The Use of Smart Technology on Improving Time Management of College Students with Intellectual/Developmental Disability

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Abstract

The purpose of this study was to examine the use of smart technology (i.e., Apple iPhone and Fitbit Smartwatch) on time management skill acquisition of students with intellectual/developmental disabilities who attend college. A single-subject multiple probe design was used to examine the use of the Model-Lead-Test strategy on three student's ability to set alarms based on his or her daily schedule and then leave for class on time. Results show that all students were able to acquire the skills needed to independently set the alarms in a brief amount of time. A description of the methodology, task analysis, and results are provided.

Keywords: Intellectual Disabilities, Developmental Disabilities, Model-Lead-Test, Smart Technology, Time Management

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Individuals with disabilities in the United States are employed at rates less than half of individuals without disabilities (Bureau of Labor Statistics, 2013). Further examination of employment statistics reveal that individuals with an intellectual disability (ID) have the highest rates of unemployment and underemployment (Office of Disability Employment Policy; ODEP, 2012). To increase employment skills and promote independence, students with ID should be taught various leisure and self-determination skills. Increasing self-determination and independence has been shown to increase employability and job retention in competitive employment opportunities for individuals with ID (Wehmeyer & Palmer, 2003).

Self-determination is one's ability to act as a causal agent in one's own life (Wehmeyer Bolding, 2001). Self-determination is developed through interrelated components that include (a) choice- and decision-making skills, (b) problem-solving and goal-setting and attainment skills, (c) self-management skills, (d) self-advocacy skills, (e) self-awareness, and (f) self-understanding (Wehmeyer & Bolding, 2001). All components are important, however self-management skills are critical as young adults' transition into new phases of life and are placed in environments that require more independence. Self-management includes the ability to manage one's time and to recognize various daily tasks or activities and to independently transition from those tasks or activities. When an individual is unable to manage schedules or tasks, he or she is reliant on others to prompt them through this process. This will most likely negatively affect the individual's belief in the intrinsic control of his or her affairs (Davies, Stock, & Wehmeyer, 2002).

The ability to manage a schedule and understand overall time management is an important component of independence. Before the use of technological devices, research on time management generally focused on the effects of picture activity books/schedules on classroom and vocational task completion (Irvine, Erickson, Singer, & Stahlberg, 1992; Sowers, Verdi, Bourbeau, & Sheehan, 1985). Picture activity books/schedules provide sequences to complete a task or transition from various activities. To date, there is a fair amount of research that has examined the effect of Picture Activity Schedules (PAS) on on-schedule and on-task behaviors in both classroom tasks and in recreation and leisure activities. Spriggs, Gast, and Ayres (2007) examined the use of PAS on on-schedule and on-task behavior while completing classroom tasks. The use of the PAS showed participants quickly learned the mechanics of the picture schedules and increased and maintained high levels of independent on-schedule and on-task behavior. Whatley, Gast, and Hammond (2009) replicated Spriggs et al. (2007) in a study of middle school students with moderate ID and found similar results across transition of leisure activities. Whatley et al. (2009) found that all participants increased on-task behavior and independent transitioning between activities. In this case, participants were allowed to choose the leisure activity they would participate in while following individual picture schedules. Imbedding the ability to choose allows the individual with ID to further develop self-determination skills. Not only did the participants show the ability to transition from activities but chose each activity they wanted to participate in. In a similar study, Carson, Gast, and Ayres (2008) further examined Picture Activity Schedule Books (PASB) on transition from activities in a school cafeteria and community job site. This study evaluated the effects of independent task changes and task completion. Prior to the evaluation, participants were taught each of the vocational tasks required for the study. The number of independent task changes in all

participants decreased as the PASB was withdrawn and when the PASB was again inserted, the number of independent task changes increased. As individuals with ID were taught to use the PASB they required less reliance on others when transitioning to other tasks in job settings.

As technology evolves, aspects of universal design are implemented into new technology, making everyday devices more accessible for students with ID. This allows individuals with ID to use their new technology as a support for increased independence but continue to look like their peers without the use of bulky or awkward assistive technology. Increased independence or less reliance on other people can often open doors to more inclusive environments. General education settings may be easier to access using supports that are not staff personnel. For students transitioning out of secondary education, career opportunities could be expanded. With the emergence of portable technology devices, the concept of same picture sequences have been applied using different modes of technology. Davies et al. (2002) examined the effects of a palmtop personal computer (PC) with Schedule Assistant software on schedule maintenance and time-management skills. The participants in the study took part in this training in either a local community agency providing community-based vocational support or participated in a school district community-based program for individuals with ID who were 18 to 21 years of age. When using the palmtop PC with the Schedule Assistant, participants made significantly fewer errors in following their work schedule and completing various vocational tasks. Riffel et al. (2005) followed up research by Davies et al. (2002) using Visual Assistance software on a palmtop PC with individuals with ID in a school or community-based setting. Results reported by Riffel et al. (2005) supported findings of previous research, suggesting increased task completion with a reduced number of external prompts in order to complete independent living or vocational tasks. The use of a technological device in mainstream settings to provide the scheduling supports (i.e.,

work, school, home, leisure) allowed individuals with ID to perform their tasks while looking like same-aged peers using the same technological devices commonly used in society. Over time, technology has evolved and similar research has been studied with newer devices. Douglas and Uphold (2014) examined the effects of electronic photographic activity schedules (ePAS) on iPad or iPod touch devices on task completion. In this study, Douglas and Uphold found an increase in task completion of various classroom and lunchroom tasks across participants when participants used the ePAS. The researchers also examined generalization of the same tasks across devices (i.e., iPad and iPod). While the results showed effective generalization across devices, social validity indicated students preferred one device over another but there was not a consensus on one device or another between participants. Each device was equally preferred among participants. Research continues to show effectiveness of daily schedules using the latest technology as a tool in increasing independent transitions and task completion for individuals with ID. The purpose of this study was to examine the use of smart technology (i.e., Apple iPhone and Fitbit Smart Watch) on the time management skill acquisition and accurate class arrival time of students with intellectual/developmental disabilities who attend college. More specifically, this study examined the use of the Model-Lead-Test strategy on each student's ability to set alarms based on his or her daily schedule as well as their ability to leave for class on time.

Method

Participants

The participants in the study were three students in a 2 to 4 year post-secondary education program for students with an intellectual/developmental disability (IDD) at a large urban university in the Southwest United States. At the time of the study, the program had 10

students, including 6 males and 4 females, between the ages 19 and 26 years old. Three of the 10 program students were randomly selected to participate in the study. To be included in the study, students met the following inclusion criteria: (a) were between the ages of 18 and 26 years old, (b) attended a post-secondary education (PSE) program for individuals with IDD or autism (i.e., registered university student), (c) provided consent to participate in the study, and (d) had their own smartphone. The PSE program coordinator provided information regarding each participant's use of technology. The information was obtained through interview and observation.

Craig. At the time of the study, Craig, a 21-year-old Caucasian male, was in his fourth semester of the PSE program. Craig has Down syndrome and had received special education services, mostly in self-contained settings throughout his k-12 school experience. Craig was an active young man and had participated in many sports throughout his school career, including his high school's varsity football, basketball, and wrestling programs. Craig's course of study in the PSE program was athletic and sports management. In addition to athletic courses (i.e., weight training, basketball, soccer, tennis, circuit training), Craig had taken courses including intro to athletic coaching, physical activity and health, and human nutrition. Craig used his smartphone (i.e., iPhone 6 plus) and laptop (i.e., MacBook Air) daily. He enjoyed accessing and using many social media sites, and his favorite was Twitter. Craig accessed his textbooks through a speech-to-text application called Kurzweil. The PSE program coordinator reported that Craig was generally comfortable using various pieces of technology.

Brittany. Brittany was a 20-year-old Caucasian female at the time of the study and was in her third semester of the PSE program. Brittany has Autism Spectrum Disorder (ASD) and had received special education services, mostly in self-contained settings, throughout her k-12

school experience. While attending the PSE program, Britany's course of study was early childhood development. In addition to meeting general course requirements, Brittany took courses specific to early childhood development and education. For example, she attended intro to special education, early childhood education, and practicum for infants and toddlers. Brittany interned at the university's preschool/daycare center for two semesters. The PSE program coordinator reported that Brittany used her smartphone (i.e., iPhone 6s) and Microsoft Surface tablet daily. She also used a Fitbit Alta to count steps; however, she was unaware of other uses of the device and the Fitbit app was not downloaded on her smartphone.

Adam. At the time of the study, Adam a 19-year-old Caucasian male, was in his third semester of the PSE program. Adam has ASD and had received special education services, mostly in self-contained settings, in both private and public k-12 schools. Adam enjoyed the opportunity to attend college and was generally upbeat. He enjoyed the courses he had taken and enjoyed working on campus during his internship. In his time at the university, Adam had interned at a small convenience store and at the Einstein's bagel on campus. The PSE program coordinator reported that Adam used his smartphone (i.e., iPhone 6 Plus) and laptop computer (i.e., MacBook Air) daily. The coordinator explained that often, Adam accessed his favorite shows and video on both devices. Similar to Craig and Brittany, Adam accessed his textbooks through a speech-to-text program on his computer. It was also reported that Adam was well versed in the use of technology.

Setting

The study took place at a large university in an urban evironment in the Southwest United States. The total enrollment of the university was 29,702 students. Each participant in the study attended fully inclusive classes offered at the university and was enrolled in a PSE program for

individuals with IDD or autism. The actual intervention took place at the center office where the PSE program was housed on the university campus. Students were familiar with the university and the office. As each of the participants arrived on campus for the day, the participant reported to the center office. None of the participants arrived on campus at the same time and each participent met with the primary researcher in the PSE program coordinator's office for approximately 15 to 25 minutes each day, Monday through Thursday, during intervention. The program coordinator's office was a single office located inside the PSE's program office. This office consisted of a desk with a computer and couch where the participants sat during the intervention. The only people in the program coordinator's office at the time of the intervention were the primary researcher, graduate student collecting interrater reliability, and the participant. Each participant had their daily schedule located on the front of a 3-ring binder. The primary researcher conducted all sessions, and a university graduate student collected interrater reliability for 30% of all sessions. The graduate student was in her third year of her doctoral studies and has over 10 years experience working with individuals with ID. Prior to the intervention, the graduate student was trained on specific procedures related to the study. The graduate student met with the primary research to practice interrater reliabilty and did so until 100% agreement was achieved in practice sessions. During this time, the graduate student and the primary researcher reviewed procedures of the study.

Materials

During this study, two smart-technology devices were used, including a smartphone and a smartwatch. Each participant in the study used his or her own personal cell phone and each participant was paired with a smartwatch. All three participants owned and used an Apple iPhone on a daily basis (e.g., to make phone calls, text, or check emails) as reported by the PSE program

coordinator. Two participants owned an iPhone 6 Plus and the other participant owned an iPhone 6s. The smartwatch each participant was given to use during the study was a Fitbit Blaze. The Fitbit Blaze was one option in Fitbit's line of devices. The Fitbit Blaze looked similar to other popular smartwatches with compatible features. Important features to the Fitbit Blaze are the capability to pair with a smartphone and receive notifications including text, email, and the ability to set alarms through the Fitbit application on the phone.

The researcher followed a 26-step direct systematic script to demonstrate how to set alarms based on the participants' daily schedule. The 26-step task analysis (see Table 1) was used to set three alarms for three separate classes or activities on the participant's daily schedule. Each session of the intervention included a demonstration of the task during the model stage. Before the participant was tested on his or her ability to complete the 26-step task analysis (TA), the researcher led the participant through all of the steps. During the lead portion of the session, the participant was directed to complete each of the steps. Following the model and lead portions of the intervention, the participant was then tested on the ability to complete the TA. The researcher recorded the number of correct steps on a data-recording sheet. Over the course of the intervention, the participants brought his or her smartphone each day. The participants were given a verbal reminder each day to bring their smartphone the following day and participants brought their smartphone with 100% accuracy throughout the study. As they arrived to meet with the researcher, the participants received the Fitbit Blaze. This ensured that the watch was charged and in working order. The researcher created a daily schedule for each participant that was kept as the first page in each participant's three-ring binder (see Figure 1).

Data Collection

Dependent variable. There were two dependent variables in this study. The first dependent variable measured the number of correct steps of the TA the participant independently achieved. A response was recorded for each step of the TA; after which, the number of steps independently completed was totaled and plotted on the participant's graph. The second dependent variable was the number of times the participant inpendently left for class when an alarm was signaled. A yes/no checklist was used to confirm whether the participant independently left for class when prompted by the alarm. If the student did not leave after 5 seconds, the researcher prompted the student to leave for his or her next activity and a (no) was recorded on the checklist. The researcher also kept anecdotal notes to document specific situations that occurred during the intervention phase. Throughout the study, a third person was present to take procedural fidelity and interrater reliablity.

Interrater reliability. This study assessed the accuracy of the measurement of the dependent variables using the following procedure: (a) the researcher recorded the participants' correct and incorrect steps of the TA, (b) inter-observer data was collected simultaneously by a trained second researcher, and (c) frequency data taken by the researcher and the second researcher were compared and a percentage of inter-observer agreement (IOA) was recorded by dividing the smaller number by the larger number and multiplying by 100. As recommended by Gast and Ledford (2014), the researcher aimed for a minimum of 80% agreement. Agreement across baseline and intervention phases was 100%. Interrater reliability was recorded 40% of sessions across baseline and intervention phases. To ensure content reliability, the researcher operationally defined the behaviors measure (i.e., correct response and interfering behaviors). This allowed the researcher and the second researcher to assess the same behaviors more accurately.

Social validity. Social validity was assessed following the completion of the study in the form of a survey that determined the level of satisfaction of each participant. The survey included questions for the participant with regards to the interventions (i.e. TA, use of smart technology), the dependent variables chosen (e.g., whether they felt they were socially significant for the individual), as well as the results. The survey asked five questions giving the participant the opportunity to reply with a "thumbs up" or "thumbs down." The survey was administered by a member of the PSE program staff not involved in the study. The survey was presented to the participant along with a graph of the participant's progress over the course of the study.

Experimental Design

The study used a single-subject multiple probe across participants design (Gast & Ledford, 2014). Without the use of the TA and prompting during the baseline phase, the interventionist asked the three participants to set three alarms based on their daily schedules. During baseline, the researcher recorded number of correct steps of the TA the participant independently achieved after he or she was asked to set alarms. The researcher also recorded the number of ontime departures during baseline. Baseline data were recorded across all three participants for a minimum of three data points before moving to the intervention phase. The order participants received the intervention was randomized by the reseracher drawing names written on a piece of paper out of a hat. While in the intervention phase, the researcher first taught the steps of the TA to the participant. The researcher then guided the participant through each step of the TA followed by the participant being tested on his or her ability to complete each step of TA. When the participant had met the mastery criteria of 26 out of 26 steps of the TA steps over five consecutive trials, a baseline trial was administered to the remaining

participants. Then the next participant was randomly chosen in the same manner as the first participant to enter the intervention phase. The study continued in this manner until all participants had received the intervention.

Procedures

General procedures. During the baseline phase of the study, a minimum of three trials were required and the baseline phase was examined for steady state responding before the first participant entered the intervention phase. Baseline and intervention phases took place as soon as each participant arrived in the center where the PSE program is located. After examining the baseline data, the researcher then randomly selected a name out of the hat to begin the intervention phase. Upon the first participant achieving criterion in the intervention phase, each of the remaining participants received a baseline probe and the researcher then began the intervention phase with the next randomly chosen participant. The study continued in this manner until all participants receive the intervention.

Baseline. During baseline probes, the researcher asked the participant to set an alarm for all activities on his or her daily schedule. At this time, the researcher gave the participant no prompts. Baseline data were collected during the exact time of day as were collected during the intervention phase of the study. After a minimum of three probes and steady state responding, the participants were randomly assigned, as outlined in general procedures, to determine the order in which they begin the intervention. In addition to the number of steps of the TA the participant independently achieves, the number of on-time departures were also recorded. The participant was given a 5-second delay from the time he or she was to leave for class. If they had not left for class after the 5-second delay, a “no” was recorded and the researcher stated “you

need to leave for class." No other statement or prompt was provided at that time. Ultimately, it would be unethical if the student was not prompted to leave and arrived late to class.

Intervention. As each participant entered the intervention phase, the researcher followed a scripted TA where they first modeled each step. After the researcher modeled the steps of the TA, he would then lead the participant through each step. After the participant had observed the researcher model each step and had the opportunity to work through each step with the researcher, the participant was then tested on his or her ability to complete the TA independently.

If the participant responded correctly on a step of the TA, a (+) was recorded. If the participant responded incorrectly, a (-) was recorded and the researcher then redirected the participant by using a least-to-most intrusive prompt to make the correct response. If the participant made no response after 4 seconds, the researcher recorded the incorrect response and followed the same procedure of least-to-most intrusive prompting to identify the correct response. The prompting system used was as follows: (a) verbal prompt (i.e., "set the hour to 11"), (b) model prompt (i.e., "here is how you set the hour to 11" as the researcher modeled how to set to 11 and then says, "now you try to set the hour to 11"), and (c) physical (i.e., the interventionist grabs the finger of the participant and sets the hour to 11). The established mastery criterion was 26 out of 26 steps over five consecutive probes. When the participant met the criteria or if the participant had been in the intervention for five sessions, a baseline probe was administered to the remaining participants and the next participant was randomly chosen in the same manner as the first participant to enter the intervention phase. The study continued in this manner until all participants received the intervention. After each probe, the researcher also recorded the number of on-time departures for the three alarms the participant set. The student

was given a 5-second delay from the time he or she was prompted by the alarm to leave for class. If they did not leave for class after the 5-second delay, a (no) was recorded.

Maintenance. After reaching mastery criterion (i.e., 26 out of 26 independently achieved TA steps over 5 consecutive probes), the participant entered maintenance. Each day, the participant arrived at the center, he or she was given the Fitbit Blaze (i.e., smart watch) and was asked to set three alarms. The participant was not given instruction as in intervention. A maintenance probe was measured once a week for two weeks after the participant had reached mastery criterion.

Procedural fidelity. When implementing the intervention, the researcher followed a scripted TA and checklist throughout the model-lead-test sections. To collect procedural fidelity, another researcher was present and used the same scripted TA and checklist as the primary researcher. Procedural fidelity data were collected for 45% of all sessions, with 98% agreement between researchers.

Results

Data for each participant across baseline, intervention, and maintenance phases and results for all three participants are reported in Figure 2 and Figure 3. A 26-step TA was used to assess participants' ability to set three alarms for classes or activities on their daily schedules. Through visual analysis, a functional relation was established between incorporating the use of technology, the use of systematic instruction implemented in the intervention phase of the study, the participants performance setting alarms based on a his or her daily schedule, and the participant leaving for class when prompted with the alarm he or she programmed. In addition, each participant showed an immediate change from baseline to intervention phases. The data show low variability and an upward trend to mastery.

While the first participant (i.e., Craig) was in the intervention phase, a slight modification was made to the overall criteria to move him into the maintenance phase. Craig repeatedly showed the ability to get between 24 and 25 of 26 steps correct. Upon further evaluation of the data, Craig was missing the same steps. When examining the steps that Craig missed, it was discovered that the steps he missed had no bearing on his ability to set his alarms. For that reason, the researchers decided to enter Craig into maintenance without meeting the established criteria to move from intervention to maintenance. The same reasoning was applied with Brittany as it was discovered that she had similar findings.

Craig

During baseline, Craig's data indicated a stable baseline where zero was recorded during three separate probe sessions (M = 0) before he entered the intervention phase. As Craig entered the intervention phase, he showed immediacy of effect from baseline to intervention phases as the intervention was implemented. Scores ranged from 21 to 26 with an overall mean of 24.9 correct responses. Visual analysis showed an immediate change between baseline and intervention with no overlap and while in intervention, an upward trend toward mastery. Craig was in the intervention phase for a total of 15 sessions. Probes were administered once a week while in the maintenance phase and two data points showed Craig's continued ability set alarms independently.

In regard to leaving for class, baseline data were stable at zero in three opportunities daily and across three sessions (M = 0). Immediately after entering the intervention phase, Craig's performance increased to an average of 2.9. In all but one session, Craig left for class when prompted by the alarm.

Brittany

During baseline, data showed that Brittany's performance was stable. Brittany recorded one step correct in the first session followed by three straight sessions where she recorded zero correct steps (M = .25). As she entered the intervention phase, Brittany's performance immediately improved showing immediacy of effect. While in the intervention phase, Brittany's scores ranged from 17 to 26 with an overall mean of 24.18. Similar to Craig, visual analysis of Brittany's data presented an immediate change between baseline and intervention with no overlap. Once in intervention, data indicated an upward trend towards mastery. Brittany was in the intervention phase for a total of 11 sessions. Maintenance data suggest Brittany's ability to continue to independently set alarms based on her daily schedule.

While in the baseline phase, data were stable at zero across three sessions in Brittany's three daily opportunities to leave for class (M = 0). Similar to Craig, Brittany's performance immediately increased, and she left when prompted by each alarm that she set for the day (M = 3). No additional prompting was required other than the alarm that Brittany programmed.

Adam

Data indicated a stable baseline where Adam recorded independent completion of one step in each of the first two sessions followed by three straight sessions where he independently completed zero steps of the TA (M = 0.4). An immediate change was found as Adam entered into the intervention phase of the study. He recorded data points ranging from 24 to 26 with an average of 25.6 steps independently completed. Adam reached mastery after six sessions in the intervention phase, achieving mastery in fewer sessions in the intervention phase than the other two participants. Similar to both of the other participants, visual analysis showed an immediate change in performance between baseline and intervention phases, with no overlap of data. Maintenance data indicated Adam's continued ability to independently complete all steps of the

TA. Similar to both of the other participants, maintenance probes were administered once a week over a 2-week period following the intervention.

In regards to leaving for class, Adam's baseline data were stable at zero across three sessions where he had three opportunities in each session (M = 0). Similar to Brittany, performance immediately increased for Adam once in the intervention phase, and he left for each class or activity when prompted by the alarm he programmed (M = 3). No additional prompting was required other than the alarm that Adam scheduled.

Social Validity

At the conclusion of the study, each participant was presented with a survey and a graph of his or her individual data. This information was given to the PSE program coordinator who presented it to the participant. The survey was administered by paper and pencil and consisted of five questions where the participant could report whether they agreed or disagreed by indicating a "thumbs up" or a "thumbs down." The program coordinator read all questions to the participant. All participants agreed that learning to follow their schedule was fun as determined by a question in the survey. In addition, they all agreed that the steps to set alarms were easy to learn. While two participants agreed that they benefited from learning to follow their daily schedule, Craig indicated he did not benefit. All three participants agreed that they enjoyed using smart technology to help them manage their time. Lastly, after examining their data, all participants agreed that they did a good job overall in learning to set alarms based on their schedule.

Discussion

The purpose of this study was to examine the use of smart technology and time management with individuals with IDD, specifically to examine the use of Model Lead Test to

teach participants aspects of time management. Data indicated a functional relation was found with each participant and their ability to set alarms based on individual daily schedules. In addition, results also indicate the participant's ability to leave for class or activity when prompted by the alarm he or she programmed. Quite possibly the most important results found were social validity data. Social validity data from the survey indicated the participants' positive experiences with the intervention, specifically the ease of learning the strategy and incorporating the use of technology to learn time management skills.

The study extends research in many ways. While there is time management research in post-secondary vocational training settings, research in PSE settings, particularly in university or college settings, is limited. Similar to Green, Hughes, and Ryan (2011), this study taught participants time management skills on a college campus. While Green et al. (2011) studied time management skills with one participant with IDD, this current study examined time management skills with three participants, allowing researchers to replicate results across multiple participants. Second, this studied used the latest technology. Research on schedules over time has often used the latest technology. Shortly after the arrival of the Palmtop PC or "Palm Pilot," many researchers began examining the effects of visual and auditory prompting and digital schedules (Davies et al., 2002; Riffell et al., 2005). Later, researchers began examining the effects of using an iPod or iPad to teach and transition from various daily living skills or vocational skills (Douglas & Uphold, 2014; Van Laarhoven, Johnson, Van Laarhoven-Myers, Grider, & Grider, 2009). As technology improves and advances, it is important that research in this area advances with it. An individual with IDD may receive unwanted attention from a bulky schedule books or outdated piece of technology, which may cause discouragement. Using the

latest technology will allow the individual to participate in various activities and to look the same as his or her peers not drawing unwanted attention.

Each participant in this current study used his or her personal iPhone. Each iPhone was within the one generation of the latest version of the iPhone at the time of the study. In addition to the smartphone, the participants were paired with a smartwatch. Smartwatch technology is relatively new and is currently a popular tech area. The smartwatch use, while simple for the purpose of this study, acted as an important prompt. Not only did the participant receive the alarm on the smartphone, they also received the alarm on the smartwatch acting as a secondary prompt. One of the last ways this study has moved research forward is by giving the participant more ownership and control as they learn the strategy to improve time management. Douglas and Uphold (2014), using an electronic picture activity schedule, systematically taught participants to schedule activities throughout each day and then transition to and from activities. Similar to Douglas and Uphold (2014), this study systematically taught students to create and follow their own daily schedule. As the students learned how to do this independently, they were not reliant on another adult or peer to prompt them to move from daily activity to daily activity.

Limitations and Future Research

As with all research, there are limitations to the present study. The first limitation in the study was the convenience sample of participants. All three participants in the study were in the same PSE program located in the southwest United States, which limits generalization. Another limitation was the small sample size. Future research should focus on replication with additional participants and should take place in other geographical areas across the United States. In addition to replication in college settings, replication should be examined across settings, such as

daily living and vocational settings. In other settings (e.g., vocational settings), working on time management skills may increase overall self-determination, which may lead to sustained employment (Wehmeyer & Palmer, 2003).

A third limitation was the expense of the technology. The latest iPhones, the iPhone 8 and iPhone X, start at a retail price point of $699 and $999 respectively. The Fitbit Blaze starts at a retail price point of $199. The cost of this technology may exclude individuals. Future research should examine other pieces of technology that are more affordable and accessible to all individuals. Another limitation, specifically with the technology, was technological glitches that occurred during the study. Over the course of the study, the researcher asked for the smartwatch back at the end of the day to ensure it was charged and in working order for the next day. Due to this, the smartphone and smartwatch became unpaired on a number of occasions throughout the study. During this time, the researcher spent some time re-pairing the devices before the intervention could resume. It took the researcher five to ten minutes to re-pair when this happened. This could potentially be a problem but would most likely not occur as many times as it did during the intervention when the devices are continuously paired.

Future research should also examine systematic instruction to teach similar use of other applications within smart technology. The smartphone has a wide variety of applications easily downloadable to the phone. There are various prompting, task reminder, and calendar applications available. This would move research forward by assigning more complex tasks than just simply setting an alarm. Future research should also examine this strategy at younger ages, including middle and high school students. Promoting self-determination at earlier ages may be particularly beneficial as students transition from high school to college settings.

IMPLICATIONS FOR PRACTICE

Based on the results of this study, there are several implications for practice. First, the direct systematic instruction (MLT) incorporated within this study can be implemented in a number of interventions when instructing individuals with IDD. Second, the specific strategy in this study can be used in a variety of settings, including independent living or vocational settings to help students' transition from tasks or activities. Third, when using this strategy to help students with IDD increase time management skills, less reliance on other adults or peers may be necessary. This study showed a successful strategy to help individuals with IDD improve time management skills as they attend a PSE program on a college campus, ultimately, helping the individual become more independent and successful.

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Table 1: Task Analysis for the Lead

Directions for Researcher	Instructional Cue	Student Expected Response
Directions for Researcher	Instructional Cue	Student Expected Response Date:
1. Locate daily schedule	"Now we will work together. We first locate our daily schedule. Where is your daily schedule?"	Participant gets out binder or points to daily schedule on front of binder.
2. Identify first activity	"Then we need to identify your first activity. Point to your first activity"	Participant points to the first activity
3. Open Fitbit app on phone	"Next, we open the fitbit app on my phone."	Participant opens fitbit app on phone.
4. Hit the account tab on the bottom right of the screen.	"Next, I hit the account tab."	Participant hits the account tab
5. Hit the blaze tab at the top of the screen.	"Then I hit the blaze tab."	Participant hits the blaze tab
6. Hit the silent alarm tab.	"Next, I hit the Silent Alarms tab."	Participant hits the silent alarm tab
7. Hit Set a new alarm	"Next I hit Set a New Alarm"	Participant hits Set a New Alarm
8. In the hour column, set alarm to the appropriate hour (e.g., 11)	"We need to set the hour of your first activity. What is the hour of your first activity?"	Participant says or points to the hour of the first activity. Participant or researcher sets the correct hour of first activity.
9. In the minute column, set alarm to the appropriate minute (e.g., 45)	"Next, we need to set the minute of your first activity. What is the minute of your first activity?"	Participant says or points to the minute of the first activity. Participant or researcher sets the correct minute of first activity.
10. Select either am or pm	"Next, we need to set either am or pm. Is it am or pm?"	Participants says the correct am or pm. Participant or researcher sets am/pm.
11. Hit save	"After setting the time, we hit save. Can you hit save?"	Participant hits save.
12. Identify second activity	"Now we need to locate your second activity. Point to your second activity."	Participant points to second activity.
13. In silent alarm section hit set a new alarm	"In the silent alarm section, I hit set a new alarm."	Participant hits Set a New Alarm
14. In the hour column, set alarm to the appropriate hour (e.g., 11)	"We need to set the hour of your second activity. What	Participant says or points to the hour of the second

	is the hour of your second activity?"	activity. Participant or researcher sets the correct hour of first activity.
15. In the minute column, set alarm to the appropriate minute (e.g., 45)	"Next, we need to set the minute of your second activity. Can you set the minute of your second activity?"	Participant sets the minute of second activity.
16. Select either am or pm	"Next we need to set either am or pm. Can you set the am or pm?"	Participant sets am or pm.
17. Hit save	"After setting the time, we hit save. Can you hit save?"	Participant hits save.
18. Identify third activity	"Now we need to locate your third activity. Point to your third activity?"	Participant points to third activity.
19. In silent alarm section hit set a new alarm	"In the silent alarm section, I hit set a new alarm."	Participant hits Sea a New Alarm
20. In the hour column, set alarm to the appropriate hour (e.g., 11)	"We need to set the hour of your third activity. Set the hour of your third activity"	Participant sets the hour of the third activity.
21. In the minute column, set alarm to the appropriate minute (e.g., 45)	"Next, we need to set the minute of your third activity. Set the minute of your third activity"	Participant sets the minute of the third activity.
22. Select either am or pm	"Next, we need to set either am or pm. Set the am or pm"	Participant sets am or pm.
23. Hit save	"After setting the time, we hit save. Hit save"	Participant hits save.
24. Hit blaze	"Then I hit blaze."	Participant hits blaze.
25. Hit account	"Then I hit account."	Participant hits account
26. Hit dashboard	"Finally, I hit dashboard."	Participant hits dashboard

Craig's Weekly Schedule					
	Monday	Tuesday	Wednesday	Thursday	
8:00am					8:00am
8:30am	Weight Training: Leave at 8:15am		Weight Training: Leave at 8:15am		8:30am
9:00am					9:00am
9:30am					9:30am
10:00am					10:00am
10:30am	Lunch with Cara at Student Union. Leave at 10:15am	Lunch with Cara at Student Union. Leave at 10:15am	Lunch with Jack at Student Union. Leave at 10:15am	Lunch with Jack at Student Union. Leave at 10:15am	10:30am
11:00am					11:00am
11:30am					11:30am
12:00pm		Work at Rec Center: Leave 11:45am		Work at Rec Center: Leave 11:45am	12:00pm
12:30pm					12:30pm
1:00pm					1:00pm
1:30pm					1:30pm
2:00pm					2:00pm
2:30pm	Astrology: Leave 2:15pm	Criminal Justice: End work and leave for class at 2:oopm	Astrology: Leave 2:15pm	Criminal Justice: End work and leave for class at 2:oopm	2:30pm
3:00pm					3:00pm
3:30pm					3:30pm
4:00pm					4:00pm
4:30pm					4:30pm
5:00pm					5:00pm

Figure 1. An example of a student's daily schedule. The student was told to set his/her alarms based on this schedule.

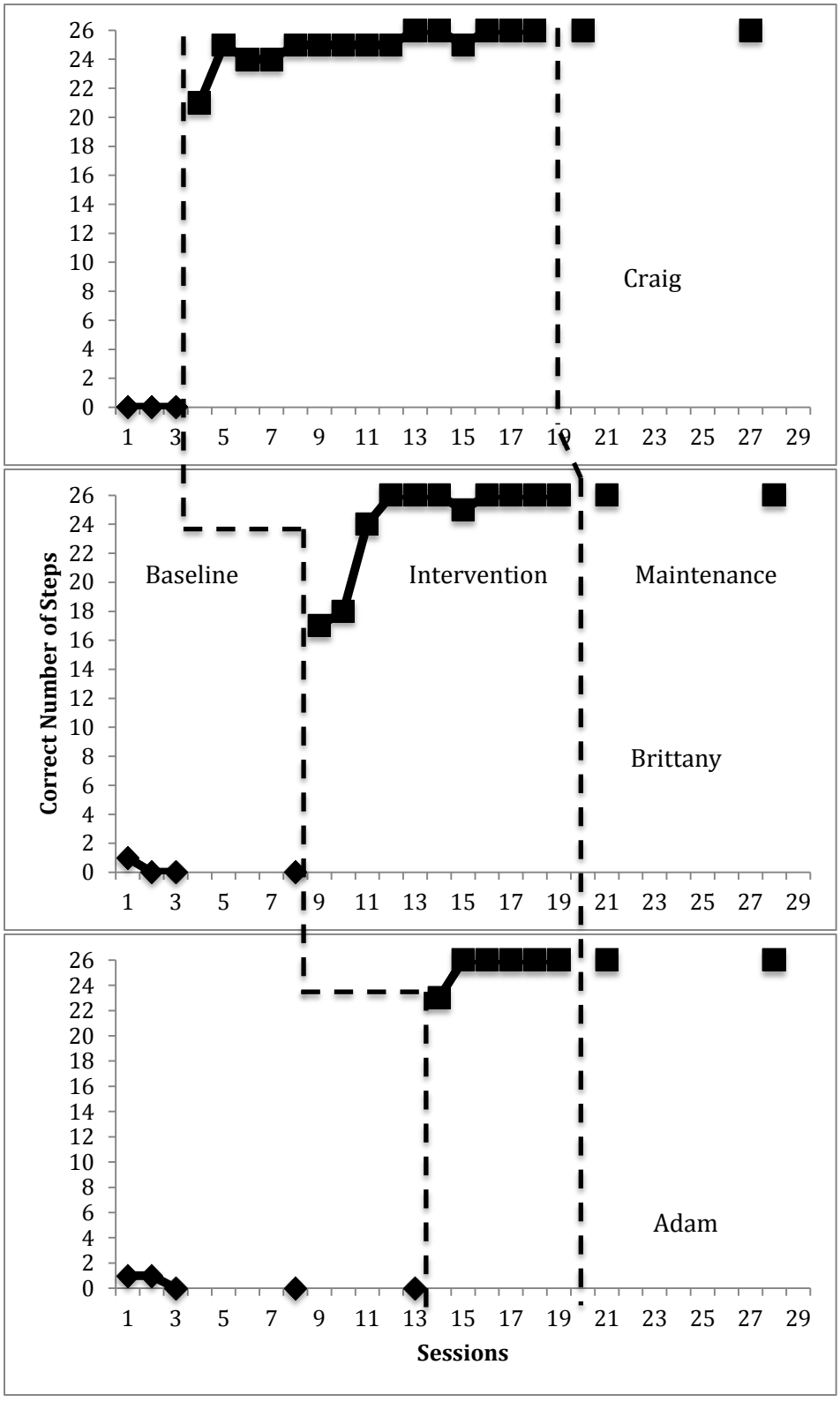

Figure 2. Number of independent steps completed.

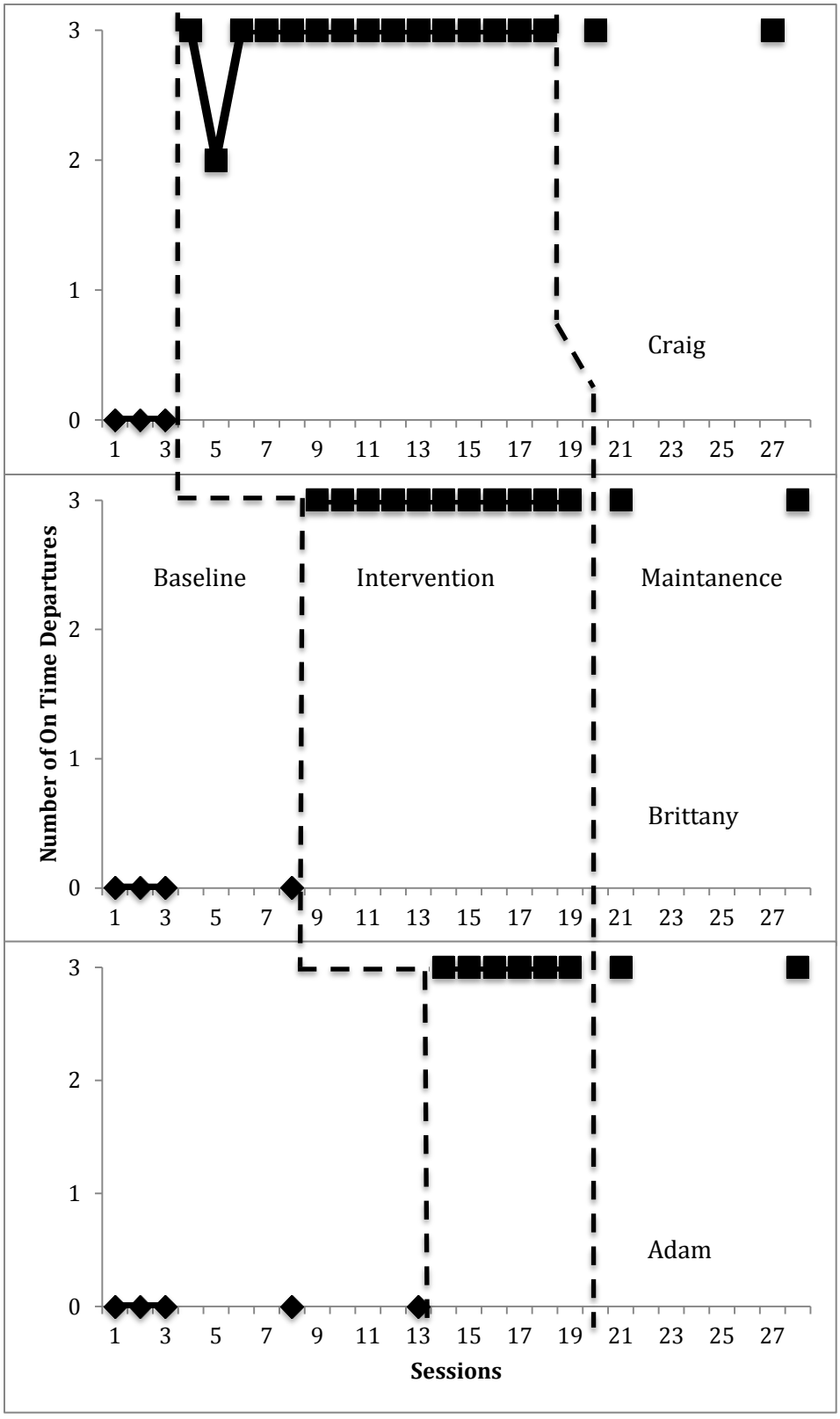

Figure 3. Number of on time departures during each session.