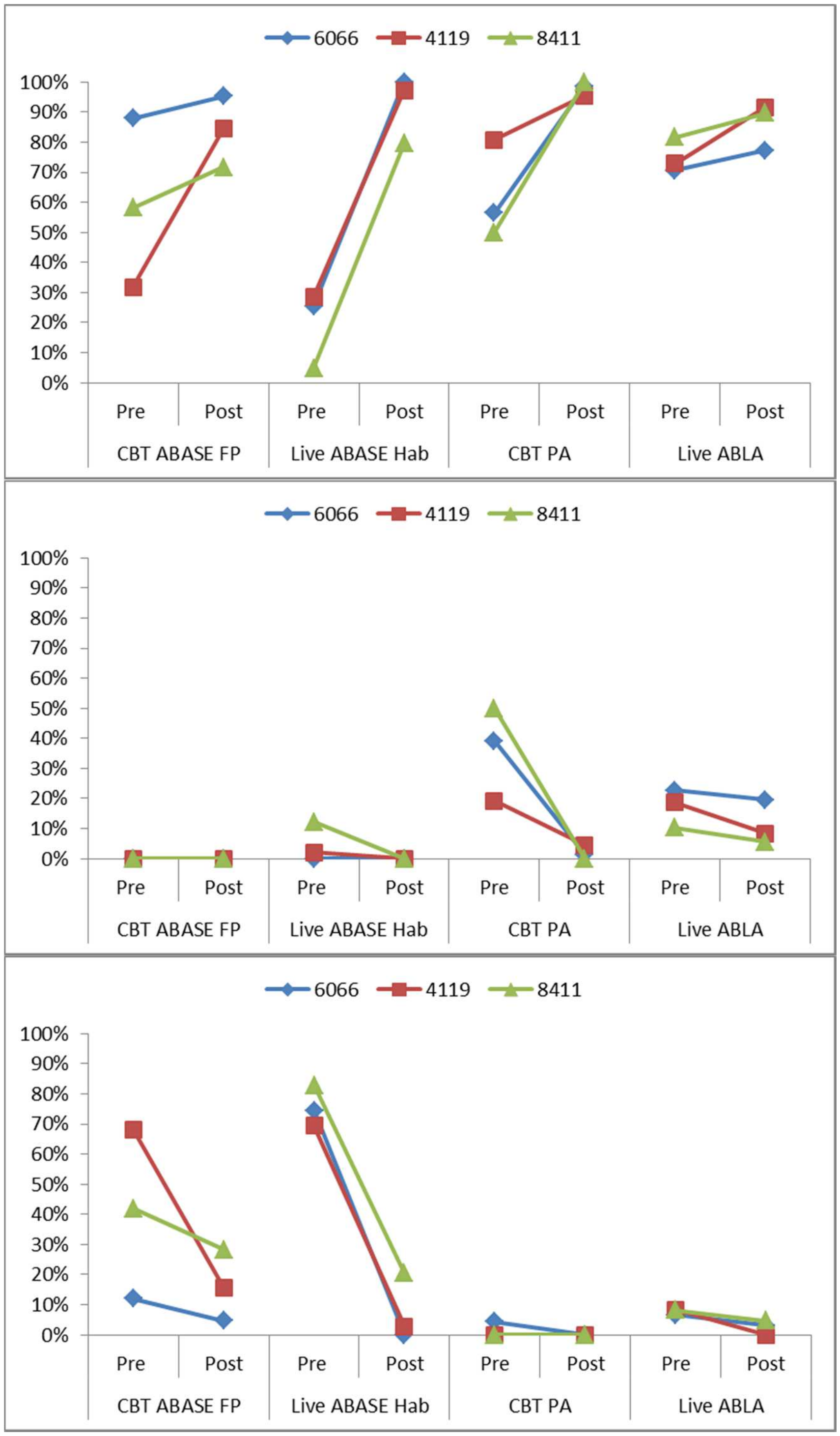


Figure 11. Change in total percentage of actions completed that were correct (top panel), incorrect (middle panel), and extraneous (bottom panel) across all tasks for the participants in Group 1, Condition 3.

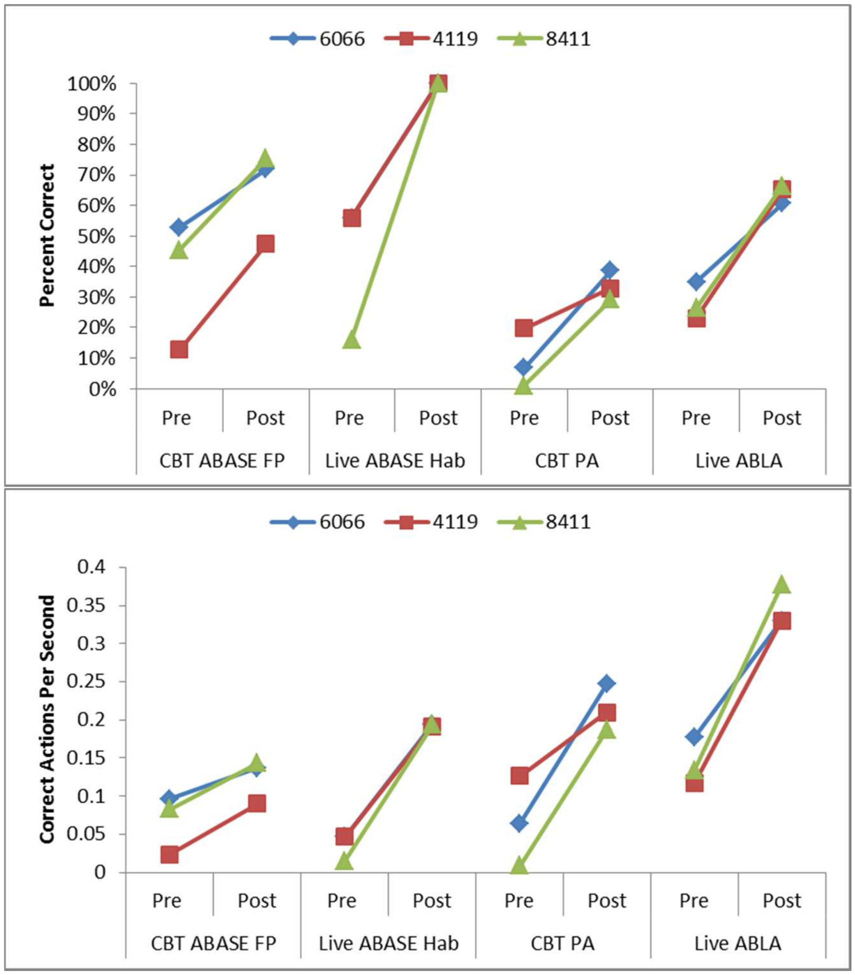


Figure 12. Change in accuracy (top panel) and the rate of correct actions (bottom panel) across all tasks for the participants in Group 1, Condition 3.

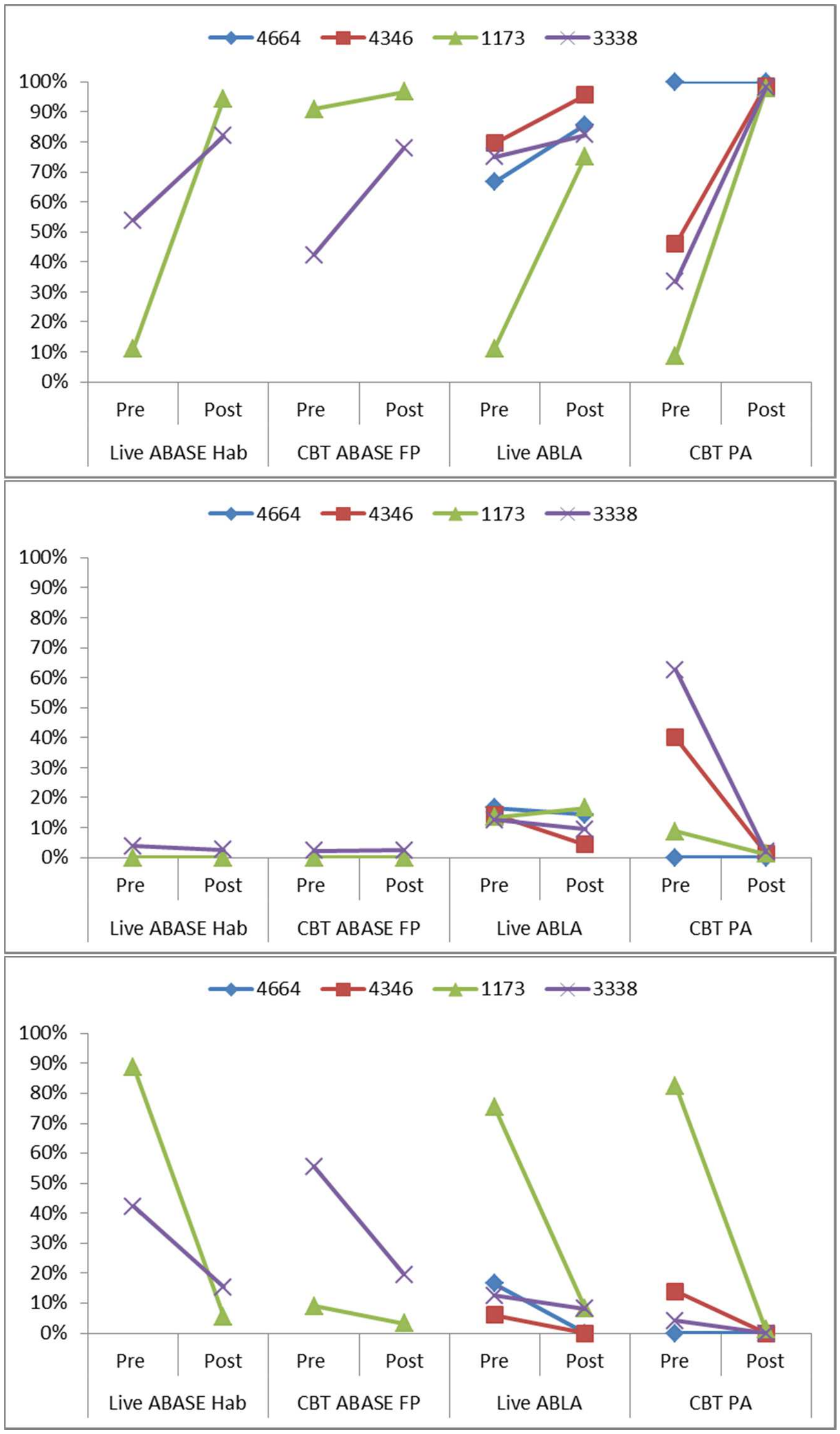


Figure 13. Change in total percentage of actions completed that were correct (top panel), incorrect (middle panel), and extraneous (bottom panel) across all tasks for the participants in Group 1, Condition 4.

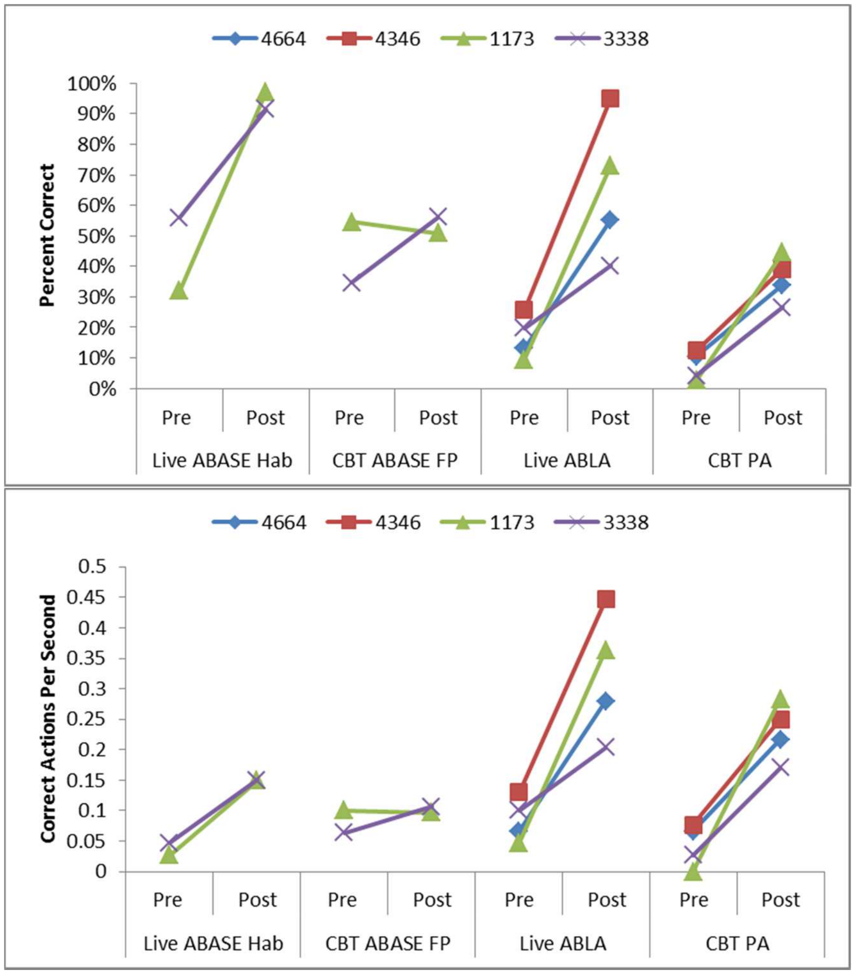


Figure 14. Change in accuracy (top panel) and the rate of correct actions (bottom panel) across all tasks for the participants in Group 1, Condition 4.

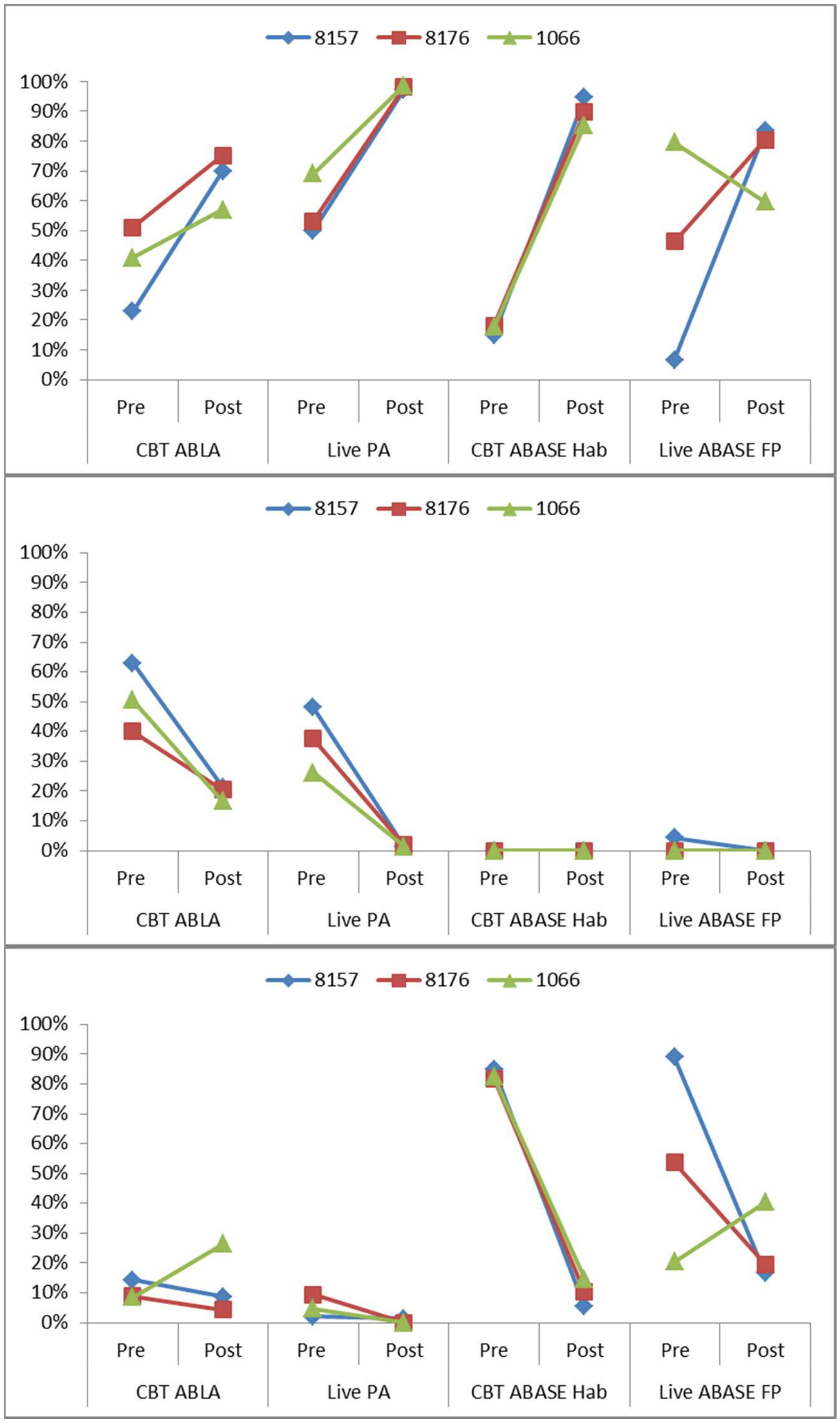


Figure 15. Change in total percentage of actions completed that were correct (top panel), incorrect (middle panel), and extraneous (bottom panel) across all tasks for the participants in Group 2, Condition 1.

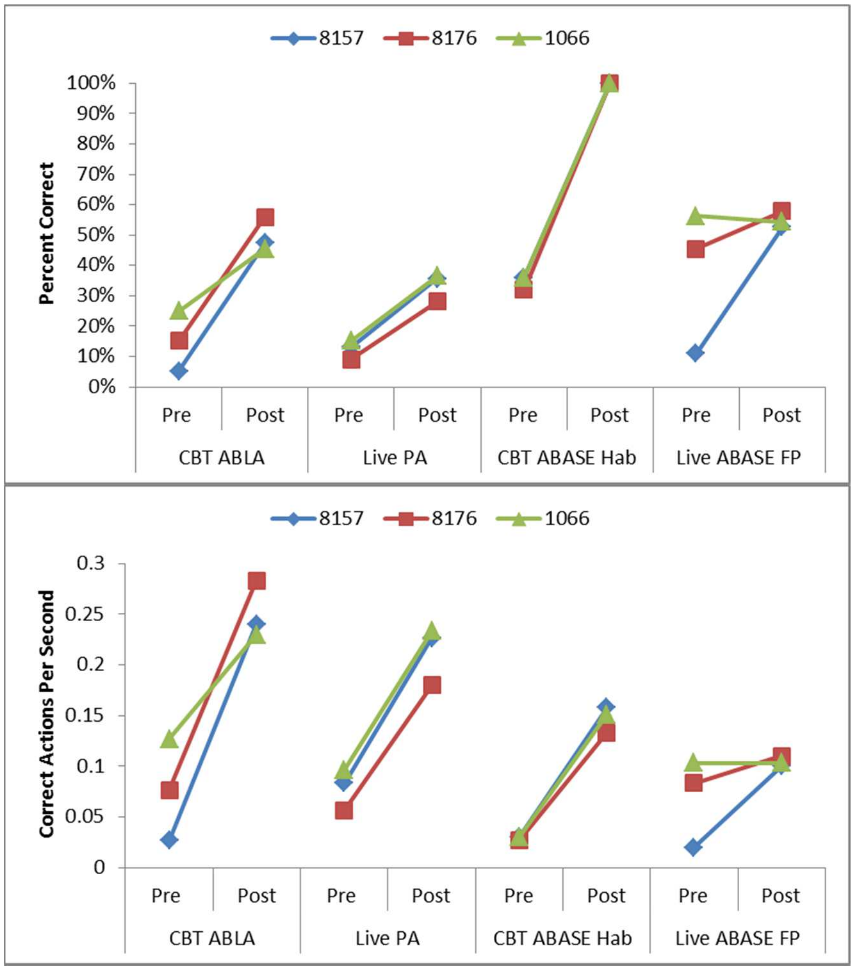


Figure 16. Change in accuracy (top panel) and the rate of correct actions (bottom panel) across all tasks for the participants in Group 2, Condition 1.

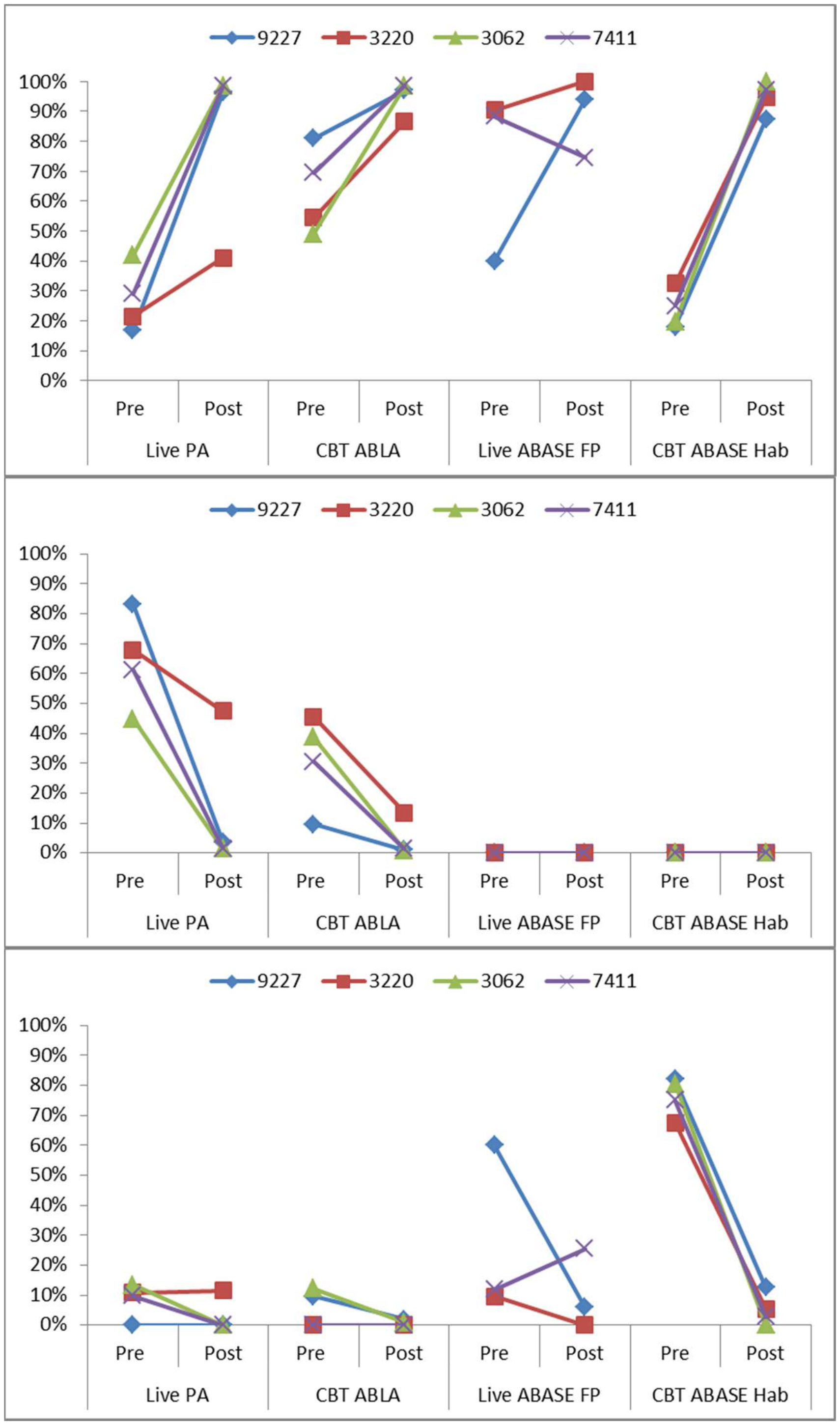


Figure 17. Change in total percentage of actions completed that were correct (top panel), incorrect (middle panel), and extraneous (bottom panel) across all tasks for the participants in Group 2, Condition 2.

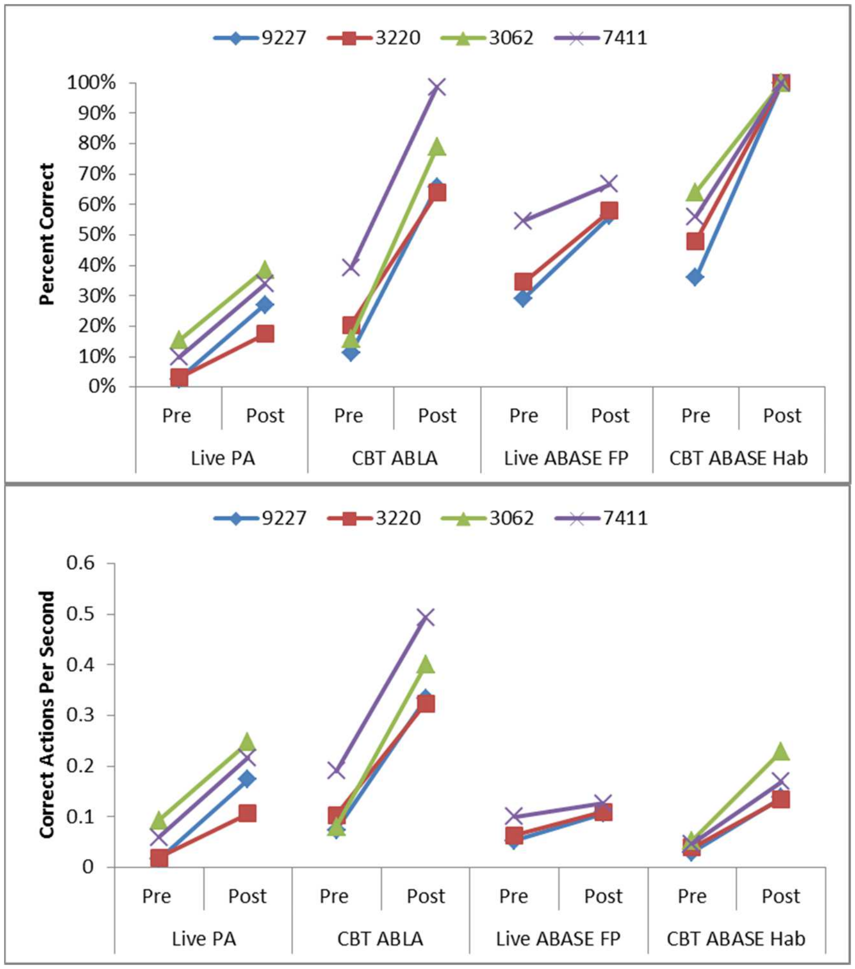


Figure 18. Change in accuracy (top panel) and the rate of correct actions (bottom panel) across all tasks for the participants in Group 2, Condition 2.

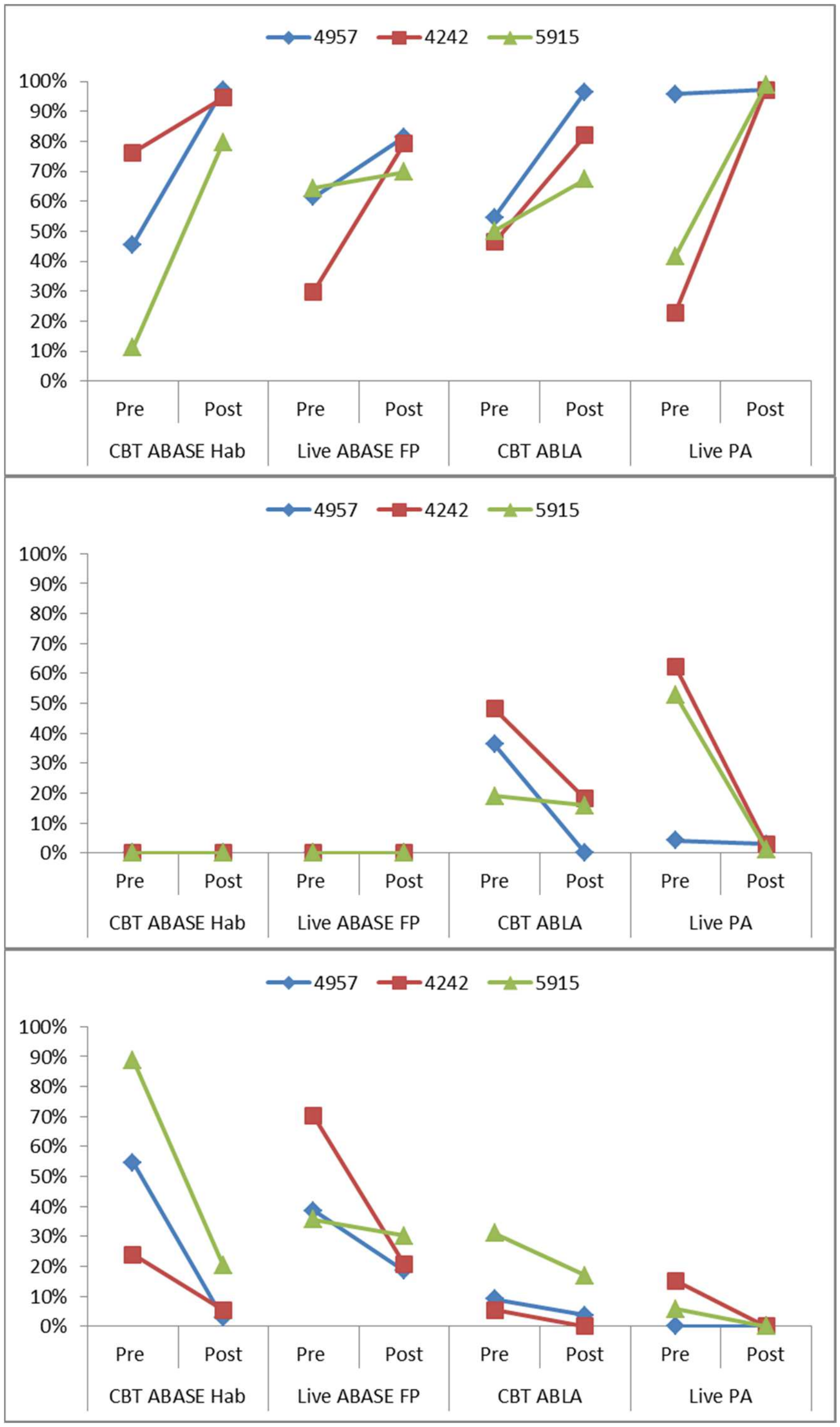


Figure 19. Change in total percentage of actions completed that were correct (top panel), incorrect (middle panel), and extraneous (bottom panel) across all tasks for the participants in Group 2, Condition 3.

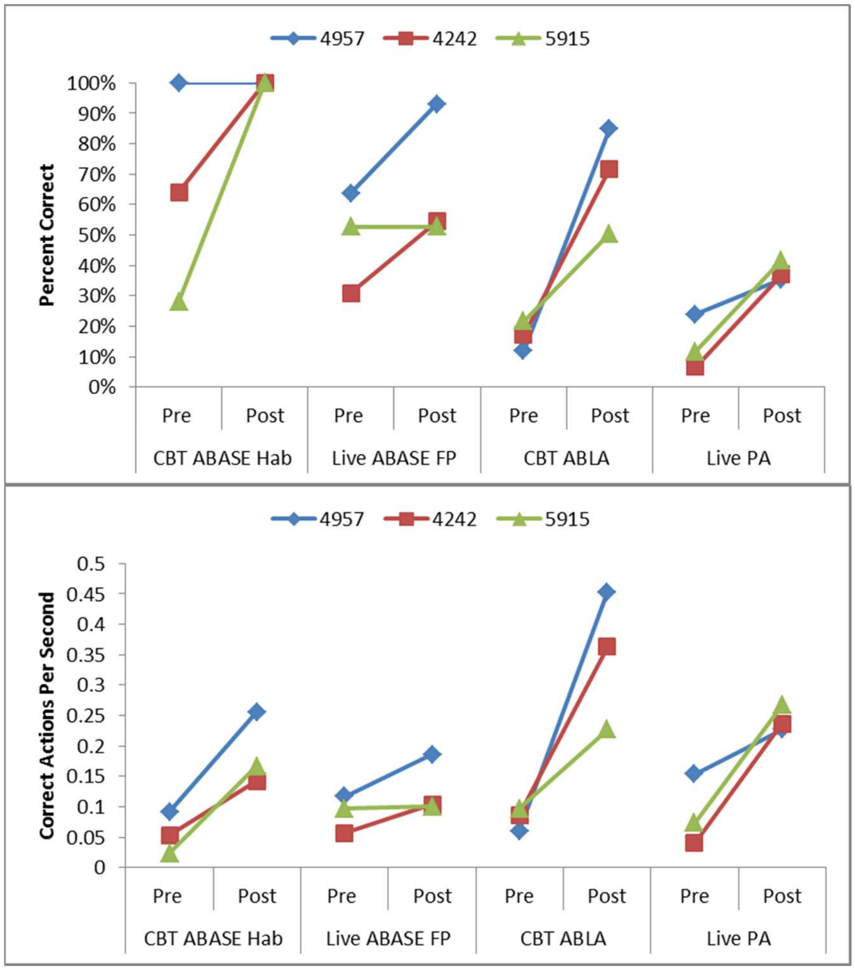


Figure 20. Change in accuracy (top panel) and the rate of correct actions (bottom panel) across all tasks for the participants in Group 2, Condition 3.

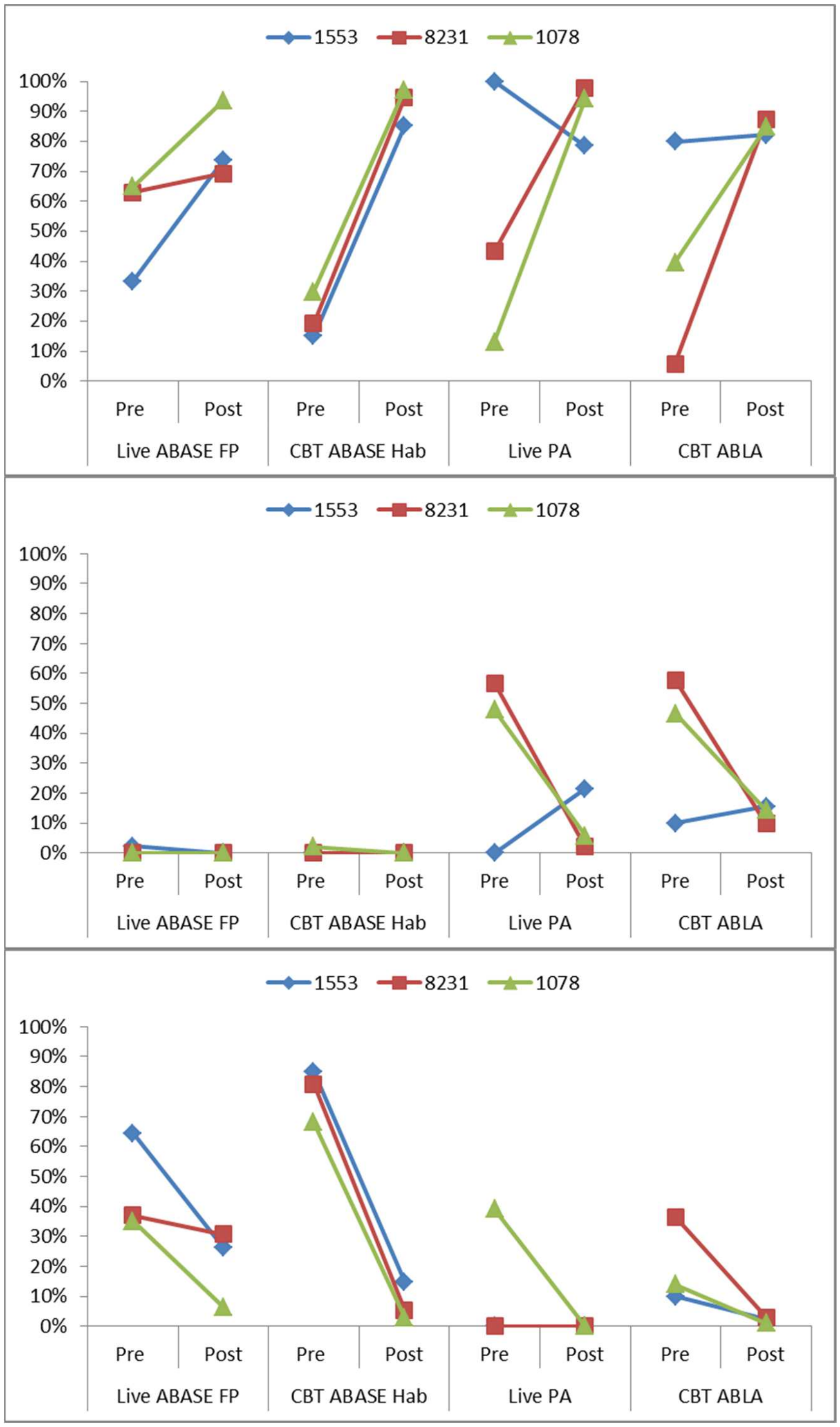


Figure 21. Change in total percentage of actions completed that were correct (top panel), incorrect (middle panel), and extraneous (bottom panel) across all tasks for the participants in Group 2, Condition 4.

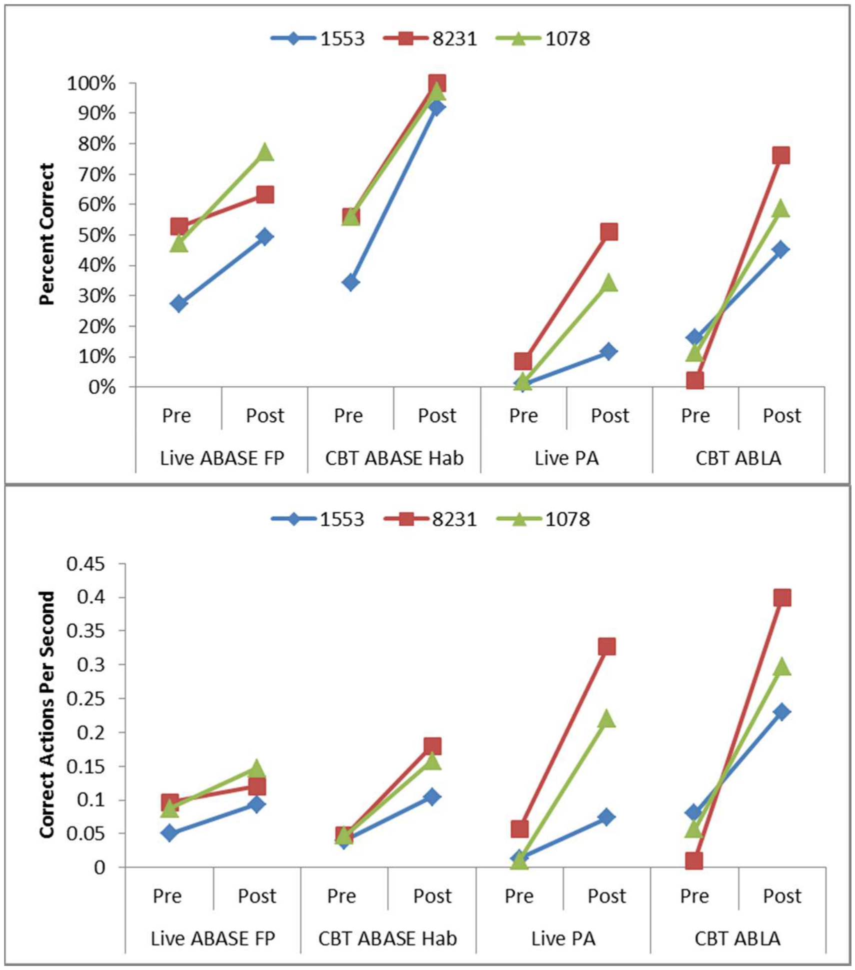


Figure 22. Change in accuracy (top panel) and the rate of correct actions (bottom panel) across all tasks for the participants in Group 2, Condition 4.

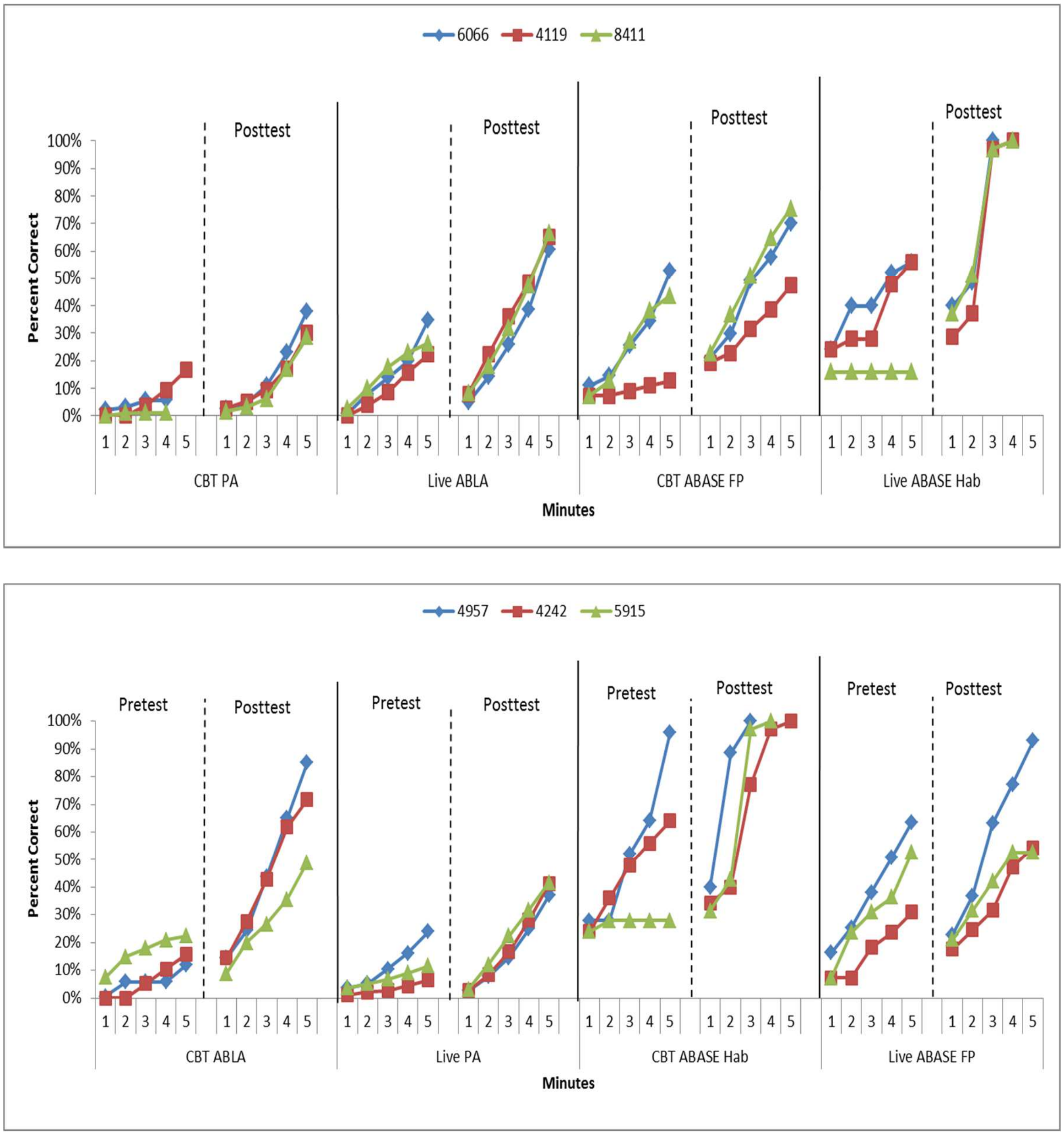


Figure 23. Percent Correct by minute of the pretest and posttest for Condition 3 of Group 1 (top panel) and Condition 3 of Group 2 (bottom panel).

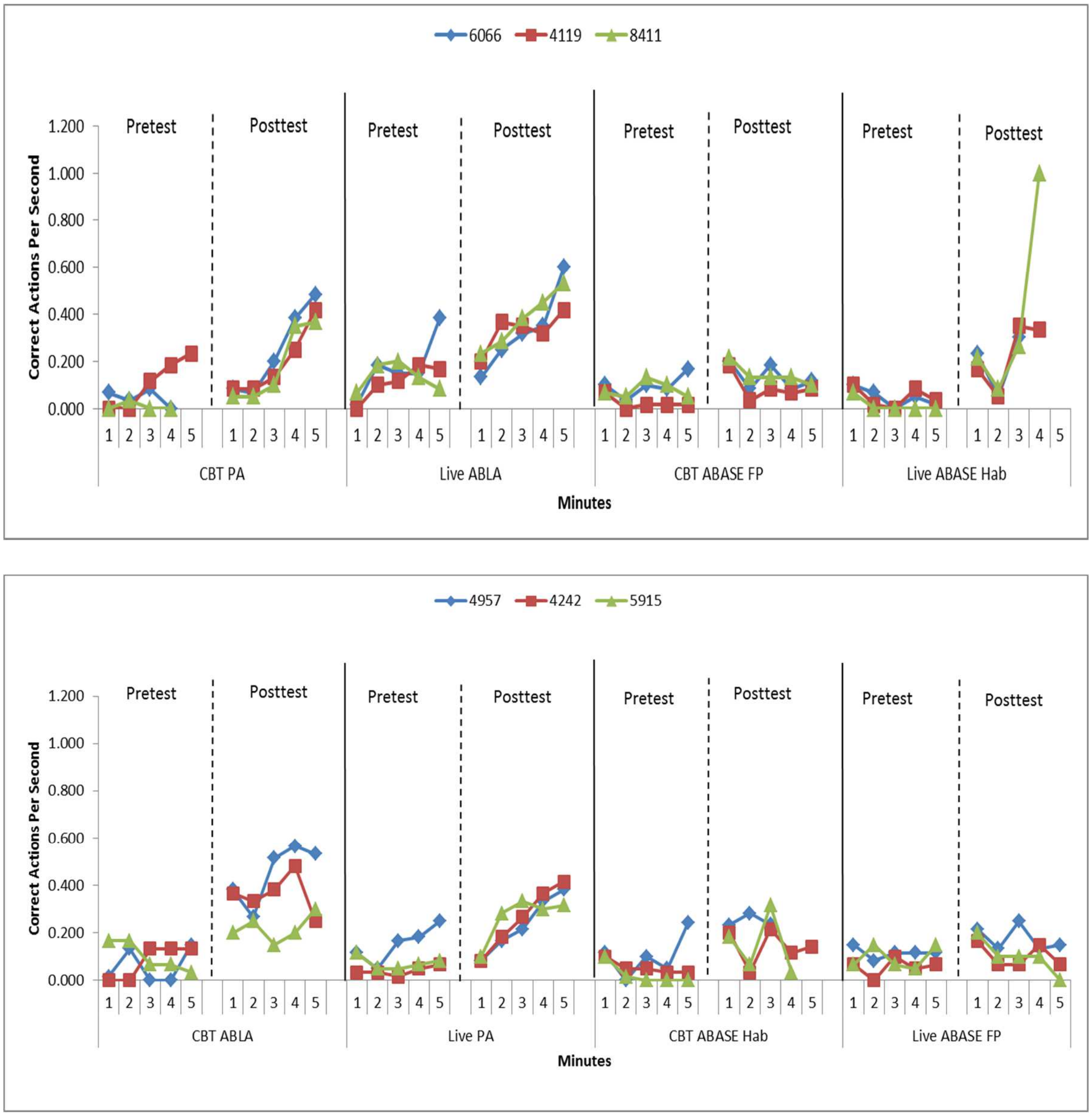


Figure 24. Rate of Correct Actions made Per Second organized by minute of the pretest and posttest for Condition 3 of Group 1 (top panel) and Condition 3 of Group 2 (bottom panel).

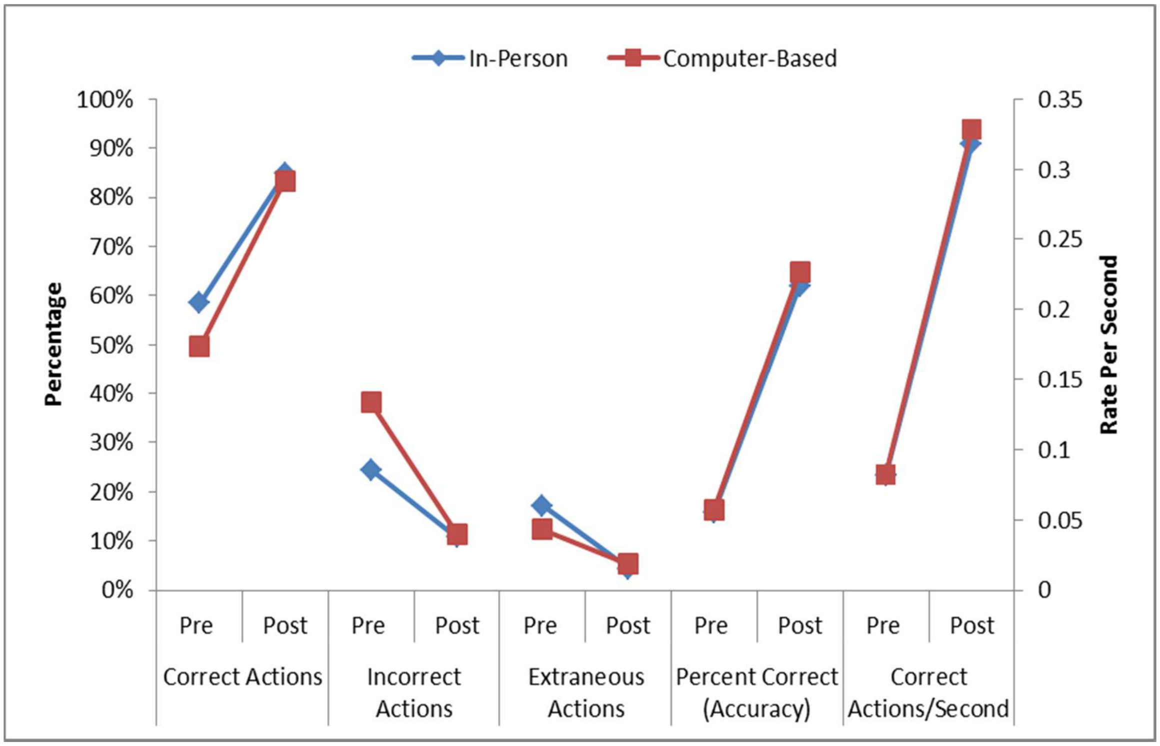


Figure 25. Average pretest and posttest scores from both the in-person (n=13) and computer-based (n=13) ABLA module for the five main measures reported. The proportion of correct actions, incorrect actions, and extraneous actions of the total actions made as well as the accuracy reported as percent correct are plotted on the primary axis. The rate of correct actions made per second is plotted on the secondary axis.

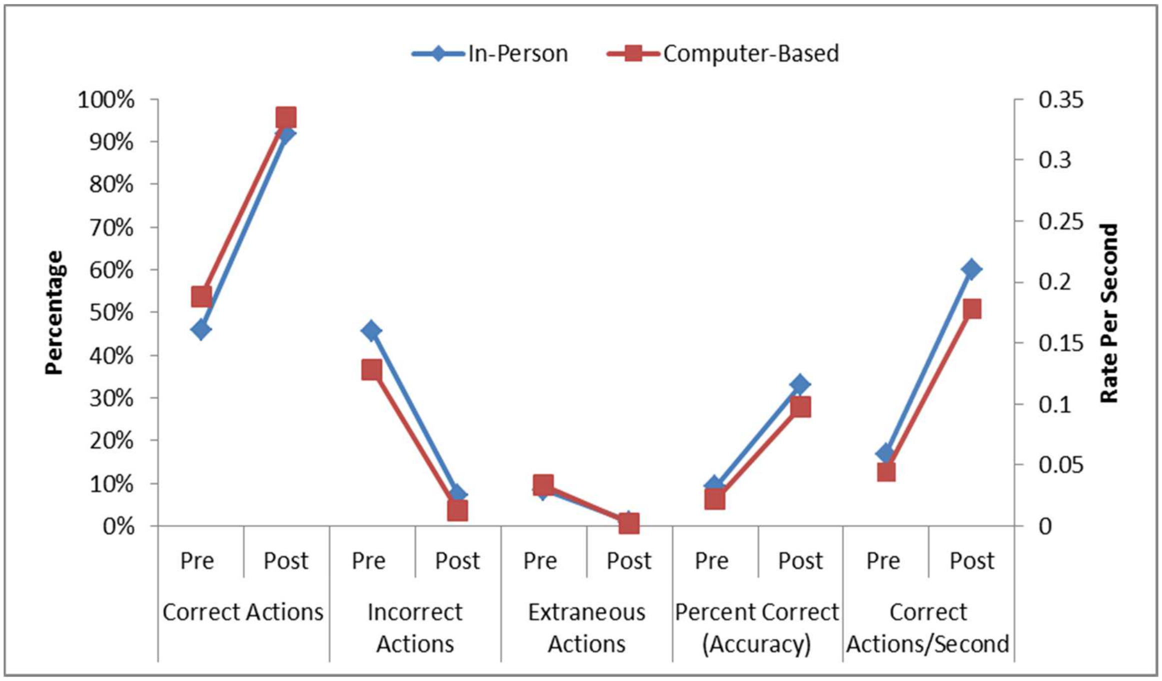


Figure 26. Average pretest and posttest scores from both the in-person (n=13) and computer-based (n=13) preference assessment module for the five main measures reported. The proportion of correct actions, incorrect actions, and extraneous actions of the total actions made as well as the accuracy reported as percent correct are plotted on the primary axis. The rate of correct actions made per second is plotted on the secondary axis.

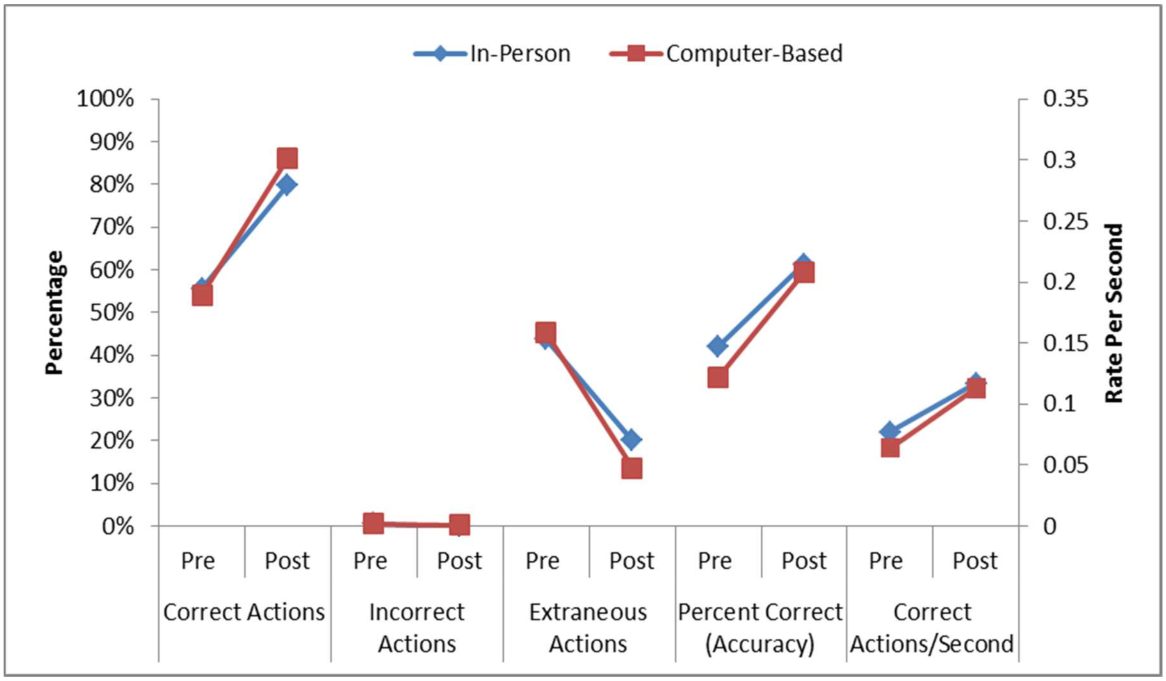


Figure 27. Average pretest and posttest scores from both the in-person (n=13) and computer-based (n=13) ABASE new entry module for the five main measures reported. The proportion of correct actions, incorrect actions, and extraneous actions of the total actions made as well as the accuracy reported as percent correct are plotted on the primary axis. The rate of correct actions made per second is plotted on the secondary axis.

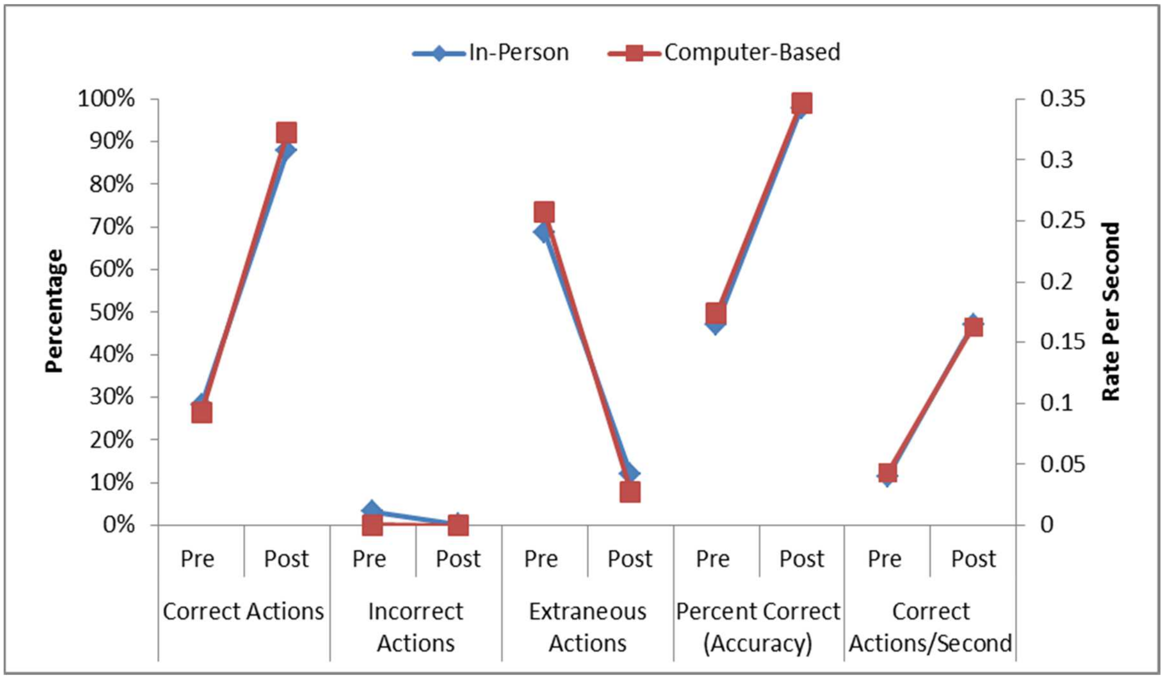


Figure 28. Average pretest and posttest scores from both the in-person (n=13) and computer-based (n=13) ABASE habilitation plan entry module for the five main measures reported. The proportion of correct actions, incorrect actions, and extraneous actions of the total actions made as well as the accuracy reported as percent correct are plotted on the primary axis. The rate of correct actions made per second is plotted on the secondary axis.

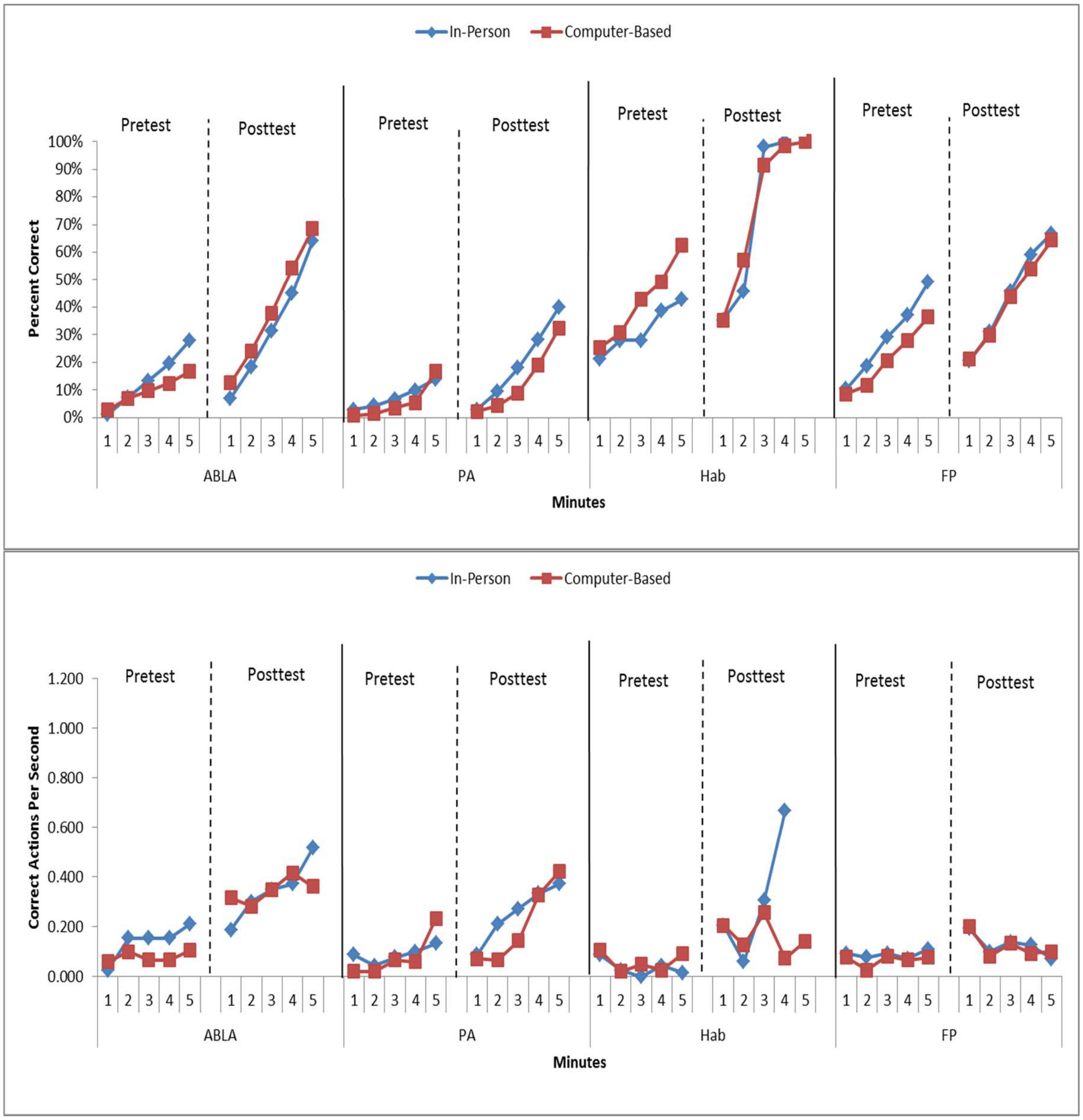


Figure 29. Average percent correct (top panel) and rate of correct actions per second (bottom panel) organized by minute of the pretest and posttest for Condition 3 of Groups 1 and 2.

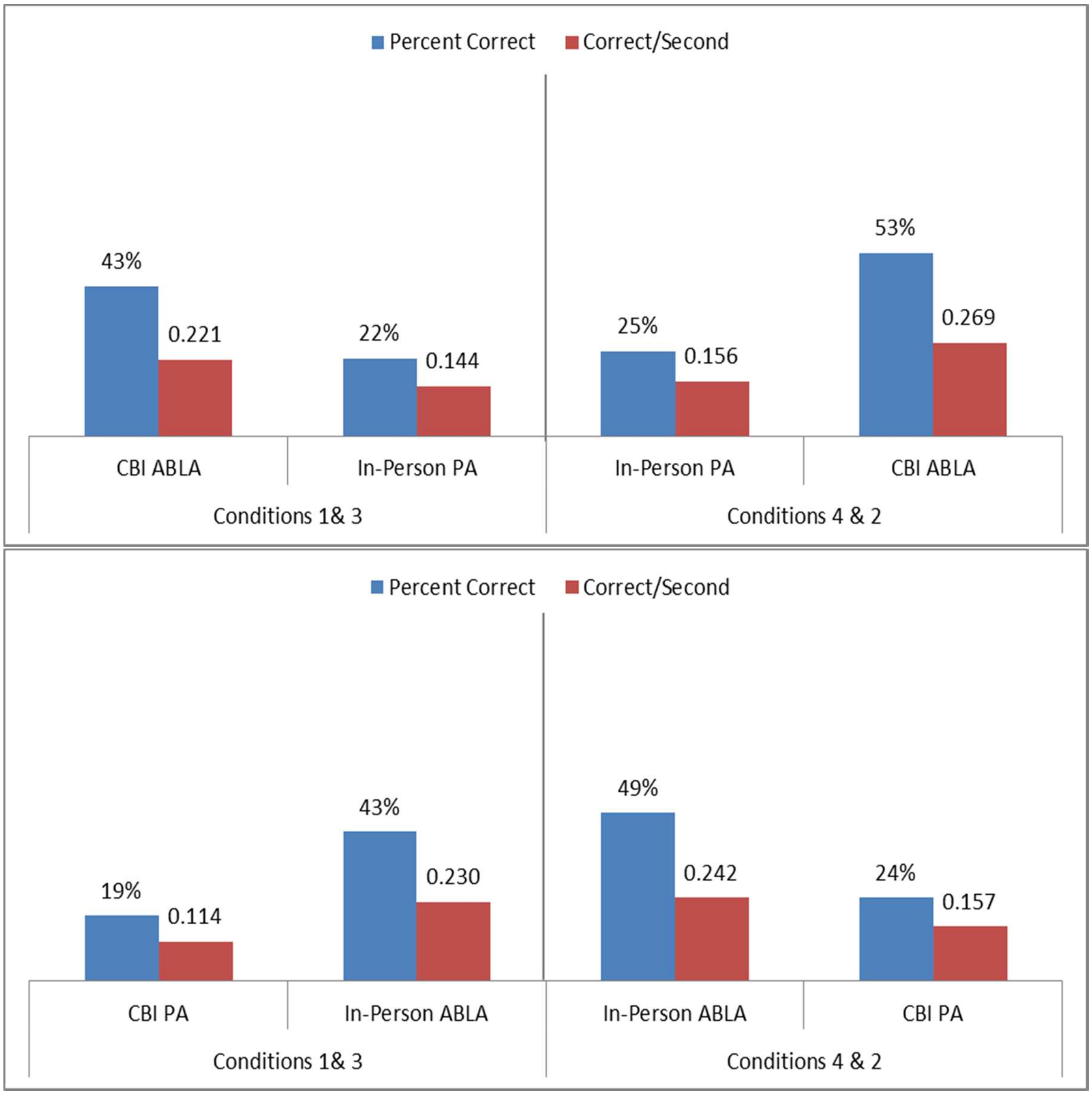


Figure 30. Gain from pretest to posttest in accuracy and rate of correct actions made per second on the preference assessment and ABLA for Group 1 (top panel) and Group 2 (bottom panel). Data are expressed in the order in which they were presented to the participants of the listed conditions.

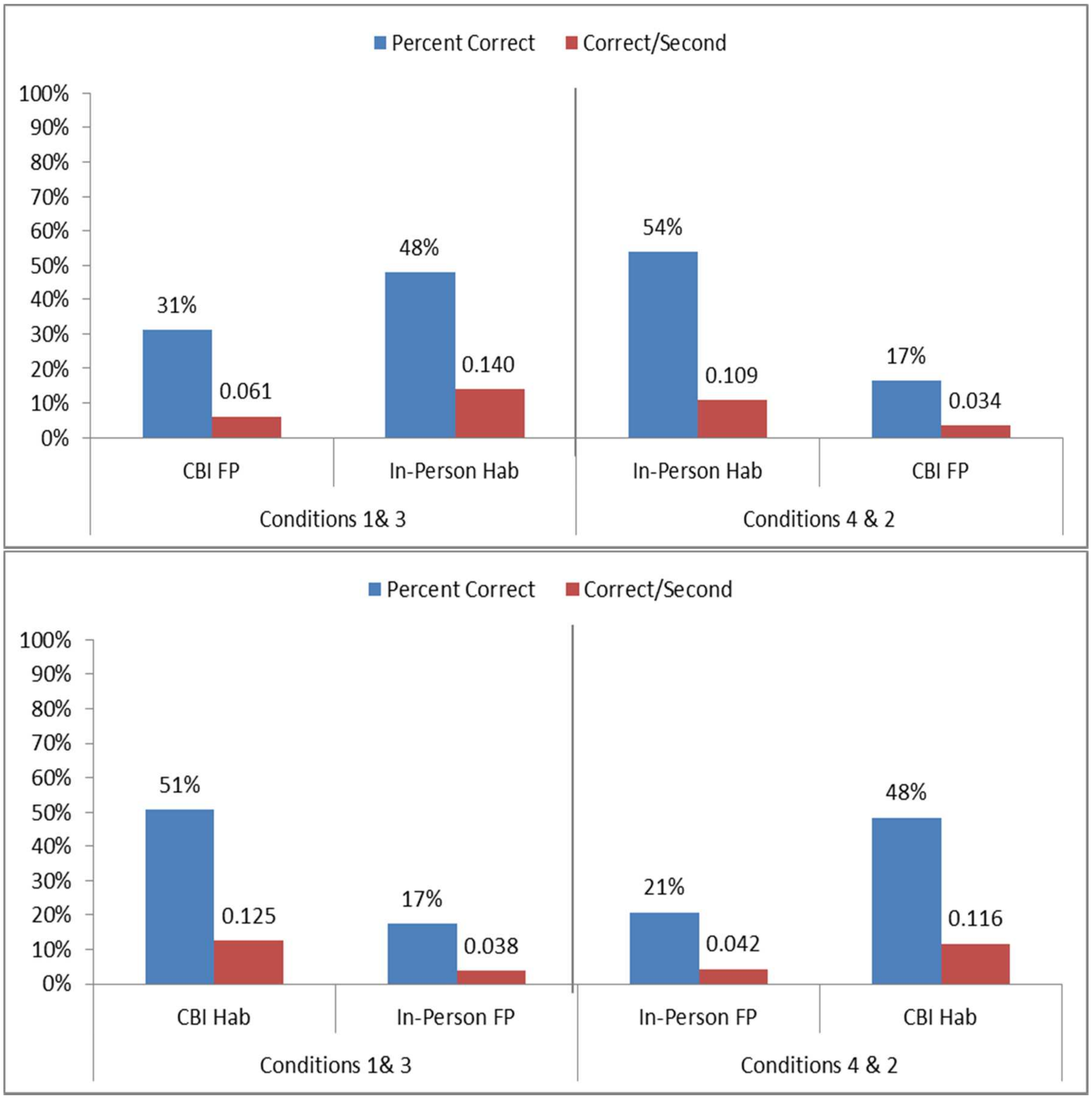


Figure 31. Gain from pretest to posttest in accuracy and rate of correct actions made per second on the entry of a focus person and habilitation plan into ABASE for Group 1 (top panel) and Group 2 (bottom panel). Data are expressed in the order in which they were presented to the participants of the listed conditions.

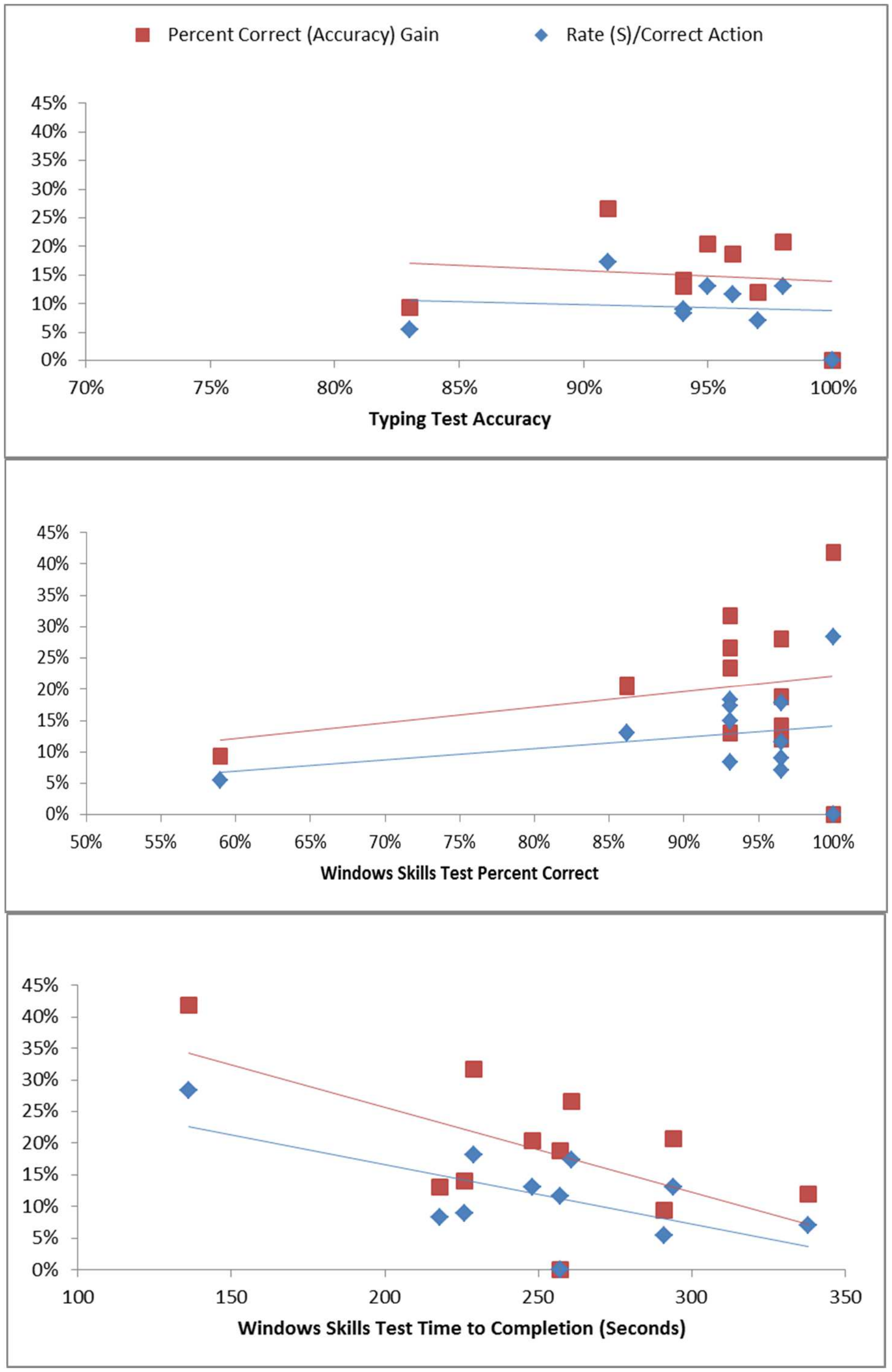


Figure 32. Scatter plot depicting the correlated relationships between acquisition measures and computer proficiency measures for participants who took a computer-based BST for administering a preference assessment.

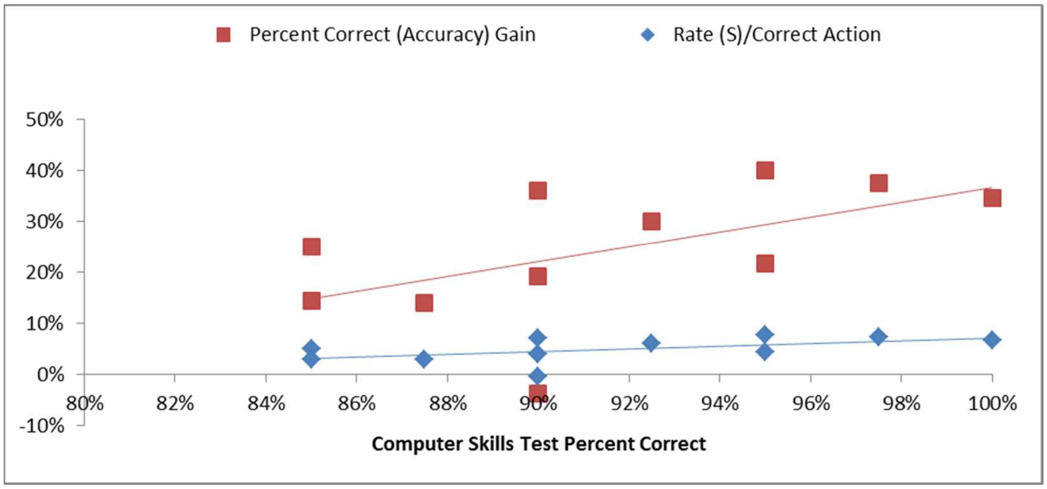


Figure 33. Scatter plot depicting the correlated relationships between acquisition measures and performance on the general computer skills assessment for participants who took a computer-based BST for entering a new focus person into ABASE.

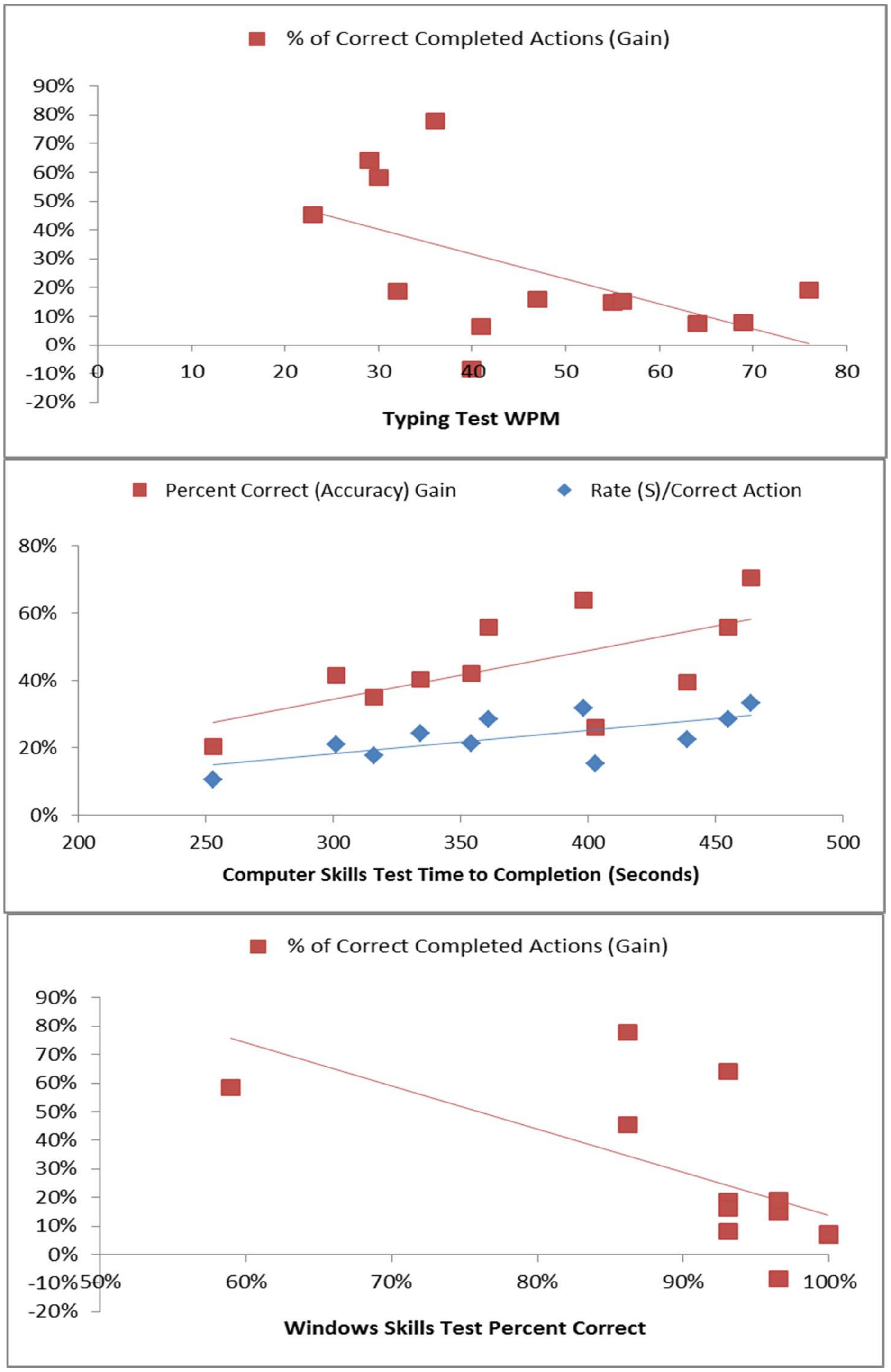


Figure 34. Scatter plot depicting the correlated relationships between acquisition measures and computer proficiency measures for participants who took an in-person BST for administering Level 4 of an ABLA.

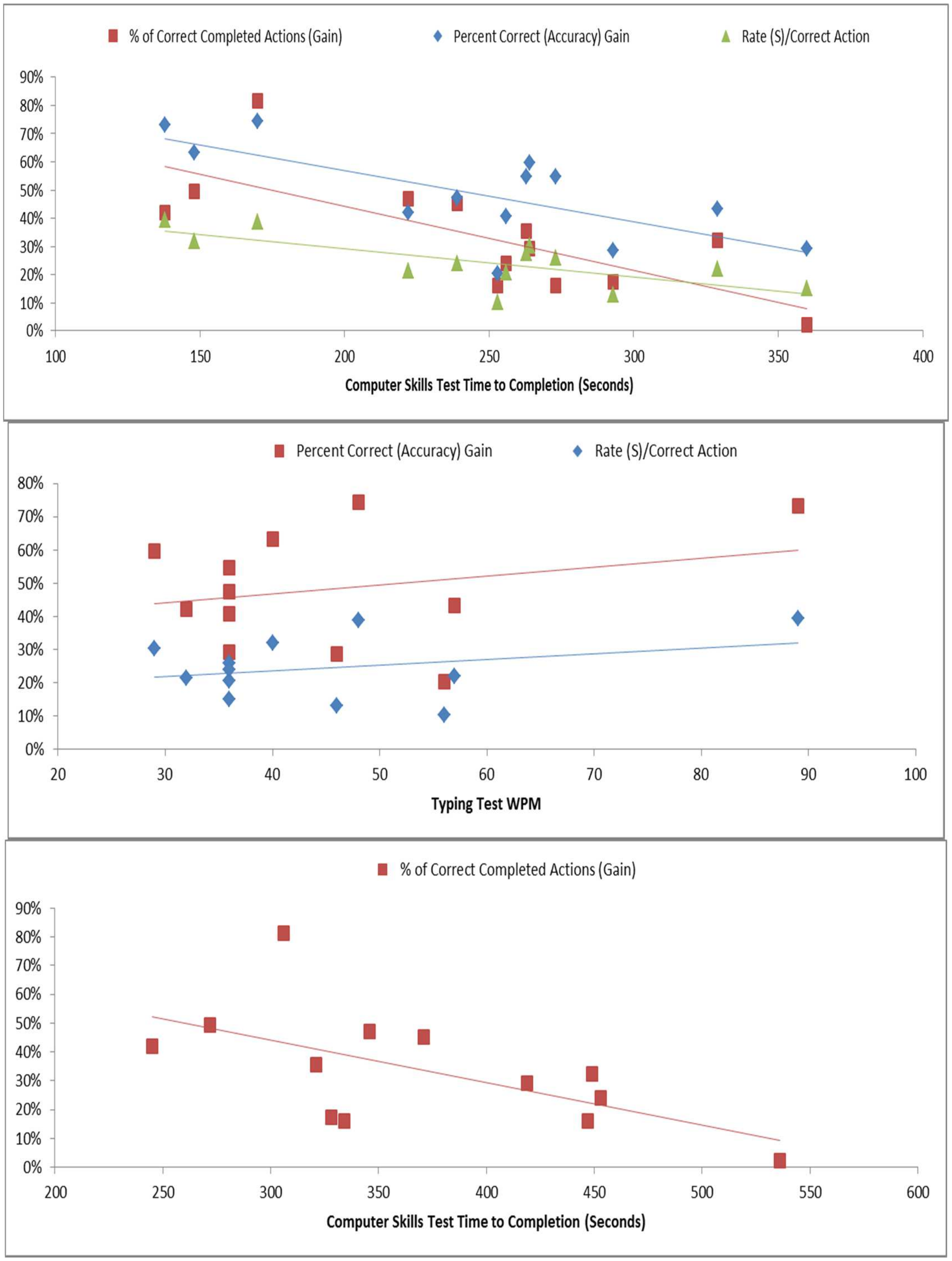


Figure 35. Scatter plot depicting the correlated relationships between acquisition measures and computer proficiency measures for participants who took computer-based BST for administering Level 4 of an ABLA.

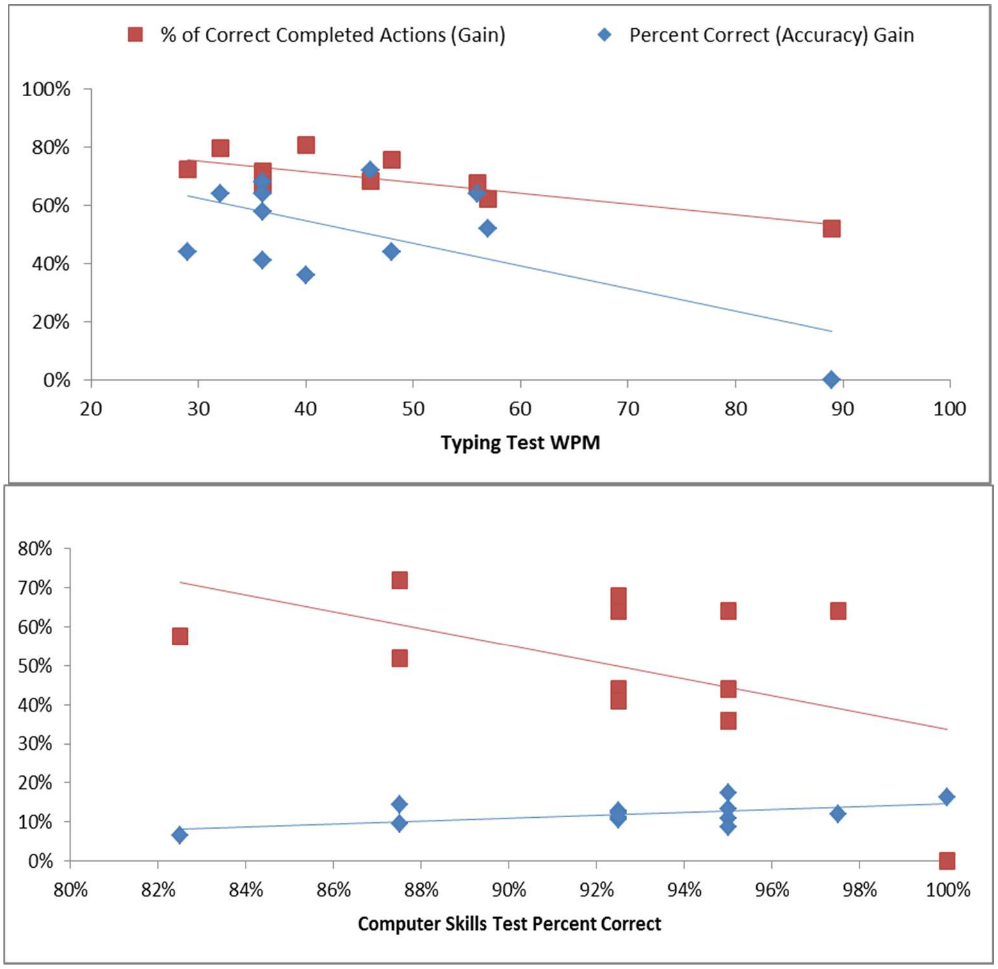


Figure 36. Scatter plot depicting the correlated relationships between acquisition measures and both typing speed and performance on the computer skills test for participants who took a computer-based BST for entering a habilitation plan into ABASE.

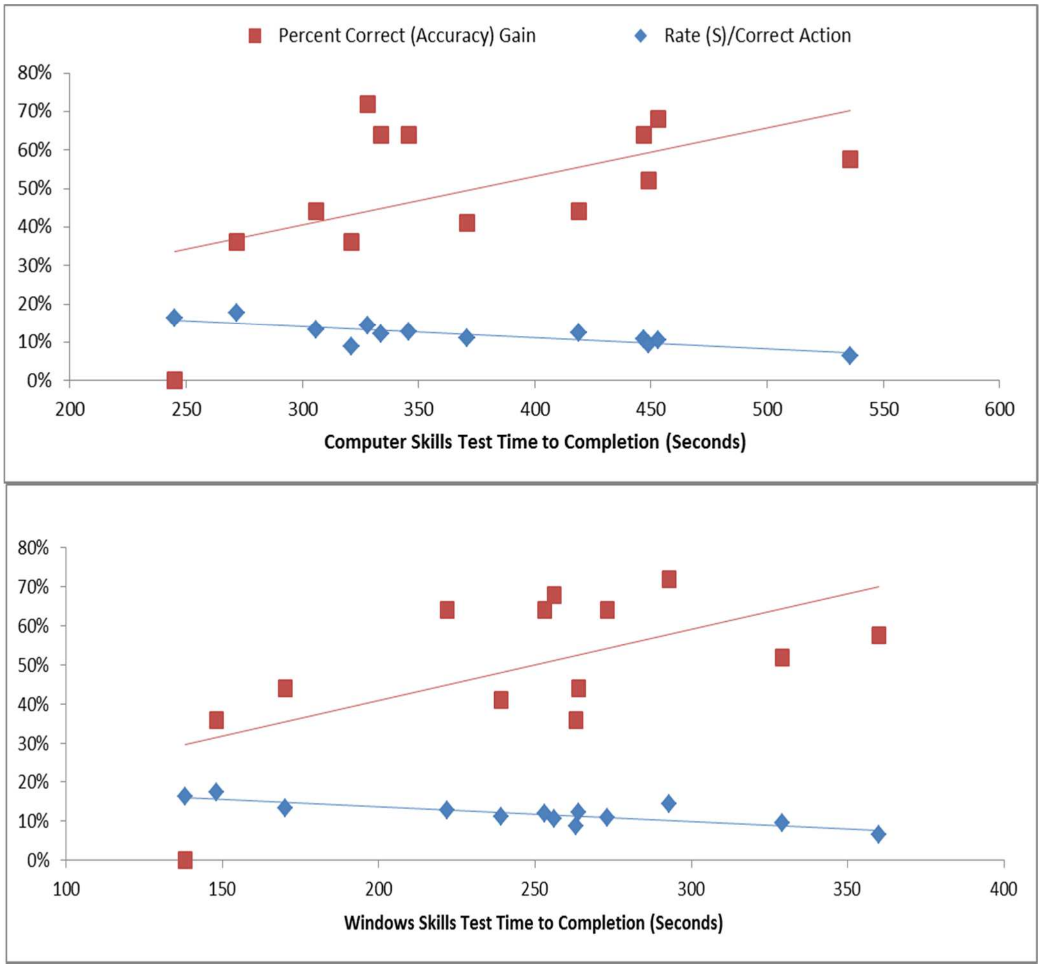


Figure 37. Scatter plot depicting the correlated relationships between acquisition measures and the rate of completion of both the general computer skills and Windows® skills assessments for participants who took a computer-based BST for entering a habilitation plan into ABASE.

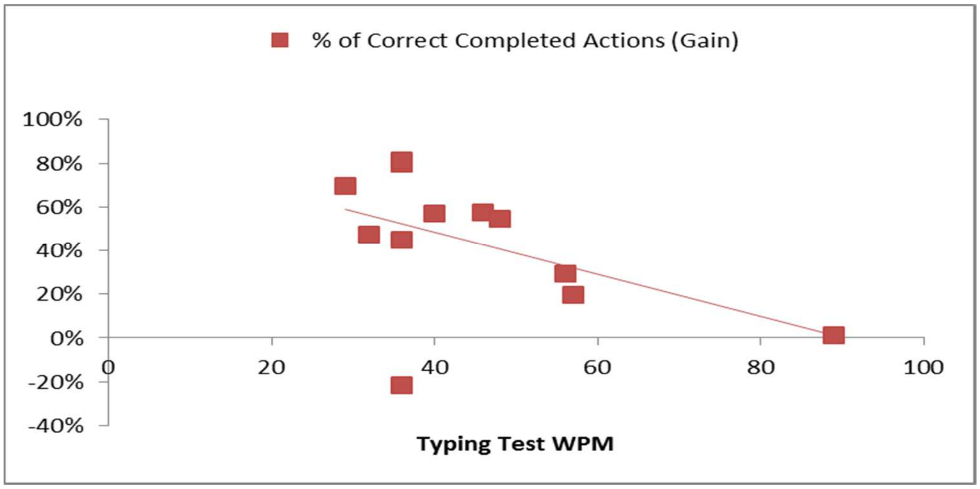


Figure 38. Scatter plot depicting the relationships between acquisition measures and typing speed for participants who took an in-person BST for administering Level 4 of an ABLA.

Appendix A

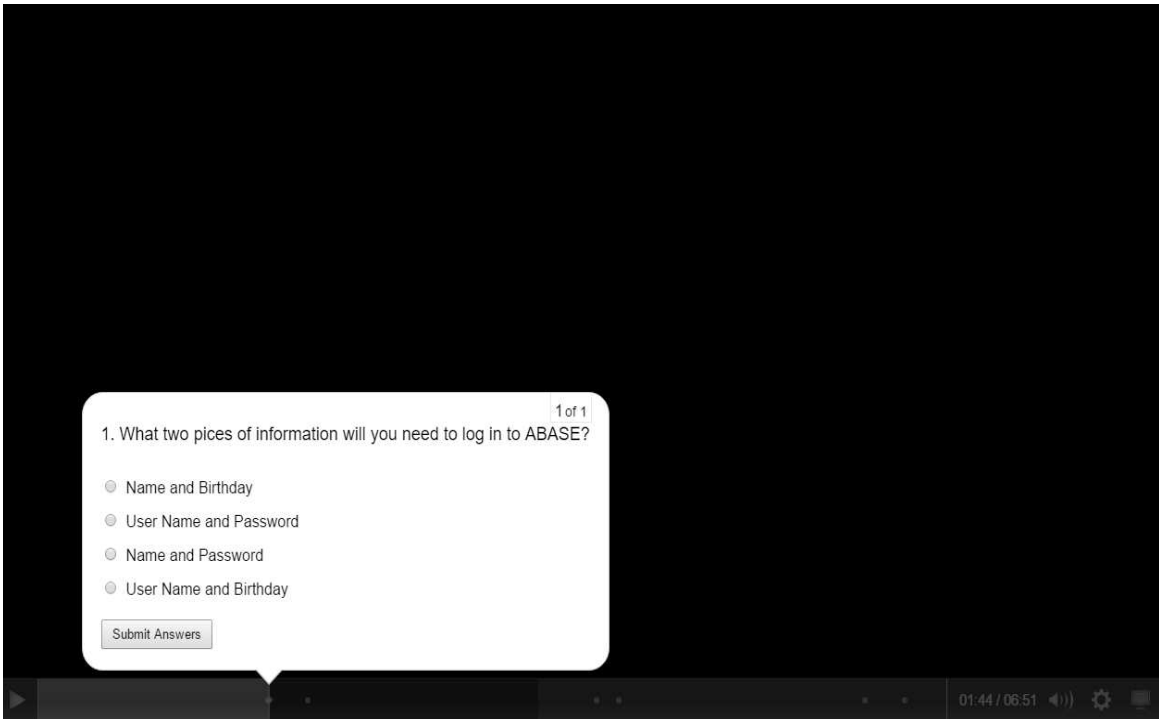
COMPUTER COMFORT SURVEY

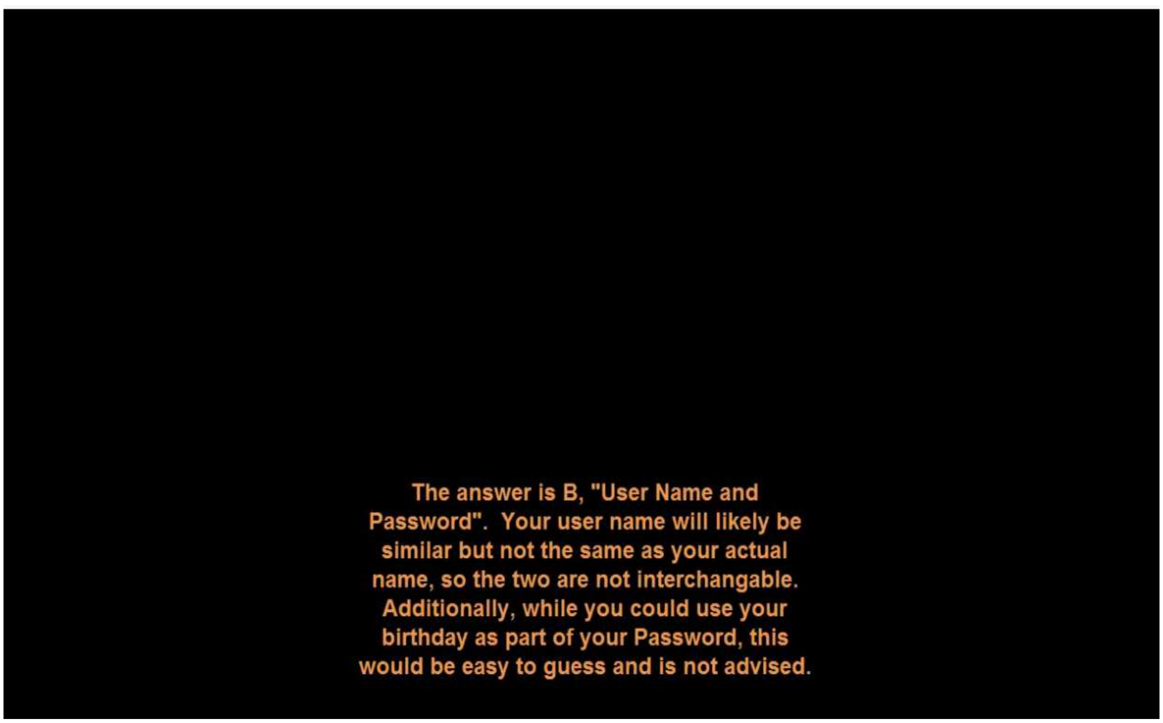
Directions: Please note how comfortable you are with each of the computer-related tasks listed on the left using the following scale.

1. I definitely don't know how to do this and would need instruction to do this task.
2. I'm somewhat comfortable doing this, but I would make many mistakes.
3. I'm comfortable doing this and would make few mistakes.
4. I'm very comfortable doing this and could do so quickly with few mistakes.
5. I could teach someone else to do this. I would also be able to do this task quickly without making mistakes.

Task	1 Don't Know Task	2 Many Mistakes	3 Few Mistakes	4 Fast & Few Mistakes	5 Could Teach Task
Turning on a computer					
Logging off of a computer					
Turning off a computer					
Identifying the parts of a computer system					
Logging on to password protected computers/programs					
Using "Enter" to move to the next line when typing					
Using left-click on the mouse to pull up relevant menus					
Opening something by double clicking on it					
Opening something by selecting it and then pressing "Enter"					
Dragging and dropping files/programs/etc.					
Using the desktop to find programs					
Using the "Start" Menu to find programs					
Using the digital recycle bin					
Using the menus inside programs to complete tasks					
Typing information into the correct spots on a form					
Switching between multiple open windows					
Minimizing, Maximizing, and closing windows					
Using "Tab" to move quickly through forms					
Using a Toolbar and the menu's on it					
Navigating dropdown menu's from the Toolbar					
Cutting and Pasting					

Appendix B


1 of 1
1. What two pices of information will you need to log in to ABASE?
Name and Birthday
User Name and Password
Name and Password
User Name and Birthday
Submit Answers
01:44 / 06:51


The answer is B, "User Name and Password". Your user name will likely be similar but not the same as your actual name, so the two are not interchangable. Additionally, while you could use your birthday as part of your Password, this would be easy to guess and is not advised.

Appendix C

Name: Leo Wyatt SRC Case #: 147342
Address: 346 Pimento Ct. Sparks, NV 89434 Phone#: 775-270-1132

Next of Kin: Casey Wyatt	Relationship: Father	Phone#: 775-270-1132	Cell#: 775-747-1133
Emergency: Lucy Wyatt	Relationship: Sister	Phone#: 775-374-3384	Cell#: 775-374-2745
Emergency: Dane Wyatt	Relationship: Brother	Phone#: 775-374-5736	Cell#: 775-384-4856

Basic Information: Start Date: 9/1/2008

SSN: 756-58-9576_____	DOB: 11/15/1985_____		Birthplace: NV________		Citizenship: USA______
Primary Language:	[X] English	[ ] Spanish	[ ] Sign Language		[ ]____________
Marital Status:	[X] Single	[ ] Married	[ ] Divorced	[ ] Widowed	[ ] Partnered
Race:	[X] Caucasian	[ ] African American	[ ] Hispanic/ Latino		[ ] American Indian/ Alaskan
	[ ] Asian	[ ] Hawaiian/ Pacific Islander	[ ] 2 or more races		[ ] Other:______ ______________
Gender:	[X] Male	[ ] Female			
Eye Color:	[ ] Blue	[X] Green	[ ] Brown	[ ] Hazel	[ ]________
Hair Color:	[ ] Blonde	[X] Black	[ ] Brown	[ ] Red	[ ]________
Height: 5'10"____	Weight: 195____	Identifying Marks:___________________________________			
Verbal Skills:	[ ] Strong	[X] Moderate		[ ]Weak	
Historian:	[ ] Good/Self	[X] Needs Support			
Supports:	[ ] Hearing Impairment	[ ] Non-Ambulatory		[ ] Visual Impairment	
Allergies:	Tylenol (Acetaminophen)				
Chronic Health Conditions:	None				

Funding Information:

Type	Number	Eligibility Date	Code/Waiver/Level
Title XIX: (SAMI)	74838478374	11/1/2000	62
Medicare/Medicaid	1826453968	11/1/2003	
Private Insurance			
Other			

Services:

Service Provider	Name	Agency	Phone	Fax
Service Coordinator	Rose Cates	SRC	775-756-9687	775-867-9576
Residential Provider	Howard Stills	Trinity	775-684-8674	
CTC/Day Service	Amanda Robbs	HSI	775-968-3548	775-867-2386
Primary Care	Dr. Kohn	St. Marys	775-586-9684	775-243-3452
Psychiatrist				

Appendix D

Service Type:	JDT
Goal:	Hand Washing
Scope/Objective:	Mary will wash her hands correctly with no more than a verbal prompt twice each day, before snack and before lunch.

Duration: Start Date:	2/1/2014	**End Date:**	2/1/2015

Provider	JDT
Hours/Week	n/a
Person Responsible to carry out steps:	Mary and Staff

Procedure to implement plan:

Step #:	Methods/Steps to assist person in learning the Scope/Objective:
1. Snack	Mary will wash her hands correctly before snack. Prompts Allowed: I, V, G, PP, FP • Independent (+): She doesn't need any prompts. • Verbal Prompt (V): Any verbal reminder to wash correctly. • Gestural Prompt (G): Pointing to parts of the hand/faucet/etc. to help her do it correctly. • Partial Physical Prompt (PP): Any touching (leading her hands to the faucet, etc.) applied to help her achieve her goal. • Full Physical Prompt (FP): If hand-over-hand is required for all the necessary steps in order to complete the goal.
2. Lunch	Mary will wash her hands correctly before lunch. Prompts Allowed: I, V, G, PP, FP • Independent (+): She doesn't need any prompts. • Verbal Prompt (V): Any verbal reminder to wash correctly. • Gestural Prompt (G): Pointing to parts of the hand/faucet/etc. to help her do it correctly. • Partial Physical Prompt (PP): Any touching (leading her hands to the faucet, etc.) applied to help her achieve her goal. • Full Physical Prompt (FP): If hand-over-hand is required for all the necessary steps in order to complete the goal.

Appendix E

Preference Assessment Form

Date: __________________ Student: ____________________

Items to be assessed

Number	Item	Number	Item
1		4	
2		5	
3		6	

Instructions:

1. Present both numbered items simultaneously. Place the first item on your left. The second item on your right.
2. If the student doesn't select one, say, "Pick One."
3. Record as a selection any touch to an item. Circle the selected items.
4. If the item is an edible, allow the student to consume it before going on.
5. If the item is an activity, let the student play with it for 30 seconds.
6. Block any attempts to touch both items simultaneously.
7. If no response is made in 10 seconds, record "NR" and move to the next trial.
8. Be sure that the student has tasted or played with all items before assessing them.
9. Calculate the percentage of trials that each item was selected. Those items selected 80% or more of opportunities are most probably going to function as positive reinforcers.

Trial	Left	Right	Trial	Left	Right	Trial	Left	Right
1	1	2	11	5	2	21	3	5
2	3	2	12	4	3	22	6	2
3	2	6	13	1	5	23	1	4
4	1	3	14	5	3	24	4	5
5	6	5	15	4	1	25	6	3
6	3	6	16	2	5	26	2	4
7	2	3	17	4	2	27	2	1
8	5	1	18	5	4	28	6	4
9	4	6	19	6	1	29	3	1
10	5	6	20	3	4	30	1	6

Summary

Item 1 Selected ___ out of 10 or ___ % of opportunities
Item 2 Selected ___ out of 10 or ___ % of opportunities
Item 3 Selected ___ out of 10 or ___ % of opportunities
Item 4 Selected ___ out of 10 or ___ % of opportunities
Item 5 Selected ___ out of 10 or ___ % of opportunities
Item 6 Selected ___ out of 10 or ___ % of opportunities

Appendix F

Level 4 – Visual Identity Match-to-Sample Discrimination

Level 4 assesses whether or not a student can learn to consistently place the red cube in the red box, and the yellow cylinder in the yellow can. Study the rest of this page carefully.

Initial Prompting Sequence - Don't Record Responses

1. Place the box and the can in front of the student.
2. Demonstrate. Start with the cylinder. Say, "When I say, `Where does it go?' it goes in here," while demonstrating placing the cylinder into the can.
3. Guided trial. Say, "Let's try together." Take the student's hand while it grasps the cylinder, say, "Where does it go?" and guide the student to place the cylinder into the can. Give praise.
4. Opportunity for independent response. Say, "Now you try. Where does it go?" Give the cylinder to the student. If the student places the cylinder into the can, give praise. If the student makes an error, repeat the prompting sequence. Do not mark the data sheet.
5. Repeat steps 2, 3, and 4 with the little red cube and the red box.

If the Student Responds Correctly on the Above Steps, you are Ready to Begin Scoring

6. Notice on the ABLA-R Level 4 data sheet (see p. 33) whether the can goes on the left or the right (see "container position"), and whether to present the cube or the cylinder (indicated by the location of the dot).
7. Give the object (the cylinder or the little red cube) to the student and say, "Where does it go?"
8. If the student places the object into the correct container:
    - Give praise.
    - Place a ✓in the test-trials rectangle on the data sheet for that trial.
    - Repeat Steps 6, 7, & 8 until the student gets 8 correct in a row.
    - Reinforce every correct independent response with praise and an edible.
9. If the student places the object in the wrong container:
    - Say, "No. That's not where it goes."
    - Shade the test-trials rectangle for that trial number.
    - Do the three steps of the error correction procedure.
    - On the opportunity for an independent response of the error correction procedure, place a ✓or shade the error-corrections rectangle (for correct or incorrect).
    - Continue error correction until a correct response occurs on an opportunity for an independent response.
    - Return to Step 6.
10. Continue until:
    - A pass occurs (8 correct test trials in a row)
    - A fail occurs (8 total errors)

Appendix G

ABLA-R Level 4 Data Sheet

Student : ______ Tester : ______ Observer : ______

Test Date : ______ Start Time : ______ End Time : ______ Result : ______

Instructions : Under "Container Position", the circle represents the can and the square represents the box. The dot shows the correct destination for the manipulandum (and therefore whether to present the red cube or yellow cylinder). If a response is correct, place a check in the appropriate Results column rectangle and proceed to the next trial. If response is incorrect, shade in the entire box and proceed to the next error correction (if any).

Trial	Container Position	Results: Test Trial	Results: Error Corrections	Trial	Container Position	Results: Test Trial	Results: Error Corrections
1	□ ⊙	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐	31	○ ⊡	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐
2	⊙ □	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐	32	⊙ □	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐
3	⊡ ○	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐	33	□ ⊙	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐
4	○ ⊡	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐	34	⊡ ○	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐
5	□ ⊙	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐	35	□ ⊙	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐
6	⊡ ○	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐	36	○ ⊡	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐
7	⊙ □	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐	37	⊡ ○	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐
8	○ ⊡	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐	38	⊙ □	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐
9	⊡ ○	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐	39	□ ⊙	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐
10	□ ⊙	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐	40	⊙ □	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐
11	○ ⊡	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐	41	⊡ ○	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐
12	⊙ □	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐	42	○ ⊡	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐
13	□ ⊙	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐	43	□ ⊙	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐
14	⊡ ○	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐	44	⊡ ○	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐
15	⊙ □	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐	45	⊙ □	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐
16	○ ⊡	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐	46	○ ⊡	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐
17	⊡ ○	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐	47	⊡ ○	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐
18	○ ⊡	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐	48	□ ⊙	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐
19	□ ⊙	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐	49	○ ⊡	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐
20	⊙ □	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐	50	⊙ □	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐
21	⊡ ○	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐	51	□ ⊙	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐
22	□ ⊙	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐	52	⊡ ○	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐
23	○ ⊡	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐	53	⊙ □	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐
24	⊙ □	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐	54	○ ⊡	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐
25	□ ⊙	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐	55	⊡ ○	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐
26	○ ⊡	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐	56	○ ⊡	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐
27	⊡ ○	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐	57	□ ⊙	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐
28	⊙ □	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐	58	⊙ □	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐
29	○ ⊡	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐	59	⊡ ○	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐
30	□ ⊙	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐	60	□ ⊙	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐

Passing criterion: 8 consecutive correct responses on test trials

Failing criterion: 8 cumulative incorrect responses

Appendix H

To the best of your ability, complete the following two tasks:

1. Enter the face sheet information into ABASE to create a new entry.

2. Alter your staff permissions so that you can access that new entry.

Appendix I

To the best of your ability, enter this habilitation plan into ABASE.

Appendix J

SLIDE 1: Today we will learn how to enter habilitation plan into ABASE.
SLIDE 2: ABASE is the Applied Behavior Analysis Software Environment. And it is a software program that is used to collect and analyze behavior data from individuals who are currently receiving support services from family or providers. To track an individual's progress on a particular skill the habilitation plan for that skill needs to be entered into the program. To do this you will need to enter the information from the patient plan into the goal tracking section of ABASE
SLIDE 3: To get started, the first thing you'll need to do is open ABASE. Then type your username and password into the entry screen that pops up. Once you've done that, hit enter on the keyboard, or click the arrow at the bottom right of the window that says next.
SLIDE 4: Next you'll need to find the entry for the individual who habilitationplan you'll be entering into ABASE. You'll do this by finding the individuals name in the list on the welcome screen. Selecting it and either pressing enter or next or just doubt clicking on it. You'll know you selected the correct focus person when their name shows up next current focus person in the upper right hand corner of the screen.
SLIDE 5: As discussed, you can see a list of the individuals whose names are in ABASE in the center of the screen after you log in. Find the correct individual and select him. As long as the name in upper right hand corner of the screen matches the one on the habilitation plan you need to enter into the program, you'll know you've done right thing.
SLIDE 6: Now open the goal look up by going into the focus person menu hovering over program goals in the dropdown and then clicking on define goals and objectives in the secondary dropdown menu appears.
SLIDE 7: Once you've done that the goals, objectives and operational definition lookup will open. Click on the plus button on the right hand side of the margins of the lookup window to open the program entry form.
SLIDE 8: When the habilitation entry form pops up you'll need to take the information from the habilitation plan and put in into the entry form in ABASE. Sections of the habilitation plan correspond to areas of the entry form.
SLIDE 9: Here you can familiarize yourself with the entry form in ABASE. As you can see there's a section for the goals, the objective, the response name, the correct response topography, the dates for the program, as well as the service area of the particular program being run.
SLIDE 10: Here you'll see the entry forms shown previously is colored coded to match the habilitation plan you'll see on paper. Each section of the habilitation plan goes into the entry form in ABASE in a particular spot, as noted by the colors here. Go ahead and take a look
SLIDE 11: Once you've entered all the basic information from the hab plan into the entry form, you'll need to select the prompts by clicking on the dropdown menu next to the goal description. You'll either select yes or no, if you'll just be describing whether or not the person did the task, or prompt, if you're going to be describing what prompt the person actually needed to do the particular task correctly. If you need to select prompt, you're going to have to click the blue link to the right that pops up and select which prompts are allowed by clicking in the boxes next to their names on the window that comes up. Once you've done this, click save.
SLIDE 12: Once you've entered in the habilitation plan information and prompt information you can feel free to click save in the bottom right hand corner of the entry form in order to save this habilitation plan into ABASE.
SLIDE 13: That's it. Now please watch the following video which will show all the steps to adding a new habilitation plan in to ABASE.

SLIDE 14 (After video): Now you'll answer some questions regarding entering habilitation plan into ABASE. Please complete each question when you're done and have submitted your answers, you'll be given feedback on your performance
SLIDE 15: Thank you very much for your participation.

Appendix K

Hab Plan Quiz: Wrong Answer Feedback

1. Incorrect - You need to log in, select the correct individual, open "Define Goals and objectives, then press the "+", then add the info from the Hab plan into ABASE and click save.
2. Incorrect - You can select the person's name on the welcome screen and then press enter, press next, or simply double click the name to open the entry.
3. Incorrect - You will know that you have selected the correct person when their name is in the upper right-hand corner of the screen.
4. Incorrect - You need to go to Focus Person, then Program Goals, and then select Define Goals and Objectives.
5. Incorrect - You need to hit the "+" button to open a blank hab plan.
6. Incorrect - Section 1 goes with B, 2 with D, 3 with C, 4 with A, 5 with F, 6 with G, 7 with H, and 8 with E.
7. Incorrect - You do need to hit "Save" when you're finished entering info into the hab plan.
8. Incorrect - Some programs use prompts, too.
9. Incorrect - You will need to select your own prompts based on what that hab plan says you need.
10. Incorrect - "Yes-No" data record whether a task was done or not. Prompts record how much help someone needed with the task.
11. Incorrect - You'll need to select "Prompt" from the dropdown, click on the blue link, and then select the prompts you need.
12. Incorrect - You need to check the I, the V, the G, and the FP.