Prompting with Wearable Technology to Increase Teaching Behaviors of a Preservice Special Education Teacher

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Abstract

Classroom management is essential for student related academic and behavioral outcomes. Novice teachers, as well as faculty members, of special education teacher preparation programs report insufficient preparedness in providing meaningful behavioral supports to exceptional learners. With advancements in technology, tactile prompting is a promising modality for teachers to overcome cognitive overload and facilitate more effective practice of classroom management behaviors. We used a multiple-baseline, across behaviors design to assess the effects of prompting with wearable technology (i.e., Apple Watch™) to increase behavior-specific praise, active questioning, and classroom scanning of a preservice special education teacher. Results indicate a functional relation between prompting with wearable technology and targeted increases across multiple behaviors. Behavior-specific praise rates, however, faded synchronously with prompting fades. The participant rated the intervention as a non-intrusive, effective device to increase teaching behaviors. Implications for future research and classroom use are discussed.

Keywords: wearable technology, preservice, teacher training, tactile prompting

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Classroom management is important, and research supports classroom management as essential for positive student related outcomes (Korpershoek, Harms, de Boer, van Kuijk, & Doolaard, 2016) as well as a teacher's sense of well-being (Friedman, 2006). Brophy (2006) defined classroom management as: "Actions taken to create and maintain a learning environment conducive to successful instruction (arranging the physical environment, establishing rules and procedures, maintaining students' attention to lessons and engagement in activities)" (p. 17). Contemporary classroom management practices were substantially influenced by Kounin (1970), whose work shifted classroom management from reactive strategies to preventative strategies. Good management focuses on techniques that elicit student cooperation and involvement thereby preventing problems from happening. Kounin observed that one key feature demonstrated by effective classroom managers was "withitness." Good and Brophy (2008) identified at least three

key behaviors to with-it management: behavior specific praise, active questioning, and classroom scanning.

Behavior-specific praise (BSP) which often operates as a positive reinforcement (Brophy, 1981) is better than general praise. For example, "thank you for raising your hand, Danny," is more effective than general praise (e.g., "good job") because it is contingent on a specific, targeted behavior. More than 30 years of research has indicated BSP as an effective management strategy for increasing students' appropriate behavior in the classroom (Allday et al., 2012; Sutherland, Wehby, & Copeland, 2000).

A second classroom management behavior that conveys withitness is active questioning. Good and Brophy (2008) emphasize the importance of regularly engaging students (i.e., active questioning) as an antecedent strategy of behavior management to reduce drifting, boredom, and potentially undesirable behaviors. Through questioning, a teacher can ensure students are engaged in a lesson. Examples include pausing and asking for a student to repeat what was just said, asking a student to expand on a key point, or simply checking in with a student to see if he has any questions.

Lastly, effective managers let their students know that they are with-it by continuously scanning the classroom and preventing problems before escalation. Whether it is called "active supervision" (Solomon, Klein, Hintze, Cressey, & Peller, 2012) or "visual monitoring" (Conroy, Sutherland, Snyder, & Marsh, 2008), research on classroom scanning documents decreases in disruptive behavior across formal and informal educational settings, such as classrooms (Depry & Sugai, 2002); recess (Lewis, Powers, Kelk, & Newcomer, 2002); and transition time (Colvin, Sugai, Good, & Lee, 1997).

Although research demonstrates that preservice teachers are less proficient at managing classrooms (Emmer & Stough, 2001), training can improve this area (Star & Strickland, 2008). The training, however, should address barriers preventing preservice teachers from implementing effective classroom management behaviors.

Barriers to Effective Classroom Management

The first barrier is cognitive overload. Cognitive overload occurs when an individual is overwhelmed with stimuli which limits their internal cognition capabilities (Sweller, 1989). When an individual is cognitively overloaded, the ability to remember is diminished or simple mistakes occur. For a preservice teacher, pedagogical skills and curricular content may account for all of the cognitive load she can process successfully (Borko & Livingston, 1989). Although the preservice teacher may be reactive to classroom management issues with reprimands and punishments, the many demands of conducting a lesson in a new environment results in the preservice teacher not having the cognitive load to implement proactive, or preventative, classroom management behaviors.

If a preservice teacher is already cognitively overloaded, Heward (2003) contends the natural contingencies of a typical classroom will further discourage preventative strategies and strengthen reactive behaviors. For example, when a child is disrupting the class, the preservice teacher will often reprimand the student resulting in immediate cessation of the disruptive

behavior. The preservice teacher's reprimanding behavior has been negatively reinforced. By contrast, if praise is delivered to a student for working on-task, the student will continue to work on-task and there is no immediate consequence to reinforce the preservice teacher's praising behavior. Overtime, noticeable increases in on-task behavior may reinforce the preservice teacher's praising behavior, yet the latency of effects often leads teachers to reprimand rather than praise (Nelson & Roberts, 2000).

The second barrier is insufficient training. Not only do novice teachers feel underprepared to address their students' behavioral characteristics (Oliver & Reschly, 2007), a study that surveyed universities with teacher preparation programs found that faculty members reported their graduates had not mastered skills related to managing students' challenging behaviors (Hemmeter, Santos, & Ostrosky, 2008). The study cited a lack of opportunities to implement practices in field placements and not enough room in their curriculum as potential causes of this lack of skill mastery. Without adequate practice in training, preservice teachers may not sufficiently acquire the skills to generalize into their classrooms as novice teachers (Scheeler, Budin, & Markelz, 2016).

To achieve mastery of a teaching behavior, it is essential to develop a set of component skills, practice those component skills to where they can be combined fluently and used to a degree of automaticity, then know when and where to apply the targeted behavior appropriately (Ambrose, Bridges, DiPietro, & Norman, 2010). Essential in the progression towards mastery are opportunities to practice. Brophy (1986) concluded that developing knowledge and skills to automaticity and errorless performance requires a great deal of practice. Additional research identifies skill proficiency and skill maintenance as two major purposes of practice (Archer & Hughes, 2011). Key features of effective practice include focusing on a specific goal or criterion of performance, targeting an appropriate level of challenge relative to current performance, and being of sufficient quantity and frequency for skills to develop (Ambrose et al., 2010). What can teacher educators do, then, to better prepare effective classroom managers to scan the classroom, deliver BSP, and engage students while overcoming cognitive overload and insufficient practice opportunities?

Technology for Teaching Effective Classroom Management

In a review of literature on interventions to increase behavior-specific praise, Markelz, Scheeler, Taylor, and Riccomini (2016) identified tactile prompting as a promising technology that directly overcomes these barriers. *Tactile prompting* is a term used to describe the use of a device that, when worn, produces a vibratory signal on a time schedule which prompts the user to perform a specific behavior. The device delivering the tactile prompt can be programmed to deliver prompts using a fixed-time prompting schedule, thereby supporting its used during extended periods of practice. Although only two studies were found using tactile prompting to increase teaching behaviors of novice teachers, results indicated a strong functional relation between prompting and increased praise rates (Haydon & Musti-Rao, 2011; McDonald, Reeve, & Sparacio, 2014). Additionally, participants responded at a 100% response rate to prompting, suggesting that tactile prompting is an effective tool for increasing teaching behaviors. Both studies, however, used dated technology (e.g., pager-size devices that were worn on participants' waists) that were only able to provide single vibratory cues; meaning only one behavior (e.g., BSP) was targeted for increase. Current wearable technology (e.g., Apple Watch) allows users to

receive vibratory prompts and visually reference the display, thereby allowing for the potential to practice multiple behaviors. As follows, advancements in technology and limited research on tactile prompting to increase teaching behaviors warrants further investigation.

In summary, at present there is a small but growing evidence for the potential of tactile prompting to overcome cognitive overload and facilitate more effective practice (Markelz, Scheeler, Taylor, & Riccomini, 2016). There is also increased availability of wearable technology that can produce tactile prompting cues (e.g., Apple Watch). The purpose of the current study, therefore, was to determine the effectiveness of prompting with wearable technology to increase three key classroom management behaviors for a special education preservice teacher: BSP, active questioning, and classroom scanning. The two research questions examined were as follows: (1) What are the effects of prompting with wearable technology on a preservice special education teacher's promotion of BSP, active questioning, and classroom scanning? (2) Does a special education preservice teacher find prompting with wearable technology to be acceptable and practical to use in the classroom while teaching?

Method

Participant and Setting

The participant volunteered from a pool of nine preservice teachers in their final semester of student-teaching at a large public university. Eligibility to volunteer for the study was based on the potential participant owning an Apple iPhone5 or later along with the most recent version of iOS software to pair their phone with Apple Watch technology.

The participant was in her final semester and completing her teaching practicum as part of a five-year undergraduate/graduate program. She was graduating with a B.S in Special Education with duel certification as a Reading Specialist and a Master's degree in Curriculum and Instruction. The study was conducted in a sixth-grade resource classroom in a rural school district. The classroom consisted of 14 students diagnosed with learning disabilities and/or emotional and behavioral disabilities. All sessions took place during small-group instruction (15 minute sessions) during which the participant was teaching or reinforcing literacy content. Initially, the participant was providing small-group instruction to three students (two male students with emotional and behavioral disabilities and a female student with a learning disability). Before session ten, however, the classroom schedule and group configurations changed. The remaining ten sessions were conducted with two female students (the previous female student and a new female student also diagnosed with a learning disability). The participant was positioned with her small group at the front of the classroom while the remaining students were in her line of sight sitting at their desks completing independent work. Also present in the classroom was the participant's mentor teacher as well as a paraprofessional.

Dependent Measures

Three teaching behaviors associated with effective classroom management were targeted for increase; delivering BSP, engaging in active questioning, and conducting classroom scanning. *BSP* was operationally defined as positive verbal feedback indicating approval of social or academic behavior. Examples of BSP given by the participant were "Luke, I like how you were listening while Kayla was talking" and "Good job taking your time to write neatly, Caleb." Non-examples would include "Good job" and "Nice work."

In the participant's small group (both group configurations), one particular student (Kayla) was quieter and participated less than other students. The participant agreed to involve Kayla in discussions more by engaging in active questioning. *Active questioning* was operationally defined as having the participant look and say Kayla's name, then ask a question resulting in a response from Kayla. The topography of questions varied, however examples included "Kayla, are you following along?" Kayla would then respond "yes". Another example was "Kayla, what do you think about that?" Kayla would then respond based on the discussion.

Classroom scanning was operationally defined as systematically observing students not in the small group (i.e., at desks doing independent work) from one side of the classroom to the other, then back again. It took the participant approximately 2-3 seconds to systematically scan the classroom.

Social Validity

The participant completed a six-item questionnaire after the study to assess the second dependent measure, perceived ease and usefulness of receiving prompts through wearable technology. The questionnaire was grounded in Rogers' (2010) model of innovation adoption which explains the process of technology diffusion among consumers and included the following open-ended questions: (1) "How easy was it to use and respond to prompting with a smart watch?" (2) "How distracting was prompting with a smart watch?" (3) "What were some difficulties?" (4) "How effective was prompting with a smart watch in increasing your teaching behaviors?" (5) "How likely would you use prompting with a smart watch to increase targeted teaching behaviors in the future?" and (6) "What would you change to make prompting with a smart watch better?"

Procedure

A multiple-baseline, across behaviors design was used to evaluate the effects of independent variable; that is, using wearable technology to increase targeted teaching behaviors. A multiple baseline design is a rigorous scientific methodology relevant for defining research-based educational practices at the individual level (Horner et al., 2005). The What Works Clearinghouse standards for single-case design to meet evidence standards (Kratochwill et al., 2010) were met by: (a) the independent variable was systematically manipulated; (b) outcome variables were measured systematically over time by more than one assessor, and inter-assessor agreement was collected for at least 20% of all sessions across all phases; (c) the study included at least three attempts to demonstrate an intervention effect at three different points in time; and (d) each phase has a minimum of five data points.

Pre-baseline. Three days prior to baseline data collection, the researcher met with the participant to supply the Apple Watch and pair it with her iPhone5. At the time of this study, the Apple Watch Sport 38mm cost $299. The iPhone 5 comes preloaded with the Apple Watch application for simple pairing of phone and watch. The participant received a five-minute tutorial of the functionality of Apple Watch including how to navigate between screens and adjust notification settings. The participant had never used an Apple Watch prior to the study. During the pre-baseline meeting, the teaching behaviors targeted in this study were identified and explained to ensure the participant had the necessary component skills to perform each behavior. The

participant verified her knowledge and accurate delivery of BSP. Active questioning was discussed and a student (Kayla) was identified to target with this behavior. Lastly, the operational definition of classroom scanning was provided and the participant demonstrated her ability to conduct classroom scanning. Including the five-minute tutorial of Apple Watch, the total time for the pre-baseline meeting was 15 minutes.

Baseline. During baseline, the participant wore the Apple Watch during her small group instruction to acclimate to the watch, however, no prompts were delivered. The participant remained in baseline condition until all three targeted behaviors were stable. Stability was determined when variability was no more than 50% from the mean (Alberto & Troutman, 2012). The first behavior (i.e., BSP) was randomly selected to enter intervention after at least five data points in baseline.

Intervention. Based on the duration of sessions (15 minutes) and previous research suggesting 6 to 10 praise statements per 15 minutes results in student behavior change (Sutherland, Wehby, & Yoder, 2002), ten prompts per session on a variable interval schedule were used. The researcher sat in a discrete location of the classroom and sent prompts via text messages. For behavior-specific praise, "BSP" was texted to the Apple Watch that the participant was wearing. Every time she received a prompt (i.e., text message from the researcher), the watch would vibrate and illuminate the screen with the message "BSP". Each prompt was a cue for the participant to provide BSP to a member of her small group. The student and behavior praised was determined by the participant in that moment. An accurate response to a prompt was recorded if the participant correctly delivered BSP and delivered the praise within five seconds of receiving the prompt. A permanent product of text messages ensured that ten prompts were sent per session and the researcher collected data during each session on the participant's response rates and delivery accuracy. Every session was also video recorded for reliability analysis.

Mastery criterion was set at an accurate response rate of 8 out of 10 prompts (80%) for three consecutive days. Although an accuracy rate of 90% or higher will indicate high-levels of accurate practice is occurring (Archer & Hughes, 2011), given the variable interval schedule of prompting, it was determined that an opportunity to perform the targeted behavior may not always be appropriate, therefore, a more liberal criterion would be suitable to accommodate these instances. Additionally, no feedback or praise was given to the participant during intervention.

After mastery criterion was met with BSP, the second randomly selected behavior (active questioning) entered intervention. To test the practicality of referencing the visual display of Apple Watch while teaching, during the second phase of intervention, prompting was split between two behaviors. In order to keep the number of prompts constant now that a second behavior was introduced, prompts were split between "BSP" and "engage" with each behavior receiving five prompts on a variable interval schedule within each 15-minute session. The 8 out of 10 mastery criterion was also split between behaviors resulting in mastery criteria of 4 out of 5 prompt responses for each behavior over three consecutive days. As determined in the pre-baseline meeting, Kayla was the targeted student for "engage" (i.e., active questioning) due to her quiet nature. An accurate response to an engage prompt was that the participant asked Kayla a question that resulted in student engagement.

After active questioning and BSP reached mastery criteria the third behavior (classroom scanning) entered intervention. To maintain 10 prompts per session, prompting was split between active questioning and classroom scanning; BSP was no longer prompted. During each session of this phase the participant received five "engage" prompts and five "scan" prompts on a variable interval schedule. Mastery criteria for both behaviors remained at 4 out of 5 prompt responses for three consecutive days.

Maintenance and generalization. Due to time constraints of the study, maintenance was only collected for BSP. Generalization was not collected.

Interobserver agreement. Interobserver agreement (IOA) data were collected on 20% of all phases of the study. A graduate student independently collected reliability data from digital video recordings of sessions. Training for agreement consisted of providing formal definitions of BSP, active questioning, and classroom scanning. The graduate student practiced identifying the teaching behaviors with feedback from the first author using a randomly selected video session. Training continued until the graduate student reached 100% agreement on the frequency and accuracy of BSP, active questioning, and classroom scanning within a session. The first author and graduate student then independently coded sessions for frequency and accuracy of BSP, active questioning, and classroom scanning. Each time a target behavior was delivered by the participant, the time was recorded. Recorded data were then compared and any behavior for which there was overlap within five seconds counted as agreement. Mean agreement was 100% across baseline behaviors. Mean agreement during intervention was 98% for BSP, active questioning, and classroom scanning (range = 94% to 100%).

Treatment integrity data were collected by maintaining a permanent product of the number of text messages sent during each session. Following each session, text message records were checked to ensure ten prompts were delivered, and when prompting was split between behaviors, five prompts were delivered for each behavior. Treatment integrity was 100% across all sessions.

Results

The two research questions examined in this study were as follows: (1) What are the effects of prompting with wearable technology on a preservice special education teacher's BSP, active questioning, and classroom scanning? (2) Does a special education preservice teacher find prompting with wearable technology to be acceptable and practical to use in the classroom while teaching?

Targeted Teaching Behaviors

Figure 1 presents the frequency of targeted teaching behaviors through baseline and intervention. During baseline condition, frequency of behaviors ranged from 0 to 2 (BSP, $M = 0.8$, range = 0 to 2; Active Questioning, $M = 0.4$, range = 0 to 1; Classroom Scanning, $M = 0$). When prompting with wearable technology was introduced in the intervention condition, the frequency of targeted teaching behaviors increased for all behaviors, reaching criterion (three consecutive sessions at 80% response rate or higher) in just three sessions. During intervention condition when only BSP was prompted, the frequency of BSP ranged from 9 to 11 praise statements ($M = 10.2$). Criterion

was met with at least 8 out of 10 prompts (80%) in the first three sessions. During intervention condition when BSP and Active Questioning prompting was split, the frequency of behaviors ranged from 4 to 7 (BSP, *M* = 4.8, range = 4 to 5; Active Questioning, *M* = 5.2, range = 4 to 7).

Criteria were met in the first three sessions with at least 4 out of 5 prompts (80%) for BSP and 4 out of 5 prompts (80%) for Active Questioning. During intervention condition when Active Questioning and Classroom Scanning prompting was split, the frequency of behaviors ranged from 4 to 7 (Active Questioning, *M* = 5.8, range = 5 to 7; Classroom Scanning, *M* = 4.8, range = 4 to 5). Criteria were met in the first three sessions with at least 4 out of 5 prompts (80%) for Active Questioning and 4 out of 5 prompts (80%) for Classroom Scanning. When no prompts were provided for BSP during the final phase of intervention the frequency of BSP dropped back down to baseline levels (*M* = 0.4, range = 0 to 1).

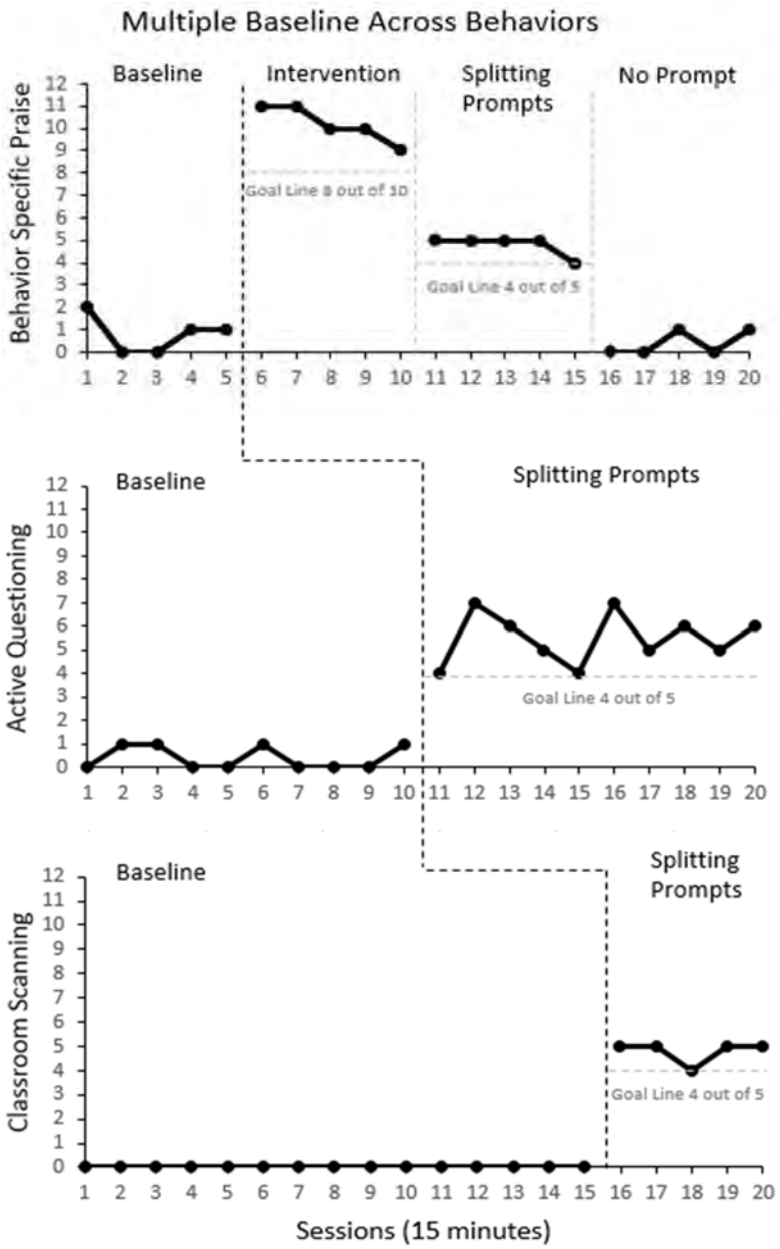

Figure 1. Frequency of targeted teaching behaviors per 15-minute session given a total of 10 prompts per intervention session.

Social Validity

The participant completed a questionnaire at the conclusion of the study to assess her comfort level with using prompting with wearable technology to increase teaching behaviors, as well as her perception of the usefulness and practicality of the technology. Furthermore, the participant was asked how this technology could be improved to enhance the application of prompting with wearable technology. When asked how easy it was to use and respond to prompting with the Apple Watch, the participant wrote, "It was very easy to use the smart watch during my lessons with my students because all I needed to do was look down to my wrist."

When asked about whether prompting with wearable technology was distracting, the participant wrote, "I did not find the watch to be a distraction at all, however, my students were occasionally distracted . . . since Apple Watch is a new product . . . they became highly interested in what the watch did." The participant offered a solution by writing, "I think it would be beneficial to introduce the watch before using it to allow students time to interact with it. This would help make the watch less of a distraction."

When asked how effective prompting with wearable technology was at increasing teaching behaviors, the participant reported that prompting from the watch was effective. With regards to providing BSP, the participant explained, "it [Apple Watch] served as a small reminder to monitor my students' responses more closely in order to tell them exactly what they did correctly so they can begin to make that behavior a habit." In terms of classroom scanning, the participant acknowledged a personal teaching deficit by writing, "Sometimes I do not scan as much as I should because there is a para and my mentor teacher in the room. However, it is important that I get into the habit of scanning when I have my own classroom." She concludes, "The watch helped me with this task."

When asked how likely to use prompting with wearable technology in the future, the participant wrote:

> *If my school district provided me with a smart watch to use, then I would definitely incorporate it into my class because it is important to me that students see how learning and technology play a role in their lives. Also, the watch did help provide me with subtle reminders on prompting students which is important, especially with EBD students. However, if I had to go buy the watch myself, then I would not use it, simply because I would not want to spend all that money on a prompting device.*

With regards to difficulties in using prompting with wearable technology the participant reported that at times the prompt was received at an inopportune time, therefore, making it difficult to respond to the prompt. For example, the participant wrote:

> *There were many instances where a student would be explaining a concept or answer to me and I would receive a prompt to "Engage" with them. During those times it did not seem appropriate to ask them if they were following along if they had just explained to me why they understood what they were working on.*

Another example occurred during session seven when a BSP prompt was delivered and the participant felt and saw the prompt, however, her mentor teacher was discussing an important matter and the participant stated afterwards that she did not want to interrupt her mentor teacher to deliver BSP. As a solution, when asked how to make prompting with wearable technology better, the participant hypothesized, "It would be nice if you could hit a 'snooze' button where if the teacher did not [respond] right away, he/she would be reminded in a minute or so." The participant concluded that a feature like this would provide flexibility for the teacher in situations where inopportune times occur to deliver a behavior following a prompt.

Discussion

The purpose of this study was to evaluate the effectiveness of prompting with wearable technology to increase targeted teaching behaviors of a preservice special education teacher. During small-group instruction, the preservice teacher received prompts via text messages on her Apple Watch cueing her to either deliver BSP, engage in active questioning, or conduct classroom scanning. Additionally, the participant's acceptability of the intervention to determine its usefulness and practicality was also assessed. Findings suggest that prompting with wearable technology was effective in increasing the participant's BSP, active questioning, and classroom scanning. The participant regarded prompting with wearable technology as a nonintrusive, effective way to increase targeted teaching behaviors. To the authors' knowledge, this study was the first to use prompting with wearable technology (i.e., Apple Watch) to increase multiple teaching behaviors of an education professional.

Targeted Teaching Behaviors

The classroom is a complex and dynamic environment. When preservice teachers do not sufficiently practice teaching behaviors and experience cognitive overload with curricular content and basic pedagogical skills, they often forget to use effective teaching techniques (Blessing & Anderson, 1996). In the current study, the authors addressed an effective intervention (tactile prompting) to increasing a teacher's behaviors on new wearable technology (i.e., Apple Watch). Expanding on previous studies that evaluated the effectiveness of tactile prompting (Haydon & Musti-Rao, 2011; McDonald, Reeve, & Sparacio, 2014), rather than a single behavior targeted with a vibratory cue, Apple Watch allows for the user to reference the watch display so that multiple behaviors can be targeted for increase. Given immediate level changes in participant behavior frequencies when prompting was split between behaviors, the potential of wearable technology as a multi-behavior training device emerges.

BSP did not maintain when prompting was faded leading the authors to conclude that the importance of high-levels of practice to sufficiently acquire a behavior cannot be understated. Willingham (2009) suggests that it is virtually impossible to become proficient at a mental task without extended practice. It is evident, therefore, that five sessions with 10 prompts and five sessions with five prompts was not sufficient practice for the participant to acquire higher than baseline levels of BSP. Although massed practice (i.e., closely follows a lesson) is commonly used and important for refining a new skill, research suggests distributive practice (i.e., practice over a longer period of time) is essential for solidifying a skill in one's long-term memory (Kang, 2016). In other words, distributive practice is needed to train a skill to automaticity.

Immediate level jumps are desirable, however, as a teaching tool, eventual behavior acquisition to levels of automaticity would be superior.

In contrast to single prompting devices, the benefit of having multiple behaviors prompted is that varying types of practice are now possible. One effective type of distributive practice is interleaving (Brown, Roediger, & McDaniel, 2014). Interleaving allows multiple skills to be practiced in parallel. For example, if skills A and B are being practiced, interleaved practice would look like this: ABABAB as opposed to practicing AAAA then practicing BBBB. Prompting with wearable technology enables interleaved, distributive practice.

Future research might address maintenance drops with greater durations and/or intensities of intervention. A possibility of prompting with wearable technology is to automate the prompting device with software application, thereby, removing logistical barriers to having a researcher manually sending prompts. An automated app that allows a user to enter multiple behaviors and set interval prompting schedules could then extend intervention and interleave practice until behaviors have been sufficiently trained to automaticity.

Social Validity

Visual analysis of this study suggest that treatment was effective and behavior increases occurred immediately, however, assessing the usefulness and practicality of treatment is also important to understand the potentials of prompting with wearable technology as a training device. The authors asked the participant to complete an emailed questionnaire at the end of the study. The participant had not previously participated in a research study, nor had she used Apple Watch for personal use or as a training device prior to this study. Time for training on the wearable device was five minutes, and as the participant reported, the ease and comfort using the device to receive prompts suggest low technological training barriers to use. Since Apple Watch is an Apple product and designed exclusively for iPhone users, setup and personalization is explicitly scaffolded upon initial device pairing. Numerous wearable technology devices are being introduced that are compatible with other companies and operating systems (e.g., Android). It should be noted that pairing and setup may be less intuitive on these devices requiring greater training time and/or greater difficulties in use.

The participant reported that using wearable technology to receive prompts was effective in increasing teaching behaviors because it reminder her to deliver the behaviors. Combined with data results, the participant's responses support the hypothesis that prompting is effective in overcoming cognitive overload with regards to implementing BSP, active questioning, and classroom scanning. The vibratory cue of a prompt was not reported as a distraction which is consistent with previous research on tactile prompting (Haydon & Musti-Rao, 2011). These findings further the literature in that splitting prompts between behaviors and adding a visual display component (which the participant was able to read on her Apple Watch) was also not reported as a distraction or disruption in lesson delivery. The discrete nature of wearable technology, and possibilities of automating the prompting schedule, could enable a user to incorporate the intervention into their classrooms for extended periods of time.

In support of the authors' prediction, and verified by the participant's response on the questionnaire, the interval prompting schedule did, at times, prompt the participant to perform a

behavior at inopportune times. Although a liberal response rate criterion was set to account for such instances, the lack of response was counted as an error. In reality, the participant received the prompt and reported thinking about performing the behavior, but decided against it. In hindsight, this was an opportunity to work with the targeted behavior and should not be considered an error. Future data collection procedures should be sensitive to such occurrences. The participant's suggestion of implementing a "snooze" feature is also plausible for application design when considering an automated prompting app.

Whenever incorporating technology as an intervention, costs and access potentially become inhibitors to use. The participant stated that she would use prompting with wearable technology in the future, however, noted that she would not personally buy Apple Watch solely as a teaching tool. Costs to date due limit the practicality of prompting with wearable technology, however, one must recognize that technology adoption by consumers is a gradual process. Wearable technology such as Apple Watch is relatively new on the market, and over time, costs should reduce and access should increase. It is challenging to predict whether wearable technology will become as prevalent as smart phones, however, projections on the smartwatch market are at 18% annualized rate of growth, reaching 70 million units by 2021 (Beaver, 2016). Early research is a worthwhile endeavor on this emerging technology.

Limitations

There are at least three limitations that should be considered and may inform us about future related research. First, the participant was a volunteer meeting mobile device requirement (i.e., iPhone user). Although the participant had never used an Apple Watch before, her questionnaire responses may have been influenced by her prerequisite technological skills. Rhine and Bryant (2007) found that student teachers' reactions to technology in field experiences were fairly consistent with their attitude toward and skill levels related to technology. In addition, Rogers (2010) identifies five adopter categories where individual characteristics position people on a continuum from innovators (i.e., willing to take risks and adopt technologies) to laggards (i.e., last to adopt an innovation). It is important, therefore, to consider the diverse range of technical skills among preservice teachers and adopter categories when evaluating social validity results.

Similar to prerequisite technological skills, the second limitation is that the participant already had necessary component skills to perform each targeted behavior. Although classroom scanning is a simple behavior to perform, training time may need to be extended and accuracy may be lower for a participant who has had no prior exposure and practice with BSP or active questioning. It would be necessary to ensure the acquisition of component skills before implementing prompting with wearable technology.

The third limitation of this study is that student data were not collected. Although BSP, active questioning, and classroom scanning are supported by research to affect student behavior, future researchers might consider assessing the effectiveness of prompting with wearable technology on student outcomes, the gold standard of teaching effectiveness.

Implications

In this study, three effective classroom management behaviors of a special education preservice teacher increased when prompted with wearable technology. This treatment has emerging implications for the field of teacher education, namely, the vibratory cue and visual display of Apple Watch, which was deemed easy to use, effective, and not a distraction to the participant, enables users to receive cues to practice multiple behaviors within dynamic classroom environments full of auditory and visual information. This study enables the field of special education to further explore the possibilities of prompting with wearable technology to support teachers in using important teaching behaviors without unduly increasing cognitive overload. Utilizing technology to promote opportunities to practice is an exciting endeavor. A goal in teacher training should be to apply sound theoretical principles while capitalizing on technological advancements for the ultimate purpose of affecting student outcomes. Prompting with wearable technology is a step towards that goal.

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