Video-Based Instruction for Learners with Autism

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14.1 Video-Based Instruction

Video-based instruction (VBI) emerged in the literature in 1987 when Harring, Kennedy, Adams, and Pitts-Conway evaluated video as a component of intervention for teaching shopping skills to adults with developmental disabilities. In this study, the authors reported the positive effects of VBI to promote generalization. By using video to present models, these researchers offered practitioners an alternative to live action models and provided a new means to model behaviors that are not otherwise easily modeled in vivo (or at least not modeled repeatedly). In the three decades since that publication, there have been more than 40 studies evaluating aspects of VBI as well as a half dozen narrative literature reviews or meta-analyses. Moving from videotapes (Alcantara, 1994) and videodisks (Wissick, Lloyd, & Kinzie, 1992) to DVDs and portable DVD players (Mechling, Gast, & Fields, 2008), smartboards (Yakubova & Taber-Doughty, 2013) and mobile devices (Cihak, Fahrenkrog, Ayres, & Smith, 2010), as well as "wearables" and augmented reality (Cihak et al., 2016) access to video has evolved.

The growth of research on VBI likely reflects the increasing ubiquity of mobile technology and corresponding high degree of social validity. Learning by imitating video is not peculiar to autism or special education. The practice has existed for a long time but has not often been referred to as VBI; entire television networks have succeeded on the premise that VBI can be enjoyable and help people learn new skills (e.g., Food Network). The high degree of social validity, ease of use, and, most importantly, efficacy provide the foundation and rationale for using video as an instructional tool. Examining online resources (e.g., YouTube.com©) to locate video models to solve household problems (e.g., repairing a doorbell) is commonplace. The focus of this chapter, however, is on the application of VBI to support learning by individuals diagnosed with autism.

This chapter provides background on research with practical implications for teachers and therapists who wish to use VBI. The discussion is organized first around the rationale and practical considerations for using VBI broadly. This

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includes the logic for using video as a component of instruction along with discussion about variables known to impact or theorized to impact VBI. Following this, the chapter's focus shifts to provide a concrete background on the research, application, and considerations for using video to teach social skills and functional life skills. Within this context, the goal is for the reader to increase their understanding of why and when to use video along with an improved knowledge of how to implement VBI with learners diagnosed with autism.

14.1.1 Rationale

When a low-tech solution is possible, why choose high tech? The best reason to use high-tech solutions is to help achieve better outcomes or provide a more efficient or expedient result. Much of the rationale for using VBI revolves around logistical factors more than evidence of increased efficiency. Some of the seminal work in this area continues to help provide sound reasoning for incorporating video into instruction.

Haring, Kennedy, Adams, and Pitts-Conway (1987) argued that one of the barriers to programming for generalization by training multiple exemplars (Stokes & Baer, 1977) involves the inefficiency of this procedure for some skills. In particular, the authors considered the range of community-based settings one might need to sample to achieve generalized responding. Recognizing that response generalization is a critical goal for instructional programming for individuals diagnosed with autism, the authors proffered that using some form of simulation in the form of actors portraying the skills in several natural environments might provide the level of multiple exemplar training needed for generalized responding.

If one were to conduct an ecological inventory focused on identifying the different ways to dry one's hands in the bathrooms of stores, restaurants, and other community gathering places, they would find an array of systems from air dryers to different towel dispensers. Sampling each of these on training trips would be ideal but may not be logistically feasible. Incorporating video modeling into training may allow learners to sample a wider range of exemplars than they could on a single training trip and still result in generalization (e.g., Haring et al., 1987).

Beyond providing quality examples of a variety of stimuli, VBI can also narrow or focus the instructional universe in a way that cannot be done in the natural environment. Sherer et al. (2001) suggested that instructional arrangements that include video may enhance attention on critical stimuli because video may make them more salient. Moreover, instructors have greater control over the presentation of stimuli in a video because they do not have to worry about the natural variations that may occur spontaneously in the natural environment. This isolation and control also allow the instructor certainty over the quality of the model. With a high-quality model, an instructor can recycle the material and ensure that assistants or parents teaching the same skill use the same model. This may provide a level of continuity for instruction and improve acquisition in contrast to seeing two or three different models of a chained task and inconsistent adherence to a task analysis.

14.1.2 Considerations for Producing in Videos for Instruction

Learning from VBI requires, at a minimum, two prerequisite skills. First, the learner must have the visual acuity to see what is depicted on the screen. Some researchers have documented that for some learners, larger screens (and therefore larger images) are more efficient (Mechling & Ayres, 2012). Second, the learner must also demonstrate generalized imitation. If the learner has not already demonstrated generalized imitation, then VBI will not likely produce desired effects for the individual. McCoy and Hermansen (2007) synthesized 34 studies that evaluated the use of video modeling for individuals diagnosed with autism. Their review specifically looked at the different types of models that are often used in video modeling including adult models, peer models, point-of-view models, self-models, and a

mix of models. Included studies had at least one participant diagnosed with autism aged 2–36 years. The review highlighted that individuals without imitation and attending skills may experience difficulty with video modeling and that further research should be conducted with individuals without these potential prerequisite skills. To date, the authors of this chapter are unaware of any empirical studies demonstrating the efficacy of teaching imitation via video.

If the learner can imitate, then several other factors should be considered prior to producing video(s). These are summarized in Fig. 14.1. A primary consideration is whether to produce a video or search for an existing video to use as the model. Some publishers have released high-quality video models intended for teaching functional life skills to individuals diagnosed with developmental disabilities. These provide teachers and therapists with simple, ready-made curricular materials that can be included in instruction. Such videos may also be more appealing due to convenience but may also be less effective. For example, Mechling, Ayres, Foster, and Bryant (2013) compared the efficacy of custom-made videos to commercially produced videos to teach chained tasks to high school students diagnosed with autism. The researchers reported that while all students responded to both video formats, the use of customized videos reliably led to better improvements in performance. Therefore, interventionists may consider commercially made (or generic videos from sources like Youtube.com©) but recognize that they may achieve greater gains with videos customized to their context.

An additional consideration relates to the viewer's perspective, irrespective of whether creating custom videos or using commercially produced or borrowed content. For example, some researchers have evaluated the efficacy of VBI shot from the perspective of the person doing the action. This is frequently referred to as point-of-view (POV) video instruction (see Mason, Davis, Boles, & Goodwyn, 2013 for a meta-analysis of POV video modeling). In contrast, some researchers have used video shot from the perspective of a bystander. Ayres and Langone (2007) reported results of a study comparing instruction of gross motor tasks with POV and what the researchers referred to as third-person video modeling. Very few differences were observed in terms of rate of acquisition, errors, or time in instruction, which led the researchers to conclude that either format may be a viable choice for gross motor tasks. They cautioned, however, that POV may not provide sufficient information for social skills (e.g., facial expressions that should be imitated).

Another variation in third-person video modeling includes using the learner as their own model. Referred to as video self-modeling (VSM), the interventionist creates a video of the person performing the task and edits out all prompts and disfluencies to produce an example for use in instruction. The rationale for using VSM rests partially on Bandura's social learning theory (Bandura, 1977) that suggested individuals were more likely to imitate models that were similar to themselves. Mason, Davis, Ayres, Davis, and Mason (2016) reported the results of a meta-analysis evaluating the efficacy of VSM for teaching students diagnosed with autism. They noted particularly strong effects when teaching social and communication skills. One benefit of producing VSM examples is that it can be done in the context of initial instruction itself as the teacher or therapist probes responding and prompts through the sequence of a skill. A meta-analysis by Bellini and Akullian (2007) highlighted that robust effects occurred across intervention, maintenance, and generalization when video modeling was used to teach functional skills. Taken together, these meta-analyses provide sufficient evidence for using VSM in a range of contexts.

Among the final set of choices discussed here regarding video production is whether to include narration to the video. Smith, Ayres, Mechling, and Smith (2013) noted that much of the research regarding VBI and video modeling had overlooked that participants may have been responding to narration included in the video examples rather than imitating the video. They evaluated the additive effect of narration to video on the acquisition of multistep chained tasks by middle school-aged students diagnosed with autism. They reported that video modeling with narration

Preliminary Consideration	
Visual Acuity	· Does the learner have necessary visual acuity to see what is depicted on screen?
Generalized Imitation	· Does the learner have a generalized repertoire of imitation behavior?
Pre-production Considerations	
Produce or Select Video	· Will you create a video for the student, or search and select an existing video that models the target behavior?
Identify the Perspective the Video Will Use	· Is a bystander perspective appropriate for the target behavior? · Is point-of-view (POV) perspective appropriate for the target behavior? · Is video self-modeling appropriate for the modeled target behavior?
Decide Whether Narration Will Be Used	· Will narration likely contribute to improved performance of the modeled target behavior?
Post-production Considerations	
Identify Whether Video Modeling or Video Prompting is Appropriate	· Will playing a video that models the entire (chained) response more likely evoke imitation of the target behavior? · Will short clips that model each step of an entire (chained) response more likely evoke imitation of the target behavior?
Identify Who Will Be The Instructional Agent	· Will a teacher, therapist, paraprofessional, parent, sibling, caregiver, or similar individual be responsible for implementing the intervention procedures? · Can the learner be taught to deliver his or her own instructor using a self-instructional process?
Prepare a List of Steps for Applying the Intervention	· Will you obtain a practice guide that outlines procedures for video modeling or for video prompting? · Will you rely on procedures from a specific study to generate the list of steps for applying the intervention? · How and who will data be collected to evaluate the effectiveness of the intervention? · How will data be collected to ensure the proper intervention procedures are followed? · Who will interpret the data and make decisions about adjustments to the video(s), instructional agent(s), and/or steps for applying the intervention?

Fig. 14.1 Preliminary, preproduction, and postproduction considerations for video-based instruction

was more efficient for two of the participants than the video that did not include narration. Smith et al. found that narration was not required for the other two participants to acquire the skills, but the participants expressed a preference for videos that included narration. From a practical standpoint, this would indicate that including narration of the steps in a multistep video is likely beneficial and at least provides consistent models of the vocabulary associated with certain tasks.

14.2 Procedural Considerations for Delivering Video-Based Interventions

Although the factors discussed next do not capture all possible variables one might consider when producing video for instruction, a summary of key features will be helpful to various professionals when preparing and producing video(s) for instruction. After the video for instructional use has been created, professionals should decide how to incorporate the video into instruction. Integration of video into instruction generally follows one of two broad categories, video modeling and video prompting, but sometimes may include procedures from both categories. Professionals also will need to decide who will deliver the intervention (i.e., follow the prescribed set of procedures). The majority of research on video modeling and VBI has used teachers or therapists as intervention agents, but parents and/or caregivers also may be appropriate depending on the targeted skill. An additional option is to teach the learner to control delivery of instruction from the instructional video. Following a brief description of the differences between video modeling and video prompting, we will address the issue of who leads instruction.

14.2.1 Video Modeling

Video modeling describes the process of displaying a video in its entirety prior to asking a learner to imitate what they saw. This application of VBI represents the simplest form from a teaching standpoint: prepare video, press play, and ask the learner to imitate. Researchers have documented the efficacy of video modeling across a wide range of skills, ages, and ability levels. They have further explored multiple means of presenting models including continuous video modeling (Mechling, Ayres, Purrazzella, & Purrazzella, 2014) and chunking (Sigafoos et al., 2007). In comparisons of video modeling to video prompting, video prompting is generally reported to be more effective and efficient (Cannella-Malone et al., 2006); however, some researchers have reported results showing that video modeling is superior (Taber-Doughty et al., 2011). In general, video modeling may have some advantages when introducing a skill for the first time because the learner has an opportunity to see the entire sequence of steps uninterrupted.

14.2.2 Video Prompting

Video prompting may have specific benefits for learners who have difficulty attending to longer videos because, during video prompting, each discrete step of the video is shown as needed. Typically, the therapist incorporates the video into a systematic prompt-fading intervention like least-to-most prompting (e.g., Smith, Ayres, Mechling, Alexander et al., 2013) or constant time delay (e.g., Graves, Collins, Schuster, & Kleinert, 2005). The learner only sees the portion of the video that is relevant to the behavior that is needed at that point in time. For example, if a learner has independently worked through 5 steps of a 12-step task analysis and pauses on the sixth step, the therapist would then show only the few seconds of video relevant to that step. This can pose some logistical challenges if the teacher has, for example, filmed a 90-s video and the student requires a prompt at the sixth step which falls at the 45th second of the video. The teacher has to fast forward the video to the appropriate place. Alternatively, if the teacher films each step separately or cuts the video into steps, then he or she may be able to navigate directly to the segment the students needs.

14.2.3 The Instructor

While a teacher or therapist can deliver instruction with video modeling or video prompting, over the past decade more work has emerged focused on teaching learners to deliver their own instruction (see Smith, Shepley, Alexander, & Ayres, 2015 for a review of this literature). As individuals diagnosed with autism access new environments (e.g., vocational settings), the demands and expectant behaviors will change from the way they were initially taught. Therefore, instead of anticipating each and every variation of a behavior and trying to teach as many discrete tasks as possible at school, instructors should focus their curriculum on self-instructional behaviors so learners can begin to teach themselves across environments. Once a student learns to self-instruct, they have acquired a pivotal skill allowing them greater independence (Ayres, Shepley, Douglas, Shepley, & Lane, 2015). Explicit instruction of self-instruction can lead to generalized use of the self-instructional process and independent initiation of self-instruction when encountering novel tasks (Smith et al., 2016). Learners also have the autonomy to pursue learning things that are of high interest to them.

Although multiple websites (e.g., YouTube.com©) provide ample collections of video that many people use to self-instruct, some students diagnosed with autism require explicit instruction in locating and using video from online resources or published curricula. In cases where the internet or other resources do not meet the learner's needs, researchers have identified ways to help students create their own instructional supports for the purposes of self-instruction by filming others performing the task (Shepley, Smith, Ayres, & Alexander, 2017). One advantage for learners in creating their own self-instructional materials is that they no longer have to rely on others to provide the raw material. For example, an adult learning a new job from a fellow employee or job coach can use a mobile device to video any tasks he or she may need to reference later.

Regardless of who delivers instruction, understanding the methods and means to using video in a variety of contexts will assist practitioners with designing better instruction for their students. The remainder of this chapter focuses on VBI in specific contexts: first, social skills and second, more life skills. The reasons for using video in the different contexts vary and some of the challenges within those settings also vary. Exploring the research in these domains and seeing how to translate the research to practice will permit therapists to provide efficient and evidence-based instruction that meets the needs of their students.

14.3 Video-Based Instruction for Social Skills

Social skills are difficult to teach because seemingly minute changes in the environment can significantly change what responses are socially appropriate or inappropriate. Something as benign as riding an elevator can be exceptionally complicated, as the social conventions vary considerably according to the situation. When standing alone in an elevator, it may be perfectly okay to blow one's nose. However, the presence of another person means blowing your nose is socially inappropriate. Similarly, where one stands in the elevator depends heavily on the number of people in the elevator at that time. In most cultures, it is socially inappropriate to stand immediately next to the only other person in the elevator. When only two unfamiliar people are in the elevator, they stand as far apart as possible because this is considered socially appropriate. However, as more people enter and exit the elevator, the socially appropriate proximity of fellow riders changes. Other unwritten rules of elevator etiquette also vary and include the direction riders should face, where they should look, whether conversations are appropriate and what topics can be discussed, asking people what floor they need versus moving to allow them access to the buttons, etc. Importantly, most people have acquired elevator etiquette and a vast array of social skills via a rich history of social experiences. Indeed, few people have received explicit

instruction for elevator etiquette, asking to play a game with peers, approaching a person to ask for a date, or countless other social skills for various and nuanced social situations.

Whether initiating conversations (Nikopoulos & Keenan, 2004), recognizing and responding to socially inappropriate behavior of others (Spivey & Mechling, 2016), complimenting others (Macpherson, Charlop, & Miltenberger, 2015), or engaging in play activities (MacDonald, Clark, Garrigan, & Vangala, 2005), VBI has been found to be an effective method for supporting social skills acquisition and performance for learners diagnosed with autism and other developmental disabilities. VBI is ideal for teaching social skills because it allows for the incorporation of various elements that highlight key social cues.

14.4 Video-Based Instruction for Social Skills Acquisition and Performance

Communication is inherently a social behavior, and given that children diagnosed with autism often have poorly developed social and communication skills, communication is often a priority of intervention teams. VBI has been an effective social communication support for learners diagnosed with autism, and much of the research in this area has focused on preschool and elementary school children diagnosed with autism. Manding (e.g., requesting) is perhaps the most fundamental communication skill (Sundberg & Partington, 1998). Any request is a mand regardless of whether the individuals makes it via speech, voice output devices, or other symbolic means (e.g., writing, gesture, picture exchange) that is reinforced by consequences specific to the request (Skinner, 1957). For example, a child might see a preferred item and vocalize while looking and reaching toward the item. A caregiver or teacher might recognize this requesting behavior and respond by retrieving and delivering the item to the child. Access to the item contingent on vocalizing and gesturing (or crying, tantruming, engaging in self injury, etc.) will likely reinforce requesting, making similar responses more likely to occur in the future.

VBI can support the acquisition and generalized use of manding. Plavnick and Ferreri (2011) used a functional analysis to confirm participants were engaging in problem behavior to gain access to preferred items or activities (i.e., requesting), then enlisted video models for appropriate requests. These researchers found acquisition, mastery, and generalization of requesting were better when VBI was clearly linked to functional communication when compared to VBI for communication skills that were unrelated to behavior function. Cihak, Smith, Cornett, and Coleman (2012) found VBI promoted more rapid acquisition and consistent requesting among four preschool children diagnosed with developmental delays, including autism, when combined with picture exchange communication system (PECS; Bondy & Frost, 2002) compared to PECS alone. Essentially, Cihak et al. used video modeling as a means of priming requests prior to introducing contrived opportunities to request (consistent with the first phase of the PECS protocol). These and similarly focused studies (e.g., Jones, Lerman, & Lechago, 2014; Plavnick & Vitale, 2016; Wilson, 2013) indicate VBI can be an effective means for teaching young children diagnosed with autism to make requests.

In a somewhat novel study, MacManus, MacDonald, and Ahearn (2015) combined VBI with a series of scripted pretend play activities for three preschool children diagnosed with autism. The researchers used 3-min videos of play sets replete with related action figures based on child interests (e.g., superheroes and villains) and scripted series of actions and phrases to be followed by the learner. The researchers measured adherence to the scripts as well as impromptu generalizations when specific elements were missing (e.g., using a different hero or villain when the scripted one was unavailable; using novel statements during play). The participants increased engagement in play, used more vocalizations, and demonstrated stimulus and response generalization, thereby illustrating the efficacy of video-based instruction for teaching

complex play skills often observed in peers without social and play deficits.

Children diagnosed with autism are often described as having significant difficulty transitioning between activities (Lequia, Wilkerson, Kim, & Lyons, 2015). This difficulty often manifests as noncompliance that varies in topography and severity (e.g., aggression to others or self, elopement, tantrums). However convenient it may be to limit transitions and restrict access to unfamiliar activities, such accommodations may have the inadvertent effect of increasing frequency and intensity of severe behavior occasioned by transitions. A common strategy is to utilize personnel to assist with and reinforce transitions, but this resource-intensive tactic is not always feasible. VBI may provide a practical and effective remedy for this common problem. Indeed, researchers have used priming techniques in videos to explain and demonstrate students' successful transition behavior and have found them to be an inexpensive, unobtrusive, and reliable way to improve transitions.

Schreibman, Whalen, and Stahmer (2000) used video models depicting appropriate transitions in the homes and community that often accompanied problem behavior with three young children diagnosed with autism. Parents implemented the intervention and, over time (i.e., 12–40 sessions), decreased disruptive transitions to zero occurrences. Participants learned to predict the upcoming transition(s) and the associated reinforcing consequences that typically accompanied (e.g., ending the mall trip at the toy store). In a different study aimed at enhancing transitions, Cihak et al. (2010) used video models of students diagnosed with autism engaging in ten transitions associated with the daily activity schedule. Rather than relying on a visual schedule, the researchers provided students with an iPod® with the transition videos and prompted them to view the transition video associated with the next destination/activity. They incorporated additional prompts contingent on transition errors until the participant diagnosed with autism arrived at the correct destination. Within 8 to 14 sessions, all four participants learned to transition to locations throughout the school, but withdrawal of the intervention resulted in increased difficulty with transitions, suggesting that video models for transitions may function as an important accommodation worthy of prolonged or permanent use.

14.4.1 Play and Other Complex Social Skills

Engagement in play offers children opportunities to develop various social skills vital for realizing long-term social outcomes. For example, play in young children affords opportunities to communicate and other foundational skills such as commenting, taking turns, cooperation, problem-solving, and developing friendships. As children mature, these and other skills become increasingly important to all aspects of education, including extracurricular activities. However, children diagnosed with autism often do not acquire or use these sorts of social skills without explicit instruction. The features associated with VBI (outlined in previous sections) suggest it can be used in various ways to support social skill development among learners diagnosed with autism in the elementary school years, and several studies support this conclusion. For example, an important play-based social skill relates to attempts to persistently solicit peers to join a preferred activity (e.g., to play a game of tag). Grosberg and Charlop (2014) explained that learners diagnosed with autism may quickly give up recruiting peers to play an outdoor game after being rebuffed, but typical peers usually persist until they identify and are joined by companions. Accordingly, these authors used VBI to teach four elementary school-aged children diagnosed with autism to engage in persistent social initiations of play with peers. Videos showed a model soliciting a peer to play a game, with some videos showing the first and second peers approached declining to join, followed by the model asking a third peer who agreed to play. Results indicated the participants learned to persist in soliciting peers to join them in play activities and that the skill is generalized to different peers and settings.

Social conventions evolve over time and are highly contextual. Thus, appropriate social skills in preschool and elementary school may eventually be deemed inappropriate for adolescents and adults. Relationship dynamics change during adolescence and throughout adulthood, and obtaining desired outcomes (e.g., employment, friendships, marriage) often is dependent on acquiring knowledge and skills about nuanced social situations with acquaintances, close friends, extended and immediate family members, and intimate partners. The nuances of social situations are complicated by the need for complex social skills, such as chained behaviors, that may not always contact reinforcing contingencies (Plavnick, Sam, Hume, & Odom, 2013). Though few studies are available that explicitly examined VBI as an intervention to teach social skills to adolescents and young adults diagnosed with autism, it is worth distinguishing older from younger learners because appropriate social skills evolve over time.

Plavnick et al. (2013) used VBI to promote complex social skills among four adolescent participants diagnosed with autism. Specifically, these researchers developed a small library of 15 videos (i.e., three different clips for each of the five targeted social skills) and implemented VBI to teach participants to (1) invite a peer to join in an activity, (2) ask peers if they could join their activity, (3) ask about the interests of peers, (4) offer assistance to peer or adult, and (5) maintain conversations. Results indicated rapid acquisition and maintenance of targeted social skills for all four participants. These skills were also taught in a replication study (i.e., Plavnick, Kaid, & MacFarland, 2015) that produced similar results, indicating that several complex social skills can be taught to adolescents diagnosed with autism using VBI.

Chan and John (2012) suggested video modeling could be used to teach sexuality-related skills, including appropriate dating behavior, as well as aspects of privacy and modesty. Though no studies are available to guide the development of procedures, some sources are available that describe intervention procedures for supporting health sexuality education (Travers & Whitby, 2014; Whitby & Travers, 2014). Travers and Tincani (2010) describe decision-making guidelines along with a rationale for providing sexuality education to learners diagnosed with autism. Also, individuals diagnosed with autism may be at increased risk for sexual exploitation (Travers, Tincani, Whitby, & Boutot, 2014), and video modeling may be an effective means of teaching individuals diagnosed with autism to reject unwanted advances, recognize dangerous behavior of others, and seek help if victimized. The demonstrable benefits of VBI and establishment of video modeling as an evidence-based practice (Wong et al., 2015), along with the need for systematic and explicit instruction for complex social behavior, suggest sexuality-related curricula, and VBI may well complement to generate positive sociosexual outcomes for adolescents and adults diagnosed with autism, though researchers should investigate what types of VBI, procedures, and skills are most amenable to this type of intervention.

VBI has been used in isolation or complementary to other interventions (e.g., PECS) to promote various social skills in preschool-aged children diagnosed with autism, including basic communication skills (e.g., requesting), imaginary play skills, and increasing appropriate transitions from/to activities. VBI also has supported acquisition and generalization of more complex social skills for elementary school children, including persistent solicitation of peers to join a preferred activity. Video instruction also can be useful for teaching elementary school students diagnosed with autism leisure skills such as motion-activated video games (e.g., Nintendo Wii™; Spriggs, Gast, & Knight, 2016) and promoting conversation skills (Charlop, Gilmore, & Chang, 2008; Charlop & Milstein, 1989).

14.5 Video-Based Instruction in Life Skills

A primary goal of life skills instruction is to assist individuals to become more independent, thus having more opportunities to participate in their community. Life skills instruction may include

teaching personal hygiene (e.g., applying deodorant), job skills (e.g., individualized according to employer), and daily living skills (e.g., housekeeping). Many of these tasks require large or expensive materials (e.g., stove), making it impossible for an instructor to model in vivo without "undoing" a step. For example, if the instructor models how to turn on a gas burning stove, they then must turn off the flame to allow the learner to imitate this step. This exact performance may be imitated by the learner diagnosed with autism, leading the instructor to implement additional error correction procedures. VBI eliminates this barrier while also allowing the instructor to program for multiple variations of materials used across environments when teaching life skills.

Life skills instructors should consider the specific set of materials and the individual's environment when developing interventions. There will likely be a substantial number of variations when teaching a specific life skill from one individual to the next. Laundry is one skill that varies based on the specific materials and environment. Some washers and dryers require digital setting adjustments, while others have a dial for each setting. Additionally, the skills required to wash clothes in a home are much different than washing clothes in a laundromat or group laundry facility. The variability among materials and settings requires an accompaniment of specific models. The ability to individualize models based on specific settings and materials allows the learner to view the life skills tasks in the natural environment, thus allowing instructors to program for generalization across settings, materials, and people (Charlop-Christy, Le, & Freeman, 2000).

VBI is different from other forms of modeling in that it allows prompting and directions to take place in a non-stigmatizing way when delivered via common forms of modern technology. This technology could benefit the majority of adults diagnosed with autism who are unemployed or cannot receive proper accommodations at their workplace. According to the Institute of Education Sciences National Longitudinal Transition Study-2 (NLTS-2; Newman et al., 2011), less than half of surveyed of young adults diagnosed with autism had worked for pay within 2 years of when data were collected. Additionally, 9.9% of individuals diagnosed with autism were fired from a job within 2 years of when the data were collected. These numbers clearly indicate a need for additional technologies to support individuals with autism in the workforce.

Cimera and Cowan (2009) reported that individuals diagnosed with autism require the most costly vocational rehabilitation services when compared to services for other individuals diagnosed with disabilities, indicating a need for vocational rehabilitation counselors who specialize in autism. Similarly, job coaches effectively reduce barriers and enhance employer accommodations, but such services are expensive and difficult to obtain (Schartz, Hendricks, & Blanck, 2006). VBI may provide some solution to the high costs associated with limited access to job training for adults diagnosed with autism (Wilczynski, Trammell, & Clarke, 2013). For example, Sauer, Parks, and Heyn (2010) examined the use of cueing systems (an umbrella term encompassing VBI, used to describe assistive technology that delivers prompts to independently complete tasks) as a job training tool for individuals diagnosed with cognitive disabilities. Results indicated that video prompts as a cueing system were valuable teaching tools for individuals diagnosed with cognitive disabilities in the workforce. Similarly, Burke et al. (2013) successfully increased adults diagnosed with autism ability to perform shipping tasks at their workplace using video modeling delivered through a tablet. The participants in the study and their caregivers considered the intervention to be socially valid and worthy of recommendation to other individuals diagnosed with autism in the workforce.

In addition to VBI saving resources when instructing life skills, a video can serve as a more appropriate model when targeted tasks are often viewed as private. Regardless of age and relationship to the individual diagnosed with autism, a live model of toilet training could be perceived as unethical, yet toilet training is a critical life skill that will increase access to future social and vocational environments.

Drysdale, Lee, Anderson, and Moore (2015) used video modeling to teach the steps for using the restroom including traveling to the restroom, undressing, sitting on the toilet, eliminating in the toilet, redressing, and flushing. The young boys diagnosed with autism included in the study acquired all of the steps for independent toileting within 8 days. Additionally, the use of video modeling required less prompting from a caregiver or therapist compared to when video modeling was not used.

There is evidence to support that VBI is an effective intervention to support daily living and vocational skills instruction for individuals diagnosed with autism. Along with its effectiveness, VBI can serve as a much needed support for adults diagnosed with autism as they begin to enter the workforce. Practitioners interested in using VBI to teach life skills should consider ways to implement the procedures for their learners diagnosed with autism. Often, VBI is one element of a larger instructional package to teach these skills; therefore it is important to consider additional components to accompany VBI, such as various prompt-fading strategies including least to most and time delay.

14.5.1 Component of Systematic Instruction

The majority of studies using VBI evaluated videos as a stand-alone, independent variable, in which the participant learns to complete a life skills task from viewing a video model or a series of video prompts. Although video modeling is an evidence-based practice for individuals diagnosed with autism (Wong et al., 2015), the procedures used do not always incorporate errorless teaching techniques. Instructors therefore may need to provide additional prompts and implement prompt-fading strategies for a learner to achieve the mastery criterion for a task. Specifically, a video may be used as a component of systematic instruction (such as least-to-most prompts or time delay) to ensure the learner correctly completes the life skills task. For example, Smith, Ayres, Mechling, Alexander et al. (2013) used a video model in the prompt hierarchy to teach high school students with disabilities to perform vocational office tasks. This procedure saved resources related to training instructors to implement the model and the need for two full sets of office supplies while also fading the use of prompts entirely until learners acquired the skills independently. In another variation, Mechling et al. (2008) used VBI and least-to-most prompting as a treatment package. Participants were first shown a video prompt depicting a single step of a cooking task, and, if unsuccessful, researchers prompted the participants to view the video again using least-to-most prompting. Likewise, Mechling, Gast, and Seid (2010) evaluated a third way to incorporate VBI into a least-to-most prompt hierarchy that was controlled by the participants. Three different prompts (i.e., picture, picture + audio, and video + audio) for each step of the cooking tasks were loaded onto a mobile device. Participants could select the prompt necessary to each complete step, and all participants self-faded their use of prompts from most intrusive (video prompt) to least intrusive (picture only) until they performed the tasks independently.

For some individuals, time delay procedures, where the instructor delivers the controlling prompt required to evoke a correct response as opposed to progressing through a prompt hierarchy, may be a more efficient use of instructional time for many individuals diagnosed with autism (Ault, Wolery, Gast, Doyle, & Eizenstat, 1988). Therefore, if a learner diagnosed with autism has a history of correctly responding to model prompts, an instructor should consider supplementing live modeling with video modeling. For example, Graves et al. (2005) used constant time delay paired with video prompts to instruct high school-aged students to perform three cooking tasks, each at different stations within a typical kitchen (e.g., stove, microwave, countertop). Initially the participants were given the task direction, "Cook the _____," and viewed a video of the entire cooking task. Following the video model, video prompts of each step played following a 0-s delay. The delay was faded to 5 s until all participants performed the cooking tasks

independently. At the completion of the study, all videos, including the priming video model, were removed from instruction and participants performed the tasks independently.

When teaching life skills to individuals diagnosed with autism, the goal of response prompting strategies is to fade the prompt until the learner is independently responding to the discriminative stimulus, whether that be a task direction (e.g., "clean the window") or naturally occurring environmental stimuli (e.g., a smudgy window). However, in some circumstances, such as when an individual has infrequent opportunities to engage in tasks or if they have difficulty with short-/long-term memory, they may indefinitely be dependent on a video prompt. If taught to deliver their own controlling prompt (i.e., video), learners diagnosed with autism can self-instruct through novel tasks and transitions, thus still increasing their independence with activities of daily living. In such cases, videos may be better characterized as an accommodation rather than a problem of prompt dependence.

14.5.2 Self-Instruction

Evidence supports the efficacy of teaching individuals to self-instruct using videos. Smith et al. (2015) conducted a review of independent self-instruction on chained tasks. They found 19 studies that met criteria over a 34-year span. While not part of the researchers' inclusion criteria, all included chained tasks which were considered life skills. Eight studies used video as the controlling self-instructional prompt, six of which were presented on handheld devices. The authors summarized ways in which researchers instructed self-instructional strategies, drawing attention to the fact that the learner has not generalized these strategies until they are completely free of instructor support, including any prompts to refer back to technology and error correction procedures.

When presented with an unknown task, ideally a learner would seek out his or her needed technology (e.g., an iPhone®) and navigate to the specific video model or prompts required to complete the skill. Yet, every study included in Smith et al. (2015) either included verbal directions to use technology (e.g., "Use the video to help you make popcorn"), handed the participant the self-instructional materials following the task direction, or had the self-instructional materials prearranged to the specific prompt (e.g., video displayed on device screen so participant only had to press play). Future researchers and practitioners should teach this pivotal skill to a criterion, plan for generalization from the outset, and assess for maintenance of self-instruction behaviors. This involves instructors carefully choosing what information to include in the task direction they present.

Smith et al. (2016) appear to be the first to examine independent and generalized initiation of a self-instructional prompt for high school students diagnosed with autism spectrum disorder (ASD). Following the task directive to complete a novel cooking, office, or party preparation task, the researchers used progressive time delay to deliver a verbal directive to "use the iPhone." All participants independently generalized initiation of retrieving the phone from their pocket in at least one environment. These findings suggest professionals should consider including initiation of a prompt as the first step in the task analysis to teach students diagnosed with autism to self-instruct. For example, if a student has demonstrated success with video models delivered via an iPhone®, the steps to self-instruct would include taking the iPhone® out of his or her pocket (or retrieving from set location), pressing the home button, swiping left to unlock, etc., until the student has accessed a video model corresponding to the target task.

Spriggs, Knight, and Sherrow (2015) taught high school students diagnosed with autism to self-instruct through three novel tasks (a combination of vocational, academic, and daily living) using video models embedded within a visual activity schedule on an iPad®. This combination of two visual strategies, schedules and video modeling, allowed learners to acquire multiple novel skills while self-instructing. Using an inexpensive application for Apple® devices (i.e., My Pictures Talk), researchers used least-to-most

prompting to teach students to navigate the iPad® to the set app, select and view the first video, then perform the modeled tasks. Upon completion of a single task, participants advanced to the next video by swiping left or pressing a green arrow. Although the participants in this study only completed three tasks, practitioners could embed as many tasks as needed into a visual activity schedule to complete in a given environment.

Although most self-instructional studies using video technologies were conducted in school settings (Smith et al., 2015), it is critical to instruct these skills in the natural environment as well, such as an employment setting for vocational tasks (Kellems & Morningstar, 2012), a public university for pedestrian skills (Mechling & Seid, 2011), or an actual apartment for daily living tasks (Mechling & Stephens, 2009; Mechling et al., 2008). To plan for generalization across environments during the initial acquisition of self-instructional skills, practitioners could use Spriggs et al.'s (2015) methodology and combine it with procedures used by Smith et al. (2016). This would consist of teaching learners diagnosed with autism to initiate their device, navigate the media library, select the visual activity schedule corresponding to the current or directed environment (e.g., kitchen, Home Depot, walk to post office), and view a series of novel tasks/transitions presented as video models within the schedule. The technology could then serve as an instructional resource for the learner replete with videos organized by environment that learners independently access when all or some of the steps are unknown.

The use of video models to teach self-instruction of life skills is a relatively new innovation reported in the research literature. If this form of technology is effective for a learner diagnosed with autism, we may not necessarily need to fully fade the prompt but instead view the mobile device as a prosthetic that they need to access their environment (Ayres et al., 2015). On the other hand, unnecessary dependence on the device (i.e., always viewing a video model, regardless of past history of independence) can conflict with goals of increasing task completion, efficiency, and accuracy. Accordingly, researchers should identify and evaluate strategies to teach learners to discriminate between situations when video support is and is not needed (i.e., distinguishing between, "I do not know how to complete this task, therefore I must self-instruct" and "I have done this many times and do not need video support").

14.6 Conclusion

Technology affords teachers and therapists' unprecedented resources to deliver instructional prompting and supports in any setting and in accordance with individual needs. Moreover, the intuitive design of mobile device hardware and applications, as well as increasingly ubiquitous nature of mobile technology, generates high social validity for VBI across various contexts. Teaching with video is not, however, without key considerations and procedures – simply making and showing a video to a learner diagnosed with autism will not likely bring desired changes in behavior. As with any teaching approach that uses any medium (e.g., books, journal articles), adherence to effective procedures for implementation is just as important as the content being conveyed. Education and related professionals should therefore consider the current evidence when designing instructional interventions, including those that incorporate VBI.

As we have outlined in this chapter, educators must make several decisions regarding the form and content of their video prior to and following video production. Having made these decisions, educators can proceed to integrate video with systematic prompt-fading procedures to support independence and, perhaps, advance toward self-instruction. Whether teaching social skills or chained life skills, ample evidence exists to support using VBI for learners diagnosed with autism (Wong et al., 2015). Furthermore, given the size of the literature base, educators can easily locate a range of options regardless of the instructional domain.

As technology changes and possibilities expand, teachers and therapists will likely be initiating new applications for VBI before

researchers are able to evaluate them. Being mindful of collecting data and attending to the overall quality of instruction will ensure that these novel applications support the learning needs of students. With the growth of augmented reality and wearable computers, the near future possibilities for VBI and video-based supports could bring about significant changes in how individuals diagnosed with autism and other disabilities interact with their environments. However, teacher reliance on any single instructional technique, including VBI, will not likely result in meeting the unique instructional needs of all students. Thus, VBI should be accompanied by a range of evidence-based practices to support the social, behavioral, communicative, and functional skills that often comprise educational programming for learners diagnosed with autism. And although VBI has many logistical advantages (e.g., recycling instructional material), teachers and therapists still must individualize instruction when using this intervention method. One way to achieve this via VBI is to incorporate different types of VBI for different students and/or for different skills. By packaging evidence-based practices with variations of VBI for different skills and learners, education professionals will better position themselves to positively impact their students by increasing social and life skills in current and future environments.

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