APPLIED USE OF VIDEO MODELING IN EDUCATIONAL AND CLINICAL SETTINGS:

A SURVEY OF AUTISM PROFESSIONALS

Nicole K. Caldwell

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APPROVED:

Smita Mehta, Major Professor
Bertina Combes, Committee Member
Todd Kettler, Committee Member
Kevin Callahan, Committee Member
Abbas Tashakkori, Chair of the Department of Educational Psychology
Bertina Combes, Interim Dean of the College of Education
Victor Prybutok, Vice Provost of the Toulouse Graduate School
Individuals with autism spectrum disorder (ASD) display deficits in communication and social interaction that can impact their ability to function in daily environments. To remediate these deficits, it is critical for professionals to use effective interventions. While there are many evidence-based practices (EBPs) identified for ASD (e.g., video modeling), the adoption of these EBPs may not occur automatically. Existing research suggests professionals have a generally favorable impression of video modeling. However, little research has examined opinions and applied use of video modeling, which was the purpose of the present study. Using survey methodology, data were collected from 510 professionals in various disciplines (e.g., special educators, speech-language pathologists [SLPs], and behavior analysts [BCBAs]). Data were analyzed primarily via factor analysis and multiple regression. Factor analysis was used to examine the underlying structure of the instrument, revealing two predominant factors: (1) interest in and (2) perceived accessibility of video modeling. Multiple regression was used to examine which demographic characteristics (e.g., age and years of experience) were associated with each factor. Results indicated that BCBAs and SLPs perceived video modeling as more accessible. In terms of interest, professionals who worked with preschool-aged students, who worked in a suburban location, and who had an extended family member with ASD showed higher interest in video modeling. Implications for practice and future research are discussed.
ACKNOWLEDGEMENTS

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APPLIED USE OF VIDEO MODELING IN EDUCATIONAL AND CLINICAL SETTINGS: A SURVEY OF AUTISM PROFESSIONALS

Introduction

Autism spectrum disorder (ASD) is a developmental disability characterized by restricted and repetitive patterns of behavior, interests, or activities (American Psychiatric Association [APA], 2013) that may include stereotyped motor movements, resistance to change during daily routine activities, fixated interests that are unusual in intensity, and atypical responses to sensory experiences. Individuals with ASD display behavioral differences in social communication and social interaction that may include failure to engage in reciprocal conversations, inability to use or understand gestures, and failure to adjust behavior to suit various social contexts (APA, 2013), yet show potential for specific cognitive strengths (e.g., visual-spatial processing; Diener, Wright, Smith, & Wright, 2014). Some of these characteristics can significantly impact an individual’s ability to learn and function successfully in daily environments (Autism Speaks, 2013).

To remediate these deficits, it is critical for professionals to use effective intervention strategies. Many interventions have been identified as evidence-based practices (EBPs) for students with ASD (e.g., see National Professional Development Center on ASD, n.d.b; Wong et al., 2014). Technological advancements have made possible the development of new computer- and video-based EBPs for skills instruction. Technology-based interventions may be uniquely beneficial for individuals with ASD, who may show a particular affinity for, or interest in, technology (Matsuda & Yamamoto, 2014). Cardon et al. (2015) suggest that video modeling in particular has become more practical, relevant, and popular among practitioners working
with individuals with ASD. It has specific components that may make it uniquely suited to meet the educational needs of this population.

Video Modeling as an Intervention Method

Video modeling, the demonstration of specific appropriate behaviors on a video clip, is now considered an established intervention for teaching social, play, and self-help skills to children with ASD (Association for Science in Autism Treatment, n.d.). As an intervention method, video modeling generally consists of an individual watching a video demonstration of a behavior (as opposed to viewing an in-vivo model) and then imitating the behavior shown in the video in a natural setting (Bellini & Akullian, 2007). Viewing the performance of a target behavior is believed to help the viewer internalize and, at a future time, accurately reproduce the behaviors observed in the video (Mason, Ganz, Parker, Burke, & Camargo, 2012) in a real-world setting (Kashinath, 2012).

Since video modeling involves visual learning through video viewing, it may capitalize on a preferred activity for individuals with ASD. A survey of families of children with ASD conducted by Shane and Albert (2008) reported that, when given leisure time, children with ASD tended to engage in high levels of interaction with electronic screen media (e.g., television or computers). According to Schreibman et al. (2000), watching videos represents an activity that may be naturally reinforcing to children with ASD because of their preference for visual stimuli. Buggey, Toombs, Gardener, and Cervetti (1999) suggest that individuals with ASD may selectively direct their attention toward television watching. It has also been reported that children with ASD may prefer to look at photographs of other people rather than directly
interacting with them (Cihak, 2011). One common element identified in these studies is the potential for videos and photographs to be inherently reinforcing to individuals with ASD.

Additionally, it may be easier for individuals with ASD to cognitively process information delivered through video technology. When compared to in-vivo instruction, videos can have fewer requirements for social interaction and greater visual prompts (Cihak, Smith, Cornett, & Coleman, 2012). Given that individuals with ASD tend to utilize visual input (e.g., from videos) as a significant source of information about their environment (Quill, 1995), visual methods of instruction have the potential to capitalize on cognitive strengths unique to ASD (Schreibman, Whalen, & Stahmer, 2000). Video modeling takes advantage of the visual learning modality (Bellini & Akullian, 2007; Mason et al., 2012), and has been demonstrated to be an effective intervention for promoting both acquisition and generalization of a variety of skills (Charlop-Christy & Daneshvar, 2003), such as social, communication, behavior, joint attention, play, cognitive, school-readiness, academic, motor, adaptive, and vocational skills for individuals with ASD ages toddler (i.e., 0-2 years) to young adult (i.e., 19-22 years) (Wong et al., 2014).

Despite the research on the effectiveness of video modeling, it cannot be assumed that video modeling has been disseminated into widespread applied use. The potential of video modeling may be limited if those who work with individuals with ASD are not aware of video modeling or do not utilize it regularly (Cardon, Guimond, & Smith-Treadwell, 2015). While the efficacy of video modeling has been established, there has been little empirical attention devoted to the extent to which practitioners implement video modeling to promote learning or behavior of their target students. A possible explanation for this lack of attention is the assumption that practitioners would readily adopt EBPs (Cook & Odom, 2013) now that they
are identified and widely disseminated. However, adoption of EBPs does not occur automatically, leading to an ever-increasing research-to-practice gap. The diffusion of innovation theory can be used to explain this gap by examining factors relating to the adoption and applied use of video modeling.

**Diffusion of Innovation Theory**

The diffusion of innovation theory is a conceptual framework for understanding the process by which new practices and ideas (i.e., *innovations*) are disseminated and adopted into social systems (Rogers, 2003). The theory is considered to have universal application (Murray, 2009) and is a general process not unique to any specific innovation, society, culture (Rogers, 2004), or discipline.

If, when, and how an innovation is adopted depends on various factors. Rogers (2003) outlined five specific influential characteristics of an innovation: (a) relative advantage (i.e., the extent to which the innovation is perceived as superior to what it is replacing); (b) compatibility (i.e., the extent to which the innovation is compatible with the beliefs, values, and experiences of individual members of the social system); (c) complexity (i.e., the extent to which people perceive the innovation as challenging to use and understand); (d) trialability (i.e., the extent to which potential users can test or try an innovation before fully adopting it); and (e) observability (i.e., how visible the results of using an innovation are to others).

The opinions of influential individuals within a social group also have a significant impact on dissemination of innovations. It has been implied that learning about an innovation via professional dissemination channels (e.g., a peer-reviewed journal) is insufficient for the spread of an innovation (Murray, 2009; Rogers, 2003). Such professional dissemination channels can
provide initial awareness of an innovation, but personal and professional networks have a
greater role in forming and/or changing attitudes toward an innovation. The majority of
individuals may form a viewpoint of any given innovation based on the opinions of members of
their peer groups already using the innovation, rather than on scientific research (Rogers,
2002).

Thus, the dissemination process has a large social component, with emphasis on
imitation of those individuals who have already adopted the innovation. When some
individuals in a social group adopt an innovation, it increases the likelihood that other people in
the group will also adopt the innovation. This phenomenon appears to be particularly true if
the first adopters of the innovation have favorable opinions of the innovation and if they are in
leadership positions that influence other individuals in the group (Rogers, 2003).

Diffusion of innovation theory provides a context for researchers to conceptualize how
EBPs may be effectively disseminated. Dingfelder and Mandell (2011) state that researchers
have made significant contributions to the body of knowledge on effective intervention
strategies in the field of ASD. However, they also indicate that this knowledge has not yet fully
impacted educational and treatment programs for many individuals with ASD, some of which
use intervention strategies that are not research-based. Recognizing how dissemination takes
place can aid researchers in promoting the applied use of research results and connect EBPs
(e.g., video modeling) with potential users (Rogers, 2003). If the diffusion of innovations is
recognized as a research priority, it increases the likelihood that effective interventions will be
adopted by schools and service providers. Per this theory, the opinions of professionals have a
substantial influence on the rate of adoption of EBPs. It is critical for researchers and other
leaders in the ASD field to have a comprehensive understanding of these opinions on the
applied use of video modeling to facilitate the bridging of the research-to-practice gap.

Applied Use of Video Modeling

Currently, there is scant research that directly measures the extent to which
professionals use video modeling for skills instruction. However, recommendations from
practitioner journals (e.g., Teaching Exceptional Children) provide a proxy for examining the
extent of applied use of video modeling. Articles in Teaching Exceptional Children have
described procedures for implementing video self-modeling (Banda, Matuszny, & Turkan, 2007;
Ganz, Earles-Volrath, & Cook, 2011; Carnahan, Basham, Christman, & Hollingshead, 2012), peer
modeling (Banda, Matuszny, & Turkan, 2007; Ganz, Earles-Volrath, & Cook, 2011; Carnahan,
Basham, Christman, & Hollingshead, 2012), point-of-view modeling (Ganz et al., 2011; Carnahan
et al., 2012), and cartoons as models (Banda et al., 2007). Authors of articles in Teaching
Exceptional Children have recommended that video modeling be utilized to teach
communication (Banda et al., 2007; Ganz et al., 2011; Carnahan et al., 2012), social skills (Banda
et al., 2007; Ganz et al., 2011; Carnahan et al., 2012), academics (Banda et al., 2007; Ganz et al.,
2011; Carnahan et al., 2012), daily living (Banda et al., 2007; Ganz et al., 2011), and hygiene
(Wolfe, Condo, & Hardaway, 2009). These articles provide suggestions to practitioners about
how they can use video modeling, but their purpose was not to examine the ways in which
video modeling is utilized in applied settings. The extent to which professionals use these
suggested methods remains unknown; therefore, the impact of these articles on bridging the
research-to-practice gap is unclear.
Another proxy measure for applied video modeling use is social validity. Published research on video modeling frequently includes measures of social validity which have indicated that educators (1) enjoyed participating in video modeling interventions (Bellini, Akullian, & Hopf, 2007), (2) believe video modeling was worthwhile for students (e.g., Bellini et al., 2007; Cihak, Fahrenkrog, Ayres, & Smith, 2010; Burckley, Tincani, & Guld Fisher, 2015; Morlock, Reynolds, Fisher, & Comer, 2015; Rosenberg, Schwartz, & Davis, 2010), (3) were likely to continue to use video modeling (e.g., Burckley et al., 2015; Cihak, Smith, Cornett, & Coleman, 2012; Rosenberg et al., 2010; Smith, Ayres, Mechling, & Smith, 2013; Spriggs, Gast, & Knight, 2016; Taber-Doughty, Miller, Shurr, & Wiles, 2013; Wilson, 2013), and (4) would recommend video modeling to others (e.g., Cihak et al., 2010; Cihak et al., 2008; Cihak et al., 2012). In one study (Cihak et al., 2010), educators specifically mentioned their appreciation of the portability of video modeling which permitted students to use it during transitions around the school.

Social validity measures can also be used to examine accessibility of and potential barriers to the implementation of video modeling. These measures have suggested that education professionals have generally positive views on the accessibility of video modeling. Professionals have reported that video modeling (1) was not disruptive to classroom routines (Bellini et al., 2007), (2) was easy to implement (Bellini et al., 2007; Burkley et al., 2015; Cihak et al., 2008; Murdock, Ganz, & Crittendon, 2013; Yakubova, Hughes, & Hornberger, 2015), (3) was socially acceptable (Cihak et al., 2008; Cihak et al., 2012), (4) would be acceptable to other educators (e.g., Cihak et al., 2010; Cihak et al., 2008), and (5) was not time consuming [to implement] (e.g., Spriggs et al., 2016; Yakubova et al., 2015). Professionals have also noted some potential barriers to video modeling use. Specific concerns have included lack of access
to relevant technology, lack of time to create videos (Taber-Doughty et al., 2013), and additional time needed for filming and editing self-modeling videos (Cihak et al., 2008).

The social validity measures of these studies give insight into how professionals view video modeling and provide some indication that professionals have overall favorable opinions about video modeling. However, these social validity measures were based on a small number of participants in each study, so they do not necessarily reflect the opinions of the entire population of professionals. Additionally, these social validity measures reflect how video modeling was perceived when it was part of a research study. In these studies, the researchers often took an active role in the development of the videos. Opinions regarding ease of use and accessibility of video modeling may have been different if the practitioners were responsible for the development of the videos and implementation of the intervention without the support of outside personnel (i.e., the researchers). It is possible that willingness to use video modeling may be influenced by these factors, but this was not measured in the studies discussed above, making it difficult to evaluate the applied value of this intervention. Thus, there is a need to examine the extent of applied use of video modeling for skills instruction with individuals with ASD.

Rationale for the Study

These studies suggest that practitioners who work with researchers have a generally favorable impression of video modeling, but additional research on how it is independently used in applied settings is warranted. The use of EBPs (e.g., video modeling) is a significant component of producing positive outcomes for people with ASD (Wong et al., 2014). However, knowledge and use of EBPs among educators and clinicians may be somewhat varied (Borders,
Bock, & Szymanski, 2015). While many professionals are aware of EBPs, little is known about how they use EBPs in practice. Individuals with ASD cannot benefit from EBPs if educators do not use them consistently and with fidelity. To facilitate the integration of research and practice, it is beneficial to understand the perspectives of professionals regarding video modeling. A survey on applied video modeling use was conducted to explore this issue.

Purpose of the Study

The purpose of the study was to examine the perspectives of professionals on the use of video modeling to teach skills to individuals with ASD. The research questions were as follows:

1. To what extent are ASD professionals aware of and interested in video modeling?
2. To what extent do ASD professionals use video modeling for skills instruction (e.g., frequency of use)?
3. What types of video modeling procedures do ASD professionals use? What specific types of skills do they teach their students/clients using video modeling?
4. What are perceived barriers to using video modeling among ASD professionals?
5. To what extent do educational and professional background factors predict levels of interest in and perceived accessibility of video modeling for skills instruction?

Methods

Research Design

A survey research design was utilized to examine the perspectives of professionals who work with individuals with ASD. Survey research provides a method for examining the subjective opinions of a group of people (Fowler, 2014) in an objective manner by providing quantitative statistical analyses of the data to answer research questions. The use of a
A questionnaire in survey research permits consistent measurement across all participants so that information obtained can be reliably compared among the respondents (Fowler, 2014).

Participant responses were gathered via a web-based questionnaire.

**Participant Recruitment**

Professionals were eligible to participate in this study if they worked with individuals with ASD, were familiar with video modeling, and were certified in at least one of the following areas: special education teacher, Board Certified Behavior Analyst® (BCBA), speech-language pathologist (SLP), occupational therapist (OT), or school psychologist. Professionals were recruited from across the United States via distribution of flyers that linked to the online questionnaire as described below. Printed copies of the study flyers were sent for dissemination via postal mail to organizations that work on behalf of individuals with ASD, as outlined in Table 1.

**Table 1**

*Organizations Contacted for Participant Recruitment*

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<td>Families for Effective Autism Treatment</td>
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<td>American Occupational Therapy Association</td>
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<td>American Speech–Language–Hearing Association</td>
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<td>Council for Exceptional Children</td>
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<td>National Association of School Psychologists</td>
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Professionals were also recruited from the public school system in the United States. To recruit these individuals, a list of contact information for public school districts for each U.S. state was obtained via online searches. A random number generator was used to select 25% of the school districts in each state for which online contact information was available (approximately 1,950 districts). If the school district provided online contact information, the special education directors or administrative staff were e-mailed to inquire if they would distribute the study flyer to the special education staff. School districts that did not provide e-mail addresses or website communication forms were not contacted.

The data collection period lasted approximately eight weeks. After the eight-week period, four participants who elected to provide their e-mail address were randomly selected to receive a $25 gift card to an online bookstore.

Sample

A total of 674 participants initiated the online questionnaire. To be eligible, participants were required to provide an affirmative answer to the first item, that is, their familiarity with video modeling. Approximately 75% of the initial participants (n = 510) were eligible to participate and complete the remainder of the questionnaire.

Dependent Variables

The dependent variables were the composite scores on interest in and perceived accessibility of video modeling as measured by the questionnaires completed by participants.

Instrument

The 47-item online questionnaire for the current study was modified from the original instrument (i.e., Video Modeling Perceptions Scale [VMPS]) developed by Cardon et al. (2015).
Given that the original VMPS was designed to survey caregivers, it was modified for the present study for use with ASD professionals with permission (T. Cardon, personal communication, January 31, 2016).

- Section I. The initial section (Items 1-17) sought information about the applied use of video modeling. This section included items regarding skills that were taught using video modeling, number of individuals taught, types of video modeling procedures used (i.e., peer, self, or point-of-view), devices used to record and show videos, sources of videos, and frequency of use.

- Section II. This section (Items 18-22) contained items regarding interest in video modeling (e.g., “I would be interested in learning how to make my own videos to use with individuals with autism”). Participants responded to items with a Likert-type scale with 5 points, ranging from agree completely to disagree completely to indicate preference.

- Section III. This section (Items 23-29) included Likert-type items reflecting perceived accessibility of and barriers to use of video modeling (e.g., “I believe that the equipment required to implement video modeling with an individual with autism is too expensive.”).

- Section IV. The background characteristics (Items 30-47) included age, professional role, training received, age/grade levels of students or clients, years of experience, certification areas, employment setting, geographical employment area, number of people with ASD worked with, highest degree received, and whether the participant had a family member with ASD.

After development of an initial draft of the modified instrument, a preliminary item review was conducted. The instrument was sent to five doctoral students with specializations in educational research, measurement, and statistics. They were asked to provide feedback on
the items in terms of accuracy, wording, ambiguity, relevance, technical item construction, level of readability, inadvertent appearance of bias, and any other areas of concern. Based on their feedback, minor changes were made to the wording of several items for purposes of clarity.

After the item review, a pilot test was conducted to examine participant experience with the instrument. Paraprofessionals, who were not eligible to participate in the final survey, were targeted for the pilot test via a snowball recruitment strategy using social media and e-mail. A total of 33 paraprofessionals completed the pilot test survey instrument. In addition to the multiple-choice and multiple-answer items, the instrument contained open-ended items that requested feedback on whether questions were confusing or unclear and offered participants the opportunity to leave feedback for how the survey could be improved. No changes were deemed necessary based on the analysis of responses to these open-ended items. For two items, additional answer choice options were added based on analysis of responses to items that contained fields marked Other, please specify, followed by a text box for participants to type in a response. After these minor adjustments to the instrument were completed, the survey was entered into the Qualtrics online survey platform for dissemination to participants.

Data Analysis

- Descriptive statistics. Descriptive statistics (i.e., frequencies and percentages) were used to address the first four research questions regarding awareness, use, and perceived accessibility of video modeling. For the Likert-type items reflecting participant interest in and perceived accessibility of video modeling, frequencies and percentages of participant-reported agreements and disagreements were recorded.
• Factor analysis. An exploratory factor analysis was conducted to examine the underlying structure of the instrument. A factor analysis can be used to reduce a larger set of variables into smaller units that may represent latent constructs (termed factors) (Gorsuch, 1974) that are not observed directly (Mulaik, 2011). In general, the ideal scenario is that these underlying factors explain a large portion of the variance in the correlation matrix of the items (Henson & Roberts, 2006).

In an article describing the original instrument, Cardon et al. (2015) conducted an exploratory factor analysis of the questionnaire for caregivers of children with ASD. Their analysis revealed two predominant factors, (1) interest in and (2) perceived accessibility of video modeling. Since the instrument was modified for a different population for the present study, an exploratory (rather than a confirmatory) factor analysis was conducted.

• Multiple regression. Multiple regression was utilized to address the research question regarding the extent to which background characteristics predicted levels of interest in video modeling and its perceived accessibility. Multiple regression can be used to analyze the associations between a dependent variable (e.g., interest in video modeling) and two or more independent variables (Salkind, 2010) (e.g., age and years of experience) by accounting for the variance in the dependent variable based on combinations of independent variables.

Results

Participant Personal, Educational, and Professional Background Characteristics

Of the 510 participants, the highest percentages of professionals identified themselves as special education teachers (44.12%) or SLPs (21.57%). Smaller percentages of professionals identified themselves as BCBAs (9.22%), school psychologists/counselors (8.24%), or OTs
Participants in categories collectively termed *other* made up 10.59% of the sample. The *other* group generally included professionals from multiple categories (e.g., a participant who was both a special education teacher and a BCBA), special education directors/administrators, and ASD specialists or consultants.

Participants had been working with individuals with ASD for a mean of 12.55 years ($SD = 8.42$), with a range of 1 to 40 years. Approximately half (57.45%) reported that they primarily worked with elementary-aged students (kindergarten–fifth grade); 15.69% with high school students (9th–12th grade, including students receiving special education services through the age of 21); 13.73% with middle school students (6th–8th grade); 11.37% with preschool students (ages 3–4 years); 0.98% with infants or toddlers (birth–2 years of age), and 0.78% with adults over the age of 21. The majority of participants worked in either rural (46.08%) or suburban areas (37.45%), while 16.47% worked in urban areas. Participant ages ranged from 23 to 74 years, with a mean of 43.31 and a standard deviation of 11.58. In terms of ASD training, 88.24% of participants indicated that they had received formal training on EBPs for individuals with ASD.

**Awareness of Video Modeling**

On the initial item in the questionnaire, respondents were asked if they were familiar with video modeling as an intervention for teaching skills to individuals with ASD. A total of 674 participants responded to this item, with 510 (75.67%) responding affirmatively. Of these 510 participants, 172 (33.73%) reported they had received training on video modeling. Sources for training included workshops or conferences (73.84%; $n = 127$), independent study of books or journal articles (37.79%; $n = 65$), university classes (30.23%; $n = 52$), in-service training from
employers (30.23%; n = 52), non-university online training (19.19%; n = 33), and other sources (6.98%; n = 12). The other sources included internship/practicum, participation in a research project, completion of a thesis on video modeling, and consulting with a behavior specialist. Given that some of these responses to the other, please specify option are part of university training programs (i.e., internship/practicum and completion of a thesis), it is possible that the percentage reported for university classes as a source of training is an underestimate.

Interest in Video Modeling

Nearly all participants (90.2%) agreed or strongly agreed they were interested in using video modeling for skills instruction for individuals with ASD. Participants were also interested in increasing their knowledge about video modeling. Most participants (86.27%) agreed or strongly agreed they were interested in learning more about video modeling and 75.88% agreed or strongly agreed that they were interested in learning to create videos. Video modeling was also perceived as an intervention that would enhance services that individuals with ASD already receive; 93.92% agreed or strongly agreed with this statement.

The Extent to Which ASD Professionals Use Video Modeling

The percentage of participants who reported using video modeling with at least one individual with ASD was 73.92% (n = 377). On average, participants reported using video modeling with approximately six individuals with ASD (mean = 6.03). In terms of frequency of video modeling use, 13.26% participants (n = 50) reported using it daily, 34.22% (n = 129) used it weekly, 34.48% (n = 130) used it monthly, and 18.04% (n = 68) used it annually.
Use of Video Modeling by ASD Professionals

Participants reported using video modeling to teach social skills (n = 330; 87.53%), daily living skills (n = 200; 53.05%), language and communication (n = 180; 47.75%), replacement responses for problem behavior (n = 179; 47.48%), play skills (n = 141; 37.40%), gestures (n = 74; 19.63%), academic skills (n = 66; 17.51%), and other skills (n = 24; 6.37%). Other responses to this item included the following skills: fine and gross motor, vocational, leisure and fitness, coping, focus and attention, and transitions. When asked to identify the one skill area they taught most often using video modeling, participants reported social skills (n = 212; 56.23%), daily life skills (n = 52; 13.79%), replacement responses for problem behavior (n = 42; 11.14%), play skills (n = 25; 6.63%), language and communication (n = 24; 6.37%;), (n = 10; 2.65%;) academic skills, (n = 1; 0.27%;) gestures, and other skills (n = 11; 2.92%). Other responses included motor skills, vocational skills, focus and attention, and transitions.

Participants were also asked to select all types of video modeling procedures they used for skills instruction. Data showed that participants used peer modeling (n = 313; 83.02%), self-modeling (n = 212; 56.23%) and point-of-view modeling (n=103; 27.32%). When asked about the type of video modeling they use most frequently, data showed a similar pattern, that is, peer modeling (n = 246; 65.25%), self-modeling (n = 97; 25.73%), and point-of-view modeling (n = 34; 9.02%).

Subsequent items requested information on how participants obtained and showed videos. Participants indicated that they made their own videos (n = 276; 73.21%), searched for videos online (n = 203; 53.85%), used videos developed by colleagues (n = 100; 26.53%), and/or purchased commercially prepared videos (n = 98; 25.99%). Sixteen participants (4.24%)
reported they used videos from other sources that included apps and videos included with
social skills books. Participants who created their own videos used various devices to record
them including tablets (n = 218; 78.99%), cell phones (n = 131; 47.46%), camcorders (n = 67;
24.28%), computers (n = 36; 13.04%), and other devices (n = 10; 3.62%). The other devices
included smart boards and specific brands of video cameras. In terms of devices used to show
videos, participants reported using any of the following: tablets (n = 291, 77.19%), computers (n
= 244, 64.72%), cell phones (n = 74, 19.63%), other devices (n = 61, 16.18%), and camcorders (n
= 9, 2.39%). The other devices used were televisions, overhead projectors, and smartboards.

Perceived Accessibility of Video Modeling Among ASD Professionals

Almost 70% of participants (68.43%) agreed or strongly agreed they already owned the
equipment necessary to implement video modeling. Very few participants agreed or strongly
agreed that this equipment would be cost prohibitive (11.38%). Participants reported
confidence in their technological abilities for implementing video modeling, with only 10.19%
agreeing or strongly agreeing that they lacked necessary technological skills. However, many
participants (47.45%) agreed or strongly agreed they would need additional training to
implement video modeling effectively. In terms of efficiency of using video modeling as an
intervention, 26.47% of participants agreed or strongly agreed that it would place extensive
demands on their time.

Psychometric Properties of Instrument

An exploratory factor analysis was used to examine the underlying structure of the
instrument. As described below, the analysis revealed two factors: (1) interest in and (2)
perceived accessibility of video modeling. Obtaining composite scores on these factors permitted examination (i.e., via multiple regression) of how participants view video modeling.

The total variance explained by each of the extracted factors is shown in Table 2. Tinsley and Tinsley (1987) described the frequently used Kaiser’s criterion in determining the number of factors extracted based on eigenvalues. Per this criterion, factors with an eigenvalue of 1.0 or greater should be retained in the analysis.

Table 2

Total Variance Explained

<table>
<thead>
<tr>
<th>Factor</th>
<th>Initial Eigenvalues</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>% of Variance</td>
</tr>
<tr>
<td>1</td>
<td>2.990</td>
<td>24.917</td>
<td>24.917</td>
</tr>
<tr>
<td>2</td>
<td>2.521</td>
<td>21.005</td>
<td>45.922</td>
</tr>
<tr>
<td>3</td>
<td>1.065</td>
<td>8.876</td>
<td>54.798</td>
</tr>
<tr>
<td>4</td>
<td>.968</td>
<td>8.063</td>
<td>62.861</td>
</tr>
<tr>
<td>5</td>
<td>.814</td>
<td>6.785</td>
<td>69.646</td>
</tr>
<tr>
<td>6</td>
<td>.751</td>
<td>6.262</td>
<td>75.908</td>
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<tr>
<td>7</td>
<td>.702</td>
<td>5.847</td>
<td>81.755</td>
</tr>
<tr>
<td>8</td>
<td>.531</td>
<td>4.424</td>
<td>86.180</td>
</tr>
<tr>
<td>9</td>
<td>.501</td>
<td>4.175</td>
<td>90.355</td>
</tr>
<tr>
<td>10</td>
<td>.485</td>
<td>4.038</td>
<td>94.393</td>
</tr>
<tr>
<td>11</td>
<td>.392</td>
<td>3.266</td>
<td>97.659</td>
</tr>
<tr>
<td>12</td>
<td>.281</td>
<td>2.341</td>
<td>100.000</td>
</tr>
</tbody>
</table>

The extraction revealed three factors with an eigenvalue of 1.0 or greater. Based on examining the scree plot (shown in Figure 1) for a point in which the curve suddenly descends
(Cattell, 1966) and comparing the relative variance accounted for by the extracted factors, only the first two factors were retained for the final analyses. Factors one and two accounted for 24.92% and 21.00% of the variance, respectively. Factor three accounted for 8.88% of the variance, and had an eigenvalue of 1.065, barely above the cut-off point for Kaiser’s criterion.

![Scree Plot](image)

*Figure 1. Scree plot.*

Based on the individual items correlating with each factor, the two retained factors were conceptualized as perceived accessibility of video modeling (Factor 1) and interest in video modeling (Factor 2). These interpretations are consistent with factors extracted by Cardon et al. (2015). The pattern matrix containing correlations of items to factors is displayed in Table 3. Using .30 or higher as a general guideline (Tinsley & Tinsley, 1987), six items correlated with Factor 1 (28, 29, 30, 31, 32, and 34), four items correlated with Factor 2 (22, 23, 24, and 25), and two items did not correlate with any of these factors (26 and 33).
Table 3

*Pattern Matrix Correlations for Individual Survey Items*

<table>
<thead>
<tr>
<th>Item</th>
<th>Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Item 22: would like to learn more about video modeling</td>
<td>-.140</td>
</tr>
<tr>
<td>Item 23: interested in using video modeling</td>
<td>.190</td>
</tr>
<tr>
<td>Item 24: interested in learning to make own videos</td>
<td>-.168</td>
</tr>
<tr>
<td>Item 25: video modeling would enhance services that individuals with autism receive</td>
<td>.251</td>
</tr>
<tr>
<td>Item 26: video modeling would replace services that individuals with autism receive</td>
<td>-.121</td>
</tr>
<tr>
<td>Item 28: already own equipment</td>
<td>.634</td>
</tr>
<tr>
<td>Item 29: equipment is too expensive</td>
<td>.484</td>
</tr>
<tr>
<td>Item 30: technological skills needed are beyond my computer and technical abilities</td>
<td>.642</td>
</tr>
<tr>
<td>Item 31: will place extensive demands on time</td>
<td>.467</td>
</tr>
<tr>
<td>Item 32: would require additional training</td>
<td>.722</td>
</tr>
<tr>
<td>Item 33: feel comfortable using pre-made videos</td>
<td>.000</td>
</tr>
<tr>
<td>Item 34: video modeling lacks a personal component; individuals with autism would learn more effectively from one-on-one instruction</td>
<td>.472</td>
</tr>
</tbody>
</table>


Predicted Interest In and Perceived Accessibility of Video Modeling

Once a composite score on each factor was calculated (by summing the individual item scores) for each participant, multiple regression was used to examine how well the demographic variables predicted the composite scores. A multiple regression was conducted for the composite scores for each factor: Factor 1 (accessibility of video modeling) and Factor 2 (interest in video modeling). The variables entered as predictors in each regression model...
were (a) years of paid experience working with individuals with disabilities; (b) years of paid experience working with individuals with autism; (c) age; (d) professional role; (e) whether the participants had formal training on evidence-based practices; (f) age/grade level of students or clients; (g) whether the participants worked in urban, suburban, or rural settings; (h) class type; (i) highest degree obtained; and (j) whether the participant had a family member (immediate or extended) with ASD.

Results of the multiple regression indicated that the overall model predicting the composite score for perceived accessibility was statistically significant, $F (23, 486) = 1.648, p = .030$, accounting for 7.2% of the variance. Professional role of BCBA ($p = .034$), professional role of SLP ($p = .016$), professional role of other ($p = .007$), and formal training on EBPs ($p = .008$) were significant predictors of perceived accessibility. On this measure, a lower score indicates that a participant perceives video modeling as more accessible. Compared to special education teachers, BCBAs scored 1.484 points lower, SLPs scored 1.225 points lower, and participants who identified as other scored 1.752 points lower. OTs and school psychologists did not have significantly different scores when compared to special education teachers. The final variable identified as a significant predictor for perceived accessibility scores was whether the participants had formal training on EBPs. Participants with formal training on EBPs scored 1.481 points lower compared to participants with no formal EBP training, indicating that participants with EBP training perceive video modeling as more accessible. All other predictor variables (e.g., age, years of experience, age of students/clients, highest degree obtained) were not found to be statistically significant.
Results also indicated that the overall regression model predicting the composite scores of interest in using video modeling for skills-instruction was statistically significant, $F (23, 486) = 1.867, p = .009$, accounting for 8.1% of the variance. When analyzing predictor variables individually, having a student/client in the age range of three to four years ($p = .045$), working in a suburban location ($p = .028$), having a doctoral degree ($p = .036$), and having an extended family member with ASD ($p = .044$) were significant predictors of the interest in video modeling composite scores. On this measure, lower scores reflect a higher level of interest in video modeling. Participants who worked with children ages 3 to 4 years scored .667 points lower compared to participants who worked with elementary school-aged children (kindergarten through fifth grade). Participants working with other age groups did not have significantly different scores. Participants who worked in suburban areas scored .492 points lower than those working in rural areas, and those who had an extended family member with ASD scored .513 points lower compared to participants who did not have a family member with ASD. The only independent variable associated with a lower level of interest in video modeling was having a doctoral degree. When compared to participants who had a master’s degree, participants with a doctoral degree scored .936 points higher. All other predictor variables were not found to be statistically significant.

While statistical significance was obtained for several explanatory variables for each factor, additional information is needed to evaluate the practical significance of these findings. A statistically significant result indicates that the differences between the groups (e.g., groups based on professional backgrounds) were unlikely to be the result of chance alone (Olejnik &
Calculating a measure of effect size may provide an estimate of the magnitude of the difference between groups (Salkind, 2004).

The effect size measure used in this study was Cohen’s $d$, an estimate of the magnitude of the difference between groups (Ferguson, 2009). To calculate Cohen’s $d$, the formula involved subtracting the mean of group two from the mean of group one and dividing this difference by the pooled standard deviation. The pooled standard deviation is calculated by (1) adding the squared standard deviation of group one to the squared standard deviation of group two, (2) dividing this result by two, and (3) taking the square root of this result (Durlak, 2009).

Using this method, the following effect size estimates (displayed in tables four and five) were calculated for the statistically significant explanatory variables.

**Table 4**

*Effect Sizes for Factor 1 (Accessibility of Video Modeling)*

<table>
<thead>
<tr>
<th>Statistically Significant Explanatory Variable</th>
<th>Composite Score Comparison</th>
<th>Compared To</th>
<th>Cohen's $d$</th>
<th>General Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Had EBP Training</td>
<td>Perceived as more accessible</td>
<td>No EBP Training</td>
<td>0.45</td>
<td>Medium</td>
</tr>
<tr>
<td>Professional Role (BCBA)</td>
<td>Perceived as more accessible</td>
<td>Professional Role (Special Education)</td>
<td>0.36</td>
<td>Medium</td>
</tr>
<tr>
<td>Professional Role (SLP)</td>
<td>Perceived as more accessible</td>
<td>Professional Role (Special Education)</td>
<td>0.30</td>
<td>Medium</td>
</tr>
<tr>
<td>Professional Role (Other)</td>
<td>Perceived as more accessible</td>
<td>Professional Role (Special Education)</td>
<td>0.47</td>
<td>Medium</td>
</tr>
</tbody>
</table>
Table 5

*Effect Sizes for Factor 2 (Interest in Video Modeling)*

<table>
<thead>
<tr>
<th>Statistically Significant Explanatory Variable</th>
<th>Composite Score Comparison</th>
<th>Compared To</th>
<th>Cohen's d</th>
<th>General Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preschool-Age Students/Clients</td>
<td>Higher interest</td>
<td>Elementary-Age Students/Clients</td>
<td>0.22</td>
<td>Medium</td>
</tr>
<tr>
<td>Working in a Suburban Area</td>
<td>Higher interest</td>
<td>Working in a Rural Area</td>
<td>0.21</td>
<td>Medium</td>
</tr>
<tr>
<td>Having a Doctoral Degree</td>
<td>Lower interest</td>
<td>Having a Master’s Degree</td>
<td>0.49</td>
<td>Medium</td>
</tr>
<tr>
<td>Extended Family Member with ASD</td>
<td>Higher interest</td>
<td>No Family Members with ASD</td>
<td>0.19</td>
<td>Small</td>
</tr>
</tbody>
</table>

**Discussion**

The purpose of this study was to examine opinions of professionals on their use of video modeling for skills instruction for individuals with ASD. Specifically, the topics of interest were awareness, applied use, interest in, and perceived accessibility of video modeling.

Data revealed that most respondents were familiar with video modeling (75.67%). Similarly, Borders et al. (2015) found that 61% of teachers of students who were deaf or had a hearing impairment were familiar with video modeling. Nearly all participants in the present study (90.2%) strongly agreed or agreed that they were interested in using video modeling for their students or clients. In an extensive review of numerous EBPs for teaching individuals with ASD, Callahan et al. (2016) found that 39.4% of 66 published studies specifically on modeling (including video modeling), reported collecting data on social validity measures. In other words, not all researchers collect data on social validity measures which seems to discount its
value in the applied world instead of attempts to bridge the research-to-practice gap. Similar to the opinions expressed by participants in the current study, social validity measures included in published video modeling research have indicated professional interest in video modeling as an instructional strategy (e.g., Bellini et al., 2007).

Various factors may account for these high levels of awareness of and interest in video modeling. In light of video modeling becoming listed as an EBP for individuals with ASD in recent years (National Professional Development Center on ASD, n.d.a), additional video modeling resources for professionals have become available (e.g., implementation guides and scripts available from the National Professional Development Center on ASD, n.d.a). These resources are designed to facilitate the implementation of EBPs among practitioners, an important step in bridging the research-to-practice gap. Per the Diffusion of Innovation Theory, the publication of research alone is generally insufficient to promote applied use of EBPs (Rogers, 2003). Additional resources (e.g., implementation guides and scripts) can assist practitioners with how to use EBPs. Individuals may be less likely to adopt a new EBP if they perceive it to be difficult or complex to understand and use (Rogers, 2003). Therefore, EBP dissemination efforts that facilitate ease of use of video modeling for practitioners in the field may account, at least in part, for the levels of interest in using video modeling and seeking available resources (e.g., implementation scripts) among professionals.

Another possible reason that professionals may have high levels of interest in video modeling is they might have been trained on EBP as part of their professional preparation programs or in-service training. In the present study, 88.24% of professionals stated they had formal training on EBPs for individuals with ASD. Individuals who have such training may also
influence EBP use among their colleagues. The Diffusion of Innovation Theory suggests that individuals form viewpoints on innovations based on the opinions of members of their peer groups who already use the innovation (Rogers, 2002). Thus, professionals with training are in a unique position to facilitate EBP use with other professionals.

Participant characteristics associated with greater perceived accessibility of video modeling included having a professional role of either a BCBA or SLP and having training on EBPs. These results may further indicate the importance of training. BCBAs, by nature of their field, have training in data-based decision making and EBPs. This may account for their perception of an EBP (in this case, video modeling) as more accessible. Among all professions surveyed, having training on EBPs seems to influence the perception of video modeling as more accessible.

Implications for Practice

Since training in EBPs was associated with greater perceived accessibility, additional opportunities for such training in both pre-service and in-service training programs may be beneficial. In addition to general training on the concept of EBP and training on specific EBPs, professionals could also be provided training on ways to locate and evaluate studies as well as how to implement intervention procedures presented in the studies (Alexander, Ayres, & Smith, 2015). This would give professionals the skills to continue to locate, understand, and use interventions based on empirical evidence after completion of EBP training.

Since only 68% of professionals in this study indicated they already own the necessary equipment, another possible topic for training might be ways that professionals can use equipment they already own to implement video modeling, including iPods (e.g., Cihak,
Almost half (47.45%) of participants indicated they would need additional training to effectively implement video modeling, so providing these opportunities may help professionals feel more comfortable with using video modeling for their students or clients with ASD.

Also in terms of equipment and resources to implement video modeling, additional research might investigate the impact of employer geographical location (e.g., urban, suburban, or rural location) on available resources, reported use of purchased vs. self-made videos, and ownership of necessary equipment.

Collaboration among professionals may also provide an opportunity to increase the knowledge and accessibility of effective instructional practices (Leko & Brownell, 2009) (e.g., video modeling) for interested professionals. In this study, BCBAs and SLPs were more likely to view video modeling as accessible, and these professionals were also identified by study participants as potential sources of information about video modeling. When asked how they could learn more about video modeling as an instructional technique, the human sources most frequently selected by study participants were BCBAs (69.22%), special education teachers (63.14%), and SLPs (61.96%). Opportunities for collaboration with these professionals can facilitate the dissemination and applied use of EBPs due to the social components of the diffusion of innovations (Dingfelder & Mandell, 2011). When some members of a social group (e.g., practitioners at a school or clinic) adopt an innovation, it increases the likelihood that others in the group will also adopt the innovation. Professionals working together on a multidisciplinary team can share knowledge and resources about video modeling and EBPs and
support each other in using them effectively. In particular, special education directors and other program administrators can facilitate these collaboration opportunities by scheduling time for professionals to discuss EBPs and mentor each other on their use.

Limitations

One limitation of this study that should be considered is the non-random, snowball sample. While it is not uncommon for these types of sampling to be used in online survey research, they do present some limitations. Results obtained from this study cannot necessarily be assumed to represent the larger population (Fowler, 2014) of ASD professionals. There is also the potential for bias based on individuals who self-selected to participate in the study compared to those who elected not to participate.

Caution should also be exercised when looking at multiple regression results for several survey items. For Items 41 and 42 (i.e., years of experience working with individuals with disabilities and years of experience working with individuals with ASD), the potential for multicollinearity exists (relating to their correlation of .807) and should be further examined. Multicollinearity (i.e., explanatory variables that have high correlations with each other), makes it difficult to examine the independent effects of each variable. In revising this instrument for future research, it may be beneficial to remove one of these items.

Additional caution is warranted when interpreting the regression results for several explanatory variables. On several of the demographic/background items, some of the response categories were selected by very few participants. This produces very little variation in the data that can be used to examine the independent effects of these response categories. The response categories with the fewest number of participants were (a) working with students or
clients who are infants or toddlers (n = 5) and (b) working with students or clients who are adults (n = 4). When revising the instrument, it may be worth altering the target population of professionals. Perhaps the survey should be targeted toward professionals who work with school-aged children (ages preschool through high school).

Directions for Future Research

In general, more research is needed on the applied use of EBPs and opinions of EBP use among ASD professionals. Few studies have examined the applied use of the EBP of video modeling specifically (e.g., Borders et al., 2015; Cardon et al., 2015), so additional research could examine this area via interview, survey, and direct observation of EBP use.

One area for future research relates to the evaluation of the revised VMPS survey instrument itself. Since the instrument was significantly revised from the original version for caregivers, additional research on its psychometric properties should be conducted before the instrument can potentially move into more widespread use. Ideally, an exploratory factor analysis should be conducted with one sample, a confirmatory factor analysis with another sample, and additional statistical procedures (e.g., multiple regression) with a third sample.

When feasible, researchers might also explore the applied use of EBPs with direct observation of behavior in the classroom or clinic (Jones, 2009). Given the inherent limitations associated with the indirect measurement methods of interviews and surveys (i.e., that self-reports may lack detail, cannot be verified for accuracy, and may be inaccurate or false; Miller, 2006), future research could examine the fidelity of implementation of video modeling in applied settings, as well as how the individuals with ASD respond to the intervention. Fidelity of implementation, the extent to which an intervention is delivered according to the protocol or
model (Mowbray, Holter, Teague, & Bybee, 2003), is critical to ensure that evidence-based practices are used in an effective manner. Along the same line, future research could explore the impact on fidelity of implementation of video modeling if teachers were provided with implementation scripts by their special education directors or other school district administrators.

Examination of the manner in which professionals use video modeling in applied settings relative to the implementation presented in published research would be useful in planning future studies that are meaningful to practitioners. The Diffusion of Innovations Theory suggests that individuals may place more trust into the opinions of their close acquaintances and colleagues, rather than published research (Rogers, 2002), which some educators may perceive as less relevant to their professional practice (Guckert et al., 2016). More research into the nature and extent of this disconnect may be useful in reducing the research-to-practice gap.

References


THE IMPACT OF VIDEO MODELING ON PROBLEM BEHAVIOR AND FUNCTIONAL COMMUNICATION SKILLS FOR INDIVIDUALS WITH ASD: A LITERATURE REVIEW

Introduction

Recent statistics from the United States Department of Health and Human Services indicate that the prevalence of autism spectrum disorder (ASD) is approximately one in every 50 children (Blumberg et al., 2013). ASD occurs across all ethnic, racial, and socioeconomic groups (Centers for Disease Control and Prevention [CDC], 2013). Children with autism display behavioral deficits, evident before the age of three years, in social communication and social interaction skills, and display restricted and repetitive patterns of behavior, interests, or activities (American Psychiatric Association [APA], 2013). Examples of social and communication deficits include failure to engage in reciprocal conversations, inability to use or understand gestures, and failure to adjust behavior to suit various social contexts. Examples of restricted and repetitive patterns of behavior, interests, or activities include stereotyped motor movements, resistance to change during daily routine activities, fixated interests that are abnormal in intensity, and atypical responses to sensory experiences (APA, 2013; Individuals with Disabilities Education Act, 2004). Many of these characteristics can significantly impact the individual’s ability to learn and function successfully in daily environments (Autism Speaks, 2013).

While not specifically listed in the diagnostic criteria, some children with ASD may exhibit various problem behaviors such as tantrums (e.g., crying, screaming, flailing limbs), property destruction (e.g., throwing or breaking objects), and aggression (e.g., using profanity, attacking others) to obtain functional reinforcers (Chung et al., 2012; Horner, Carr, Strain, Todd,
& Reed, 2002; Poon, 2012). Because problem behavior has a significant impact on a child’s participation in social, educational, and community opportunities, targeting the reduction of such behaviors with concurrent improvement in socially appropriate replacement behavior is an important area in ASD intervention. Given the importance of this issue, it is of paramount concern that the interventions utilized to reduce problem behavior are empirically documented to be effective.

Evidence-Based Approaches to Reducing Problem Behavior

Evidence-based approaches to reducing problem behavior in individuals with ASD frequently involve the teaching of functional equivalent responses based on outcomes of a functional behavioral assessment (FBA) procedure. When interventions are developed on the basis of a hypothesis generated through the FBA process, problem behaviors are more likely to decrease because a functional alternative response is taught (Horner et al., 2002; Ingram, Lewis-Palmer, Sugai, 2005). Developing interventions for problem behavior in individuals with ASD without completing an FBA is a questionable practice that may increase the risk of counterproductive and ineffective outcomes (Reichow, Doehring, Cicchetti, & Volkmar, 2011).

The use of hypothesis- or function-based behavior intervention plans has received extensive empirical support in the field of special education and applied behavior analysis (Ingram et al., 2005; Powers, Palmieri, D’Eramo, & Powers, 2011). Professional literature since the early 1900s has discussed the concept of socially mediated behavior and the need for assessing the functional relation between behavior and environmental events. Prominent behavioral psychologists such as John Watson, Edward Thorndike, Ivan Pavlov, and B. F. Skinner have examined this concept in their respective works.
Skinner (2005) proposed that the study of human behavior needed to be scientific, marked by direct observation of the interaction between person and environment. Skinner's scientific approach to human behavior was based on the principles of operant conditioning, which suggest that environmental consequences influence the probability of the future occurrence or non-occurrence of specific target responses. The commonly used terms reward and punishment may describe this concept, but verifying the existence of a functional relation between behavior and specific environmental events requires experimental analysis. This procedure is necessary because a reward may not always increase desired behavior, and something commonly considered a punishment may not always decrease undesirable behavior.

The behavioral approach gained ground in the latter half of the 20th century with the 1968 publication of the seminal article, “Some Current Dimensions of Applied Behavior Analysis,” by Donald Baer, Montrose Wolf, and Todd Risley, in the first issue of the Journal of Applied Behavior Analysis (Sugai, Lewis-Palmer, & Hagan-Burke, 2000). Since that time, both conceptual and empirical articles have been published in the Journal of Applied Behavior Analysis, as well as similar journals, such as the Journal of Positive Behavior Interventions, Behavior Modification, and the Journal of Behavioral Education. These articles provide empirical demonstrations of the effectiveness of behavior analytic approaches to improving behavioral outcomes for individuals with disabilities (Gresham, Watson, & Skinner, 2001).

Over the years, behavior analytic researchers have examined various intervention strategies for reducing problem behavior, including extinction, response cost, and time-out. The purpose of these intervention methods has been to reduce or eliminate problem behavior, especially behavior that is disruptive to daily functioning and/or dangerous to the self or others.
While the reduction of problem behavior is an important step in a treatment plan, problem behavior should also be replaced with socially appropriate behavior (Carr & Durand, 1985; Mirenda, 1997). Researchers and practitioners can both reduce problem behavior and increase a socially appropriate behavior in its place using data from a process known as functional behavior assessment (FBA).

Functional Behavior Assessment and Functional Communication Training

FBA is a process that serves to provide information about the environmental factors that contribute to both the occurrence and maintenance of problem behavior (Horner, 1994). It involves gathering critical information for designing an effective behavioral support plan. Five key objectives of a functional behavior assessment process are (a) operationally defining and describing the problem behavior; (b) identifying situations, times, or events that predict the occurrence and non-occurrence of problem behavior; (c) identifying the consequences that maintain problem behavior in order to delineate the social function of these behaviors; (d) generating hypotheses based on the above information; and (e) collecting data via direct observation to support the hypothesis statement(s) (O’Neill et al., 1997). These data are utilized to identify competing behaviors and reinforcers in order to develop a behavior intervention plan based on the assumption that problem behavior serves communicative functions.

Functional communication training (FCT) is an intervention approach that involves the use of FBA data to teach an alternative communication response to replace the problem behavior (Durand, 1990; Durand & Merges, 2001). The focus is on teaching a socially appropriate method for communication that effectively produces the same functional outcome.
as the problem behavior (Franzone, 2009). This alternative behavior is a functional replacement for the problem behavior (Sugai et al., 2000). Once a potential replacement behavior is selected, FCT is used to teach the replacement response by prompting and reinforcing its rate of occurrence while concurrently extinguishing problem behavior (Franzone, 2009). An example would be teaching a child to request a break from a non-preferred activity (Horner, Sugai, Todd, & Lewis-Palmer, 2000) by using vocal language, a manual sign, or an assistive technology device with voice output. This alternative response is reinforced while problem behavior is moved toward extinction.

Traditionally, children and adults with disabilities have been taught to use functional communication responses using in-vivo modeling or prompting procedures. Practitioners and interventionists frequently use a prompt, such as demonstrating how to request a break or physically guiding a child's hand to activate an assistive technology device with voice output saying, “I want a break.” Prompts are gradually faded over time, so the individual performs the replacement behavior independently (National Professional Development Center on ASD [NPDC], 2010b). While these approaches have been documented to be effective in the empirical literature (e.g., Carr & Durand, 1985; Davis, Fredrick, Alberto, & Gama, 2012; Durand & Carr, 1991; Olive, Lang, & Davis, 2008; Sigafoos & Meikle, 1996), recent advances in technology have facilitated the development of additional intervention strategies (e.g., video modeling, computer-assisted instruction, and mobile devices) for skills instruction (e.g., Delano, 2007; Kagohara et al., 2013; Pennington, 2010). Video modeling, the demonstration of specific appropriate behaviors on a video clip, is now considered an established intervention for teaching social, play, and self-help skills to children with ASD (Association for Science in Autism
Video modeling has numerous benefits that may make it an effective strategy for teaching functional communication replacement behaviors to children with ASD.

Video Modeling as an Intervention Method

Video modeling refers to a method of promoting observational learning (Corbett, 2003) that involves a video demonstration of target behavior. As an intervention method, video modeling generally consists of an individual watching a video demonstration of a behavior (as opposed to viewing a live or in-vivo model) and then imitating the behavior of the video model in the natural setting (Bellini & Akullian, 2007). A video modeling intervention involves the modeling of appropriate behaviors that an individual is being taught (Delano, 2007) by a model who is selected based on competence at performing the target behavior (Kashinath, 2012). Viewing the performance of a target behavior is believed to help the viewer to internalize and, at a future time, accurately reproduce the behaviors observed in the video (Mason, Ganz, Parker, Burke, & Camargo, 2012) in a real-world setting (Kashinath, 2012). Phrased another way, the purpose of video modeling is to improve an individual’s ability to imitate, memorize, and generalize the target behavior in order to apply the behavior to natural settings.

Video recordings used in a video modeling intervention can be specifically developed for each individual and created to emphasize certain targets, such as relevant social cues, precise communicative responses, or sequences for completing a task (McCoy & Hermansen, 2007). To conduct a video modeling intervention, an individual is generally encouraged to sit in front of a television, computer, or other screen, watch the video model, and pay attention to the specific target behaviors displayed by the model. The individual may be reinforced for attending to the
video. Later, an opportunity is provided or arranged in the natural environment for the individual to display the target behavior observed in the video (Corbett, 2003).

A video modeling intervention can incorporate a variety of methods, including peer modeling, video self-modeling, and point-of-view modeling. In peer modeling, the video recording shows a target behavior modeled in a relevant context by another person (Shukla-Mehta, Miller, & Callahan, 2010). The person shown in the video may be an adult, a child peer, or a child sibling of the target individual (Bellini & Akullian, 2007). Both adult and peer models may be familiar (e.g., parents, teachers, or classmates), or unknown to the individual. When child peer models are selected, they are frequently of the same gender and a similar age to the individual (McCoy & Hermansen, 2007). This type of video modeling may also be referred to as video modeling with other as model (VMO; Mason et al., 2012).

Video self-modeling is similar in that a relevant target behavior is shown, but the individual demonstrating the target behavior is the individual with ASD him- or herself (Bellini, Akullian, & Hopf, 2007). An example of only the successful completion of the target behavior by the individual (without prompts or reinforcement by others) is shown (Shukla-Mehta et al., 2010). Any unsuccessful attempts at behavior, as well as prompting or assistance from others, is edited and removed to create the final version of the video to be viewed (Mason et al., 2012).

These two types of video modeling involve the use of the self or other people as models, while point-of-view video modeling takes a different perspective. This type of video modeling shows the completion of a target behavior from the vantage point of an individual completing the behavior (Hine & Wolery, 2006).
Theoretical Foundations for Video Modeling

The foundations for the use of video modeling are based upon the idea of learning through modeling, or observational learning. Observational learning refers to behavioral and cognitive change that takes place due to the observation of the behavior of other people (Bandura, 1986). The use of modeling as a learning technique was promoted as a part of the social learning theory of Albert Bandura (1977, 1997). Specifically, modeling refers to an individual demonstrating a behavior that may be imitated by others. This demonstration can be observed in person (i.e., in-vivo) or through a video recording (Corbett, 2003). Bandura (1977) suggested that it was possible for children to acquire a wide variety of new behaviors by observing others without needing the personal experience of directly engaging in the behaviors themselves.

According to Bandura (1977), children may imitate the behavior(s) they observe through modeling whether or not reinforcement for engaging in these behaviors is delivered. While observing others receive consequences for their behaviors is not always necessary, observing the consequences can have an impact on the viewer’s behavior. For example, if a child sees a model engaging in a particular behavior that is followed by reinforcement, it may increase the likelihood of the viewer engaging in that particular behavior in the future (assuming that the observed reward is preferred by the viewer). Observing behaviors that are followed by punishing consequences may also vicariously punish those behaviors for the viewer (Bandura, 1969). Behaviors learned through observational learning can also generalize to other settings outside of the context where the behaviors were originally modeled and observed (Bandura, 1977).
Similar to observational learning, *social cognition* allows individuals to learn from others in an indirect manner by observing the experiences of others. This process involves the capability to think about one’s own mental states and thoughts, as well as those of others. While many people acquire these abilities naturally, individuals with ASD frequently struggle with the underlying social skills used in social cognition. Imitation is a behavior that falls under the category of social cognition. It requires the ability to learn socially, that is, to observe the actions of others, make a connection between their behavior and one’s own, and incorporate the observed behavior into one’s own behavioral repertoire (Rogers & Williams, 2006). Imitation may relate to the process of navigating social relationships and learning about the world during early childhood (Young et al., 2011).

Difficulties with imitation skills have long been associated with ASD (Vanvuchelen, Roeyers, & De Weerdt, 2011a). Children with ASD show more significant impairments in imitation skills compared to their peers without disabilities or peers with Fragile X syndrome and other developmental disorders (Rogers, Hepburn, Stackhouse, & Wehner, 2003). In a study examining risk factors for ASD, Vanvuchelen et al. (2011b) found that procedural imitation delay was associated with ASD in preschool-aged children. While imitation deficits may be present and potentially long lasting, they may not be universal in those with ASD at a young age. Vanvuchelen et al. (2011a) suggested a need for further research in this area before making definite conclusions.

In order to successfully imitate, an individual must first attend to the behavior of a model (Bandura, 1977) by socially interacting with the model. Children with ASD are less likely to socially engage with others (APA, 2013), thereby limiting the possibilities for observational
learning in natural ways like many other children learn. The use of video technology may help address the social demands associated with in-vivo modeling. Video modeling contains elements that may increase a child’s motivation to attend to the behavior of a model depicted in a video recording (Bellini & Akullian, 2007; Charlop-Christy, Le, & Freeman, 2000).

**Video Modeling and Autism Spectrum Disorder**

Video modeling interventions may have benefits specifically for individuals with ASD, who appear to possess greater strength in visual processing skills relative to auditory processing abilities (Cihak, 2011; Quill, 1997). Given that people with ASD tend to utilize visual input as a significant source of information about their environment (Quill, 1995), visual methods of instruction have the potential to capitalize on cognitive strengths unique to ASD (Schreibman, Whalen, & Stahmer, 2000). Quill (1997) suggested that it might benefit individuals with ASD if their instructors shift from language-based to visually-based instruction. Video modeling takes advantage of the visual learning modality (Bellini & Akullian, 2007; Mason et al., 2012).

By definition, video modeling involves visual learning through watching individuals on some type of television or computer screen. It has been reported that individuals with ASD may show a particular affinity for, or interest in, technology (Colby, 1973). A recent survey of families of children with ASD reported that, when given leisure time, children with ASD tended to engage in high levels of interaction with electronic screen media (e.g., television or computers). Additionally, half of all children were reported, on occasion, to spontaneously perform either verbal or physical imitation during movie or television viewing, and 7% were reported to do so frequently (Shane & Albert, 2008). According to Schreibman et al. (2000), watching videos represents an activity that may be naturally reinforcing to children with ASD.
because of their preference for visual stimuli. Additionally, they may selectively direct their attention toward television watching, especially if they are motivated to watch themselves (Buggey, Toombs, Gardener, & Cervetti, 1999).

Video-based instruction may also help alleviate stimulus overselectivity present in some individuals with ASD. Stimulus overselectivity refers to the difficulty of attending to the relevant parts of a learning situation and instead overselecting (attending to) other, less relevant, stimuli present in the environment (Koegel & Koegel, 2006). This issue may make it difficult to determine the specifics of which behaviors of others should be imitated (McCoy & Hermansen, 2007). Video-based instruction may help alleviate this difficulty. Videos can focus attention to a specific area, that is, the viewing screen (Sherer et al., 2001). Additionally, the video itself can focus on and emphasize the relevant cues by zooming in on target behavior one or more times. This enhancement may make it more likely that an individual with ASD will attend to the important cues in the video rather than irrelevant stimuli in the environment (Charlop-Christy et al., 2000).

Additional, it may be easier for individuals with ASD to cognitively process information delivered through video technology. When compared to in-vivo instruction, videos can have fewer requirements for social interaction and greater visual prompts (Cihak, Smith, Cornett, & Coleman, 2012). It has also been reported that children with ASD may prefer to look at photographs of other people instead of directly interacting with them (Cihak, 2011).

Video modeling, as a method of teaching and learning, has been documented in the literature as an evidence-based practice (EBP) for teaching various types of skills to individuals
with ASD (NPDC, 2010a) and is thought to promote both acquisition and generalization of a variety of skills (Charlop-Christy & Daneshvar, 2003).

Purpose of the Literature Review

Research on evidence-based practices for individuals with ASD indicates that an approach to reducing problem behavior should be based upon an FBA. Once this has been completed, functional communication skills may be taught as a replacement to the problem behavior. Video modeling has been frequently researched for the teaching of social communication skills, with more limited, but increasing amounts of research examining video modeling for the reduction of problem behavior and the teaching of functional communication skills. Therefore, an investigation into the application of video modeling on these target behaviors for individuals with ASD is warranted. The purposes of this review are as follows: (a) review the existing literature to identify research examining the effect of video modeling on reducing problem behavior and increasing functional communication skills in individuals with ASDs; (b) determine the general effectiveness and outcomes of video modeling studies for these target behaviors and population; and (c) review the quality of existing studies on video modeling for these target behaviors and population based on criteria proposed by Reichow et al. (2011).

Video Modeling Intervention to Decrease Problem Behavior

Most existing research on problem behavior reduction typically utilizes a hypotheses-based intervention model that focuses on teaching a functionally equivalent replacement response. However, much of the existing research on video modeling to decrease the problem behavior of individuals with ASD has focused on teaching imitation of a socially appropriate
behavior as an antecedent strategy rather than aligning intervention with the function(s) of problem behavior. A summary of the studies included in this review is presented in Table 6.

Schreibman et al. (2000) implemented POV video modeling to reduce tantrums (e.g., crying, screaming, kicking, and dropping to the floor) during transition routines. Participants included three male children, age 3 to 6 years, diagnosed with ASD at varying levels of severity. They viewed videos in their homes that showed the POV of a child transitioning from one location to another (e.g., stores in a shopping mall). After watching the video clip, the parents initiated the transition routine. On location, parents were instructed to go about their routine and respond to their child’s behavior as they would normally. Data from the multiple baseline design across participants indicated that levels of tantrums were reduced for all participants.

For the first participant, baseline levels of problem behavior averaged 70% of measured time intervals. During intervention, the level of problem behavior dropped to zero on the first session, and remained at zero for all sessions except one. For the second participant, the level of problem behavior during baseline averaged 60%. During intervention, levels of problem behavior decreased rapidly, although not immediately, eventually reaching near-zero levels. Results were similar for the third participant where baseline levels of problem behavior that averaged 60% and decreased to near-zero levels during intervention. For all participants, the results maintained at post-treatment measurement and one-month follow-up, demonstrating the effectiveness of point-of-view video modeling for decreasing problem behavior related to transition. Based on quality indicators for rigor in reporting research established by Reichow et al. (2011), this study may be considered to have a strong level of rigor, meeting all six primary quality indicators and three of six secondary quality indicators.
### Table 6

**Summaries of Individual Studies**

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Research Design</th>
<th>Participants/ Location</th>
<th>DV</th>
<th>IOA for DV</th>
<th>Intervention</th>
<th>FOI</th>
<th>Outcome</th>
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<tbody>
<tr>
<td>Schreibman, Whalen, and Stahmer (2000)</td>
<td>MBL across participants.</td>
<td>Three male children with autism in the mild/moderate to severe range. Ages 3 to 6 years.</td>
<td>Tantrum behavior (including whining, crying, screaming, pulling on adults).</td>
<td>Collected on at least 1/3 of sessions for each participant with a mean of 97.86%.</td>
<td>Participants viewed a POV video model of completing individually selected transition routines.</td>
<td>Not specified.</td>
<td>Levels of tantrum behavior reduced to near zero levels for all participants. Results maintained at post-treatment measurement and follow-up.</td>
</tr>
<tr>
<td>Coyle and Cole (2004)</td>
<td>Various forms of the reversal design.</td>
<td>Three male children with autism ages 9 to 11.</td>
<td>Off-task behavior.</td>
<td>Collected for one session per week for each participant. Participant 1 = mean of 98.3%, Participant 2 = mean of 97.9%, Participant 3 = mean of 98.3% (week 1) and 100% (week 2).</td>
<td>A combination of video self-modeling of appropriate classroom behavior and self-monitoring.</td>
<td>Collected one session per week for each participant. 100% for all participants.</td>
<td>Decreases in off-task behavior coincided with the changes in the independent variable for all three participants.</td>
</tr>
<tr>
<td>Buggey (2005)—Study 2</td>
<td>MBL across two participants.</td>
<td>Two male children: a 6-year-old diagnosed with Asperger’s and an 8-year-old diagnosed with autism.</td>
<td>Tantrums (including physical withdrawal and an outward manifestation such as sobbing or negative verbalizations).</td>
<td>IOA was reported to be 100% on the onset of behavior and 94% on the duration.</td>
<td>Videos showed the participant himself having an appropriate reaction to a difficult classroom situation.</td>
<td>Not specified.</td>
<td>Duration of tantrums decreased for all participants.</td>
</tr>
<tr>
<td>Buggey (2005)—Study 3</td>
<td>MBL across two behaviors.</td>
<td>A 5-year-old male child with pervasive developmental delay.</td>
<td>Inappropriate behavior with peers (grabbing and squeezing the cheeks of a peer).</td>
<td>IOA was reported to be 100% for the target behavior.</td>
<td>Video showed the participant playing appropriately with peers.</td>
<td>Not specified.</td>
<td>The target behavior was reduced to zero or near-zero levels during intervention and maintenance.</td>
</tr>
<tr>
<td>Cihak, Fahrenkrog, Ayres, and Smith (2010)</td>
<td>ABAB for each participant.</td>
<td>Four children, ages 6 to 8 years, three male and one female, all in the severe range of autism.</td>
<td>Number of independent transitions to various locations within a school.</td>
<td>Collected for 60% of baseline sessions and 33% of all subsequent phases with a mean of 99%.</td>
<td>Videos were a combination of POV and self-modeling to show transitioning between locations in the school.</td>
<td>Collected for 33% of all intervention phases with a mean of 99%.</td>
<td>Transitions improved for all participants and increases and decreases were associated with the phases’ changes.</td>
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</table>

*(table continues)*
Table 6 (continued).

<table>
<thead>
<tr>
<th>Author(s)</th>
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<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cihak (2011)</td>
<td>Alternating treatments.</td>
<td>Four children, ages 11 to 13 years, three male and one female, all in the severe range of autism.</td>
<td>Number of times a participant independently transitioned to a new task.</td>
<td>Collected for 25% of each phase with a mean of 97% agreement.</td>
<td>Participants viewed either a picture of an activity or a video clip of the participant completing an activity.</td>
<td>Was scored from a script and received a mean of 99%.</td>
<td>All participants increased independent transitions with both interventions. For two participants, pictures were considered superior, and for the other two participants, video modeling was considered superior.</td>
</tr>
<tr>
<td>Plavnick and Ferreri (2011)</td>
<td>Alternating treatments within a multiple probe across behaviors design for each participant.</td>
<td>Three boys and one girl between 4.5 and 6.5 years of age with a diagnosis of autistic disorder and a severe language impairment.</td>
<td>Function-based and nonfunction-based mands.</td>
<td>Collected during 25% of sessions across all conditions, participants, and phases. Was 100%, 100%, and 98% mean for Participant 1, 100%, 93% and 94% mean for Participant 2, for Participants 3 and 4: 100% for all measurements.</td>
<td>Compared two video conditions: videos showing a peer displaying function-based mands and videos showing a peer displaying a nonfunction-based mand. In both videos, the peer received the requested item from an adult.</td>
<td>Used a checklist during 20% of all interventions sessions across all phases, conditions, and participants with a mean level of 96%.</td>
<td>All participants more readily acquired mands during the function-based conditions compared to the nonfunction-based conditions. Generalization was observed more for function-based mands, but not for nonfunction-based mands.</td>
</tr>
<tr>
<td>Cihak, Kildare, Smith, McMahon, and Quinn-Brown (2012)</td>
<td>Alternating treatments and a reversal design within the superior phase.</td>
<td>Three males with autism, ages 11 to 13 years, and one 14-year-old male with Asperger’s.</td>
<td>Task engagement.</td>
<td>Collected during a minimum of two sessions for each phase. For Participant 1, mean of 89%, for Participant 2, mean of 92%, for Participant 3, mean of 96%, for Participant 4, 92%.</td>
<td>Videos showed each participant reading a social narrative describing a situation in the classroom and an appropriate replacement behavior for that situation, along with a demonstration of the replacement behavior.</td>
<td>Collected during a minimum of two sessions for each phase. For Participant 1, mean of 98%, for Participant 2, mean of 95%, for Participant 3, mean of 94%, for Participant 4, 97%.</td>
<td>Results indicated that on-task behavior improved for all participants after viewing the video social narrative that corresponded to the specific function of their off-task behavior. Similar increases were not demonstrated after viewing the video social narratives that did not correspond to the function of the off-task behavior.</td>
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</table>
In another study, Coyle and Cole (2004) targeted the reduction of off-task behavior in three male children with autism, ranging from mild/moderate to severe levels of impairment, between 9 and 11 years of age. Before beginning an independent work period in his special education classroom, each participant watched a video of himself engaged in on-task behavior. During this 10- to 15-minute training session, each participant was also taught to self-monitor both on- and off-task behavior. Using a reversal design, the authors reported that decreases in off-task behavior coincided with the changes in the independent variable for all participants.

Results were reported in terms of how many seconds each participant was off-task during each 30-second observation interval. For the first participant, the baseline mean was 25.5 seconds, the intervention mean was 1.6 seconds, and the return to baseline mean was 14.5 seconds. In a baseline follow-up phase, the mean was 14.2 seconds, and the mean for an intervention follow-up phase was 1 second.

The second participant had similar levels of behavior during baseline. For this participant, the baseline mean was 25.9 seconds, the intervention mean was 5.5 seconds, and the return to baseline mean was 19.3 seconds. In a baseline follow-up phase, the mean for this participant was 23.5 seconds, and during an intervention follow-up, the mean was 5.8 seconds.

For the final participant, a similar baseline mean of 25.8 was observed. The intervention mean was 1.5 seconds, and the return to baseline mean was 14.2 seconds. For this participant, a Phase C was added that represented an intervention phase in which prompts were reduced. The mean for this phase was 0.7 seconds, and a final return to baseline mean was 8 seconds.

There were immediate increases and decreases in the dependent variable that coincided with phase changes with minimal overlap for all participants. These results showed
that a combination of video self-modeling and self-management was successful in reducing off-task behavior in a classroom setting. This study met five out of six primary quality indicators and four out of six secondary quality indicators, thus representing an adequate research rigor rating.

A similar video modeling intervention was implemented by Buggey (2005) to reduce tantrums (e.g., negative verbalizations, flailing of limbs, sobbing) and other problem behavior during social interactions with peers (e.g., grabbing, squeezing, and pushing faces of peers). Two of the three studies described in this article focused on replacing problem behavior with appropriate behavior. In one study, two male children with mild symptoms of ASD, ages 6 to 8 years, watched a video recording before class at school. Each video showed the participant himself acting out a script of a difficult situation that would often lead to tantrum behavior. The video showed the participant making an appropriate response to the situation.

The multiple baseline design across participants indicated that duration of tantrums decreased for both participants during the intervention phase. For one participant, the baseline mean duration of tantrums was 16.25 minutes. During intervention, this was reduced to a mean of 1.6 minutes per tantrum. Similar results were observed in maintenance (a mean of 2.8 minutes). In a 2-day follow-up three weeks later, no tantrums were observed.

For the second participant, tantrums in the baseline phase lasted a mean of 19.3 minutes. During intervention, the mean duration was 4 minutes. Further reductions were observed in maintenance, with a mean duration of 2.3 minutes. During the follow-up period, no tantrums were observed. Data for both participants showed immediate decreases at the time of the phase change and showed minimal or no overlap between the phases.
In the second study, utilizing a multiple baseline design across behaviors, a 5-year-old male diagnosed with pervasive developmental delay and a significant speech delay exhibited problem behaviors with peers (e.g., grabbing, squeezing, and pushing faces of peers). The participant was shown a self-modeling video where he was interacting appropriately with peers (e.g., sharing toys and hugging a peer).

Results indicated a reduction from a mean of 2.2 incidents of problem behavior per observation period during baseline to a mean of 0.1 incidents in the intervention phase. During the maintenance phase, no incidents of the problem behavior were observed. These two studies clearly demonstrated clinical effectiveness of viewing self-models of appropriate behavior in situations where problem behavior was likely to occur. However, the research design utilized only two baselines and best practice in single case experimental designs suggest the need for at least three demonstrations of effect (e.g., Kratochwill et al., 2012). Primarily due to the number of replications of effect, these two studies both received a weak research rigor rating.

Video modeling was also used by Cihak, Fahrenkrog, Ayres, and Smith (2010) to reduce the problem behavior of children with ASD during transitions. They implemented a combination of point-of-view and self-modeling with four children with severe ASD (three males and one female). The videos showed transitions to various locations within a school. Participants viewed a video clip of a transition to a specific location immediately prior to making the transition.

Using an ABAB design for each participant, the authors reported that independent transitions (i.e., transitions without problem behavior) improved for all participants, and these
changes corresponded with the phase changes. Participant 1 had a baseline of 4% independent transitions, which increased to a mean of 83% during intervention. When the intervention was withdrawn, the mean percent of independent transitions reduced to 23%. Upon re-implementation, the percentage rose to 93%. For all phases, there were immediate changes in level of the data corresponding with each phase change with no overlap between adjacent phases. Percentage of independent transitions was 100% at the 9-month follow-up.

For Participant 2, the baseline mean of 6% rose to 72% during intervention. This percentage reduced to 27% when the intervention was withdrawn, and it increased to 82% when re-implemented. There were immediately increasing levels from baseline to intervention, which represented some minimal overlap. For other phases, there were immediate changes in level corresponding with each of the phase changes. The percentage of independent transitions was also at 100% for Participant 2 during follow-up.

Similarly, Participant 3 had a low level of independent transitions at baseline (8%). Upon introduction of the intervention, this increased to 79%. When the intervention was withdrawn, the percentage dropped to 47%, but it again increased when the intervention was re-implemented (to 88%). There was minimal data overlap between adjacent phases, and immediate changes were observed corresponding to each phase change. As with the other two participants, the follow-up level for Participant 3 was 100%.

The final participant had the highest level of independent transitions during baseline (10%). This level increased to 74% during intervention, and subsequently reduced to 47% when intervention was withdrawn. It increased to 90% when the intervention was re-implemented and remained at 90% during follow-up. For this participant, there was a more slow and gradual
increase from the baseline into the intervention phase. For the other phases, there was a more immediate change that coincided with the phases changes.

This study provides an additional example of reducing problem behavior during transition routines using point-of-view video modeling. In terms of research rigor rating, this study also was considered strong, meeting all primary quality indicators and five out of six secondary quality indicators.

Similar behaviors were targeted in a follow-up study by Cihak (2011), where participants were four children with severe ASD (three males and one female), ages 11 to 13 years. The target behavior was independently transitioning to new tasks without problem behavior. This study utilized an alternating treatments design to compare a video modeling activity schedule with a picture activity schedule. Immediately prior to transitioning to a new activity, participants were shown either a picture of the next activity or a video clip with a combination of self-modeling and point-of-view of the transition to the next activity.

Data indicated that all participants improved their independent transitions between activities in both conditions. For two of the participants, the picture activity schedule was considered the superior treatment. For the other two participants, the video modeling schedule was considered superior.

One of the participants had a mean percentage of independent transitions of 2% during baseline. Using the picture schedule, this mean increased to 63%, and it increased to 65% using the video modeling schedule. He met the criterion of 100% for three consecutive sessions in the picture schedule condition, so this was considered the superior treatment. In a superior treatment phase, the percentage for this participant was 100%.
Another participant began with 8% of independent transitions during baseline. During the picture schedule condition, this percentage was 69%, and during the video modeling schedule condition, it was 51%. This participant met the criterion with picture schedules, so this was considered superior, and the rate during this condition was maintained at 100%.

For the other two participants, the video activity schedule was considered superior. One of these participants had a baseline mean percentage of independent transitions of 12%. When using pictures schedules, this increased to 82%, and it increased to 91% using video modeling. He met the criterion with both conditions, but video modeling was considered superior because fewer transitions required teacher assistance. The mean for the superior only phase for this participant was 100%.

For the final participant, baseline data were also 12%. An increase to 63% was observed for the picture schedule, and an increase to 85% for video modeling. He met the criterion for video modeling, and maintained 100% of independent transitions during the superior treatment phase.

The fact that both types of schedules increased levels of appropriate behavior and each of the different types of schedules were considered superior for different participants may not be surprising. Both methods used visual approaches, and the choice of a picture schedule or a video clip may be a matter of personal preference. This study was also considered a strong study in terms of research rigor, meeting six out of six primary quality indicators and three out of six secondary quality indicators.
Video Modeling and Functional Behavior Assessment

While the previously described studies on video modeling addressed the reduction of problem behavior in individuals with ASD, the authors of these studies did not report on the procedures for identifying alternate responses based on the specific functions of problem behavior. To date, two studies have examined the use of video modeling as an intervention in individuals with ASD by identifying functionally equivalent alternate responses based on functional analyses.

Plavnick and Ferreri (2011) conducted a functional analysis of idiosyncratic communication (i.e., gestures) of four young children with ASD (ages 4.5 to 6.5 years) and severe language impairment. They evaluated levels of the gestures during four conditions, (materials [access to tangibles], escape, attention, and a control condition). During three conditions (i.e., materials, attention, and escape), an adult functionally reinforced student gestures by providing access to preferred items, attention, and removal of demands, respectively. A control condition was also provided during which the child was given non-contingent access to preferred items as well as frequent attention from an adult. Results of the functional analysis indicated that, for three of the four participants, gesture rates were highest during the materials condition, suggesting that the function of the behavior was access to preferred items. The remaining participant displayed the highest rates of gesture behavior during the attention condition.

Using this information, Plavnick and Ferreri (2011) examined the acquisition of either picture exchange or spoken mands as a replacement behavior for idiosyncratic gestures in the context of two video modeling conditions. The authors used an alternating treatments design...
embedded within a multiple probe design across behaviors to compare the two conditions several times for each participant. In a function-based video modeling condition, a mand was taught that was functionally equivalent to the individual’s gesture behavior. In a nonfunction-based video modeling condition, a mand was taught that was unrelated to the function of the individual’s gesture. The videos depicted a peer emitting a target mand and an adult delivering the requested item to the peer. The participants viewed videos immediately prior to an opportunity to emit the target mand.

Results indicated that all participants more readily acquired mands during the function-based conditions than during the nonfunction-based conditions. None of the participants made any targeted mands during the baseline phase. For function-based mands, Participant 1 made the targeted mand in 78% of observation intervals for the first mand, 88% of intervals for the second mand, and 63% of intervals for the third mand. Non-function based mands were made in less than 6% of observation intervals for all three mands. Function-based mands also generalized to a novel situation (occurring in 95% of intervals) and remained high in follow-up (98% of intervals).

For Participant 2, percentages for function-based mands were also high during intervention (97%, 88%, and 60%). All of the non-function based mands occurred in less than 6% of intervals. Generalization and follow-up scores for Participant 2 were also high, at 95% and 96%, respectively. In terms of visual inspection, the data of Participants 1 and 2 showed a similar pattern: for the first two mands, immediate increases were observed at the point of phase change with no overlap. For the final mand, there was an immediate but more gradual increase with minimal overlap.
Data for Participant 3 also showed improvements on function-based mands (100%, 67%, and 80%), but less so with nonfunction-based mands (9%, 32%, and 0%). The changes for the function-based mands were immediate and coincided with the phase change. Generalization and follow-up sessions were not reported for this participant.

Participant 4 showed more improvements with the nonfunction-based mands compared with other participants. For function-based mands, 80% was reported compared to 41% for nonfunction-based mands. The authors reported that this participant quickly acquired mands that were function-based, but the non-function based mands were more gradually acquired. This participant used picture exchange to mand, and when the distance between the participant and the communicative partner was increased (i.e., the participant had to move a greater distance to mand), the function-based mands were observed in 84% of intervals, and nonfunction-based mands were observed in 48%. Generalization remained high for function-based mands (83%), but was less so for nonfunction-based mands (23%). For this participant, there was an immediate increase from baseline to intervention for function-based mands and a more gradual increase for nonfunction-based mands. Considering the study as a whole, it met five out of six primary quality indicators and four out of six secondary quality indicators, giving it an adequate research rigor rating.

Similar results for different target behaviors were obtained by Cihak, Kildare, Smith, McMahon, and Quinn-Brown (2012). In this study, participants were four male middle school students with autism or Asperger’s disorder, ages 11 to 14 years. They ranged in IQ from 83 to 105. A teacher interview and a brief functional analysis were conducted to identify possible functions of off-task behavior during a math class period. Both a general and special education
teacher familiar with the participants were interviewed to identify target behaviors and conditions within the classroom that may have occasioned or maintained problem behavior. Results of this interview suggested that off-task behavior occurred during independent seatwork. A brief functional analysis was conducted during independent seatwork with three conditions. In an attention condition, a teacher provided a verbal statement of task redirection and brief close physical proximity to the participant contingent on off-task behavior. In an escape condition, a teacher briefly removed the task contingent on off-task behavior. In a control condition, the teacher did not place academic demands on the participant but instead provided continuous attention in the form of discussing afterschool activities with the participant. Results of the functional analysis indicated that, for two participants, rates of on-task behavior were lower during the attention conditions (i.e., higher rate of off-task behavior). For the other two participants, rates of on-task behavior were lower during the escape conditions (i.e., higher rate of off-task behavior).

Based on these data, Cihak, Kildare, et al. (2012) used an alternating treatments design to compare a video social narrative addressing attention-maintained behaviors with another video social narrative addressing escape-maintained behaviors. These self-modeling videos showed each participant reading a social narrative describing the situation in the classroom and an appropriate replacement behavior for that situation (e.g., raising one’s hand to gain teacher attention). The videos also included clips of participants demonstrating the replacement behavior and being functionally reinforced following its occurrence (e.g., teacher attention or escape). Participants viewed one of either type of video as the teacher distributed math seatwork in class.
Results indicated that on-task behavior increased for all participants after viewing the video social narrative that corresponded to the specific function of their off-task behavior. Lower levels of on-task behavior were observed when the video social narratives did not correspond to the function of the off-task behavior. The function of Participant 1’s behavior was hypothesized to be attention. Throughout the intervention comparison condition, the mean percentage of intervals of task engagement was 92% during the attention-seeking video condition and 55% during the task-avoidance video condition. The attention-seeking video was implemented alone as the superior intervention, during which the mean was 98%. The intervention was then withdrawn, resulting in a reduction to 64%. When the attention-seeking video was re-implemented, the mean increased to 92%.

Attention was also hypothesized to be the function of Participant 2’s off-task behavior. For the attention-seeking video condition, mean task engagement was 83%, and the mean was 30% for the task-avoidance video condition. When the attention-seeking video was implemented alone, the mean percentage was 97%. When it was withdrawn, the percentage of task engagement reduced to 82%. Upon reintroduction of the intervention, the mean percentage returned to 97%.

For Participant 3, the function of off-task behavior was hypothesized to be escape or avoidance. When viewing the escape video condition, the mean percentage of task engagement was 97%. When viewing the attention video condition, the mean percentage was 68%. In the superior alone condition, the mean percentage was 100%, and when this was withdrawn, the mean percentage decreased to 60.
The final participant’s data also indicated a function of escape or avoidance for off-task behavior. During the escape video condition, the mean percentage was 65%, and during the attention video condition, it was 47%. Continued improvement (a mean of 77%) was observed during the superior treatment only phase, which decreased to 58% when the intervention was withdrawn. When this intervention was re-implemented, the mean increased to 88%. The study by Cihak, Kildare, et al. (2012) received a research rigor rating of adequate. This study met five out of six primary quality indicators, and two out of six secondary quality indicators.

The two studies described above illustrate the importance of addressing the behavioral function when implementing video modeling to reduce socially mediated problem behavior. In these studies, greater levels of problem behavior reduction were evident when replacement behaviors matched the behavioral functions taught using video modeling. When replacement behaviors that did not match the behavioral functions were taught, levels of problem behavior did not decrease to the same degree. Given the limited number of studies that utilize FBA procedures as a basis for video modeling, it appears that further research is needed to demonstrate the use of hypothesis-based video modeling interventions for children with ASD.

Support for Video Modeling as an EBP for Problem Behavior and Functional Communication: Overview of Rating System

Each study included in this review was evaluated on the quality of the methodology, data analysis, and reporting of results. This evaluation was completed using the criteria for high quality research proposed by Reichow et al. (2011). This rating system allows for the evaluation of methodological quality as well as the determination of whether a particular practice meets the criteria for an EBP. Specifically, this rating system was designed to identify EBPs for individuals with ASD.
The rating system consists of six primary quality indicators (e.g., type of participant characteristics that need to be described) and six secondary quality indicators (e.g., whether or not observers were blind to the treatment conditions) for single subject research (Reichow et al., 2011). Each included study was independently coded on its primary and secondary quality indicators.

After being reviewed for quality indicators, studies were assigned a research strength rating of strong, adequate, or weak according to the number of primary and secondary quality indicators met by the study. For a full description of the quality indicators and rating guidelines, see Reichow et al. (2011).

Reichow et al. (2011) described an established EBP as an intervention that has demonstrated effectiveness in multiple studies with sound research methodology that have been conducted by at least two separate researchers (or research teams) in different geographic locations. These authors provided a formula \(((\text{Group}_s \times 30) + (\text{Group}_a \times 15) + (\text{SSEDS} \times 4) + (\text{SSEDA} \times 2) = Z)\) for the calculation of a score that may be used to determine the status of an intervention as an EBP. This formula is calculated by using the number of strong group design studies (\(\text{Group}_s\)), the number of adequate group design studies (\(\text{Group}_a\)), the number of participants for whom the intervention was successful from the strong single subject design studies (\(\text{SSEDS}\)), and the number of participants for whom the intervention was successful from the adequate single subject design studies (\(\text{SSEDA}\)). Studies that receive a weak rating are not considered (in this particular formula) for determining an intervention’s status as an EBP.
When a score is obtained based on the formula, it is compared to various levels of EBP. According to Reichow et al. (2011), interventions receiving scores from 0–30 points are not considered an EBP, interventions receiving scores from 31–59 are considered a promising EBP, and interventions receiving scores 60 or greater are considered an established EBP.

Research rigor ratings. When evaluating the evidence for video modeling being considered an EBP for reducing problem behavior and increasing functional communication skills for individuals with ASD, the Reichow et al. (2011) evaluation criteria were applied to each study included in this review. Three studies received a rating of strong, three studies received an adequate rating, and two studies received a weak rating. These results are displayed in Table 7.

Table 7

**Evaluation of Individual Research Studies**

<table>
<thead>
<tr>
<th>Authors</th>
<th>Primary QI</th>
<th>Secondary QI</th>
<th>Strength Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schreibman, Whalen, and Stahmer (2000)</td>
<td>6</td>
<td>3</td>
<td>Strong</td>
</tr>
<tr>
<td>Coyle and Cole (2004)</td>
<td>5</td>
<td>4</td>
<td>Adequate</td>
</tr>
<tr>
<td>Buggey (2005)—Study 2</td>
<td>2</td>
<td>2</td>
<td>Weak</td>
</tr>
<tr>
<td>Buggey (2005)—Study 3</td>
<td>3</td>
<td>2</td>
<td>Weak</td>
</tr>
<tr>
<td>Cihak, Fahrenkrog, Ayres, and Smith (2010)</td>
<td>6</td>
<td>5</td>
<td>Strong</td>
</tr>
<tr>
<td>Cihak (2011)</td>
<td>6</td>
<td>3</td>
<td>Strong</td>
</tr>
<tr>
<td>Plavnick and Ferreri (2011)</td>
<td>5</td>
<td>4</td>
<td>Adequate</td>
</tr>
<tr>
<td>Cihak, Kildare, Smith, McMahon, and Quinn-Brown (2012)</td>
<td>5</td>
<td>2</td>
<td>Adequate</td>
</tr>
</tbody>
</table>
Based on the studies included in this review, video modeling received a score of 66 points, indicating that video modeling can be considered an established EBP for problem behavior and functional communication for individuals with ASD. However, this conclusion is drawn from grouping all of the studies together even though many of the studies have different ages of participants, target behaviors, and approaches to the intervention. Clearly, additional research in this area is warranted in order to evaluate specific applications of video modeling interventions.

Recommendations for Future Research

As noted previously, FCT is an approach for teaching a communication response as a replacement behavior based on the outcomes of an FBA. In the National Standards Report (National Autism Center, 2009), FCT is embedded within the Behavioral Package of interventions, and video modeling is embedded within the intervention entitled “Modeling.” Twenty studies on FCT were reviewed, and these were classified under various intervention categories that include Pivotal Response Training (1), Behavioral Package (18), and Reductive Package (1). Similarly, 31 studies on video modeling were reviewed and classified under intervention categories that include Antecedent Package (1), Behavioral Package (11), Modeling (18), and Self-Management (1). Both interventions are listed as established for skills-instruction for individuals with ASD. While an established intervention is considered to be supported by empirical evidence, two lines of research need further investigation.

First, numerous studies on video modeling have indicated effectiveness for teaching various skills for children with ASD. It has been used to teach play skills (e.g., Boudreau & D’Entremont, 2010; Lydon, Healy, & Leader, 2011; Sancho, Sidener, Reeve, & Sidener, 2010),
social interaction skills (e.g., Charlop, Dennis, Carpenter, & Greenberg, 2010; Deitchman, Reeve, Reeve, & Progar, 2010; Tetreault & Lerman, 2010), imitation (e.g., Cardon, 2012; Cardon & Wilcox, 2011; Kleeberger & Mirenda, 2010; Tereshko, MacDonald, & Ahearn, 2010), and manding (or requesting) (e.g., Cihak, Smith, et al., 2012; Plavnick & Ferreri, 2011). Video modeling has also been used to improve problem behavior such as tantrums (e.g., Schreibman et al., 2000), off-task behavior (e.g., Coyle & Cole, 2004), responding to adult instructions (e.g., Nikopoulos, Canavan, & Nikopoulou-Smyrni, 2009), and transitioning to a new task or location (e.g., Cihak, 2011; Cihak et al., 2010). Several of these studies (Cihak et al., 2010; Nikopoulos et al., 2009) specifically recommended the use of video modeling in the context of identifying effective interventions based on a functional assessment of problem behavior. According to Plavnick and Ferreri (2011), video modeling procedures are more effective when they are linked to the identified socially mediated functions of communicative behavior. Based on what has been documented in the literature, continued investigation of the implementation of the effects of video modeling following an FBA is warranted.

Second, several studies noted above (e.g., Cihak & Schrader, 2008; Sherer et al., 2001) have compared the relative effectiveness of different types of video models (e.g., peer, adult or self as model). However, the relative effectiveness of these types of video models has not been widely researched in the context of problem behavior, in particular, when teaching a replacement behavior following an FBA. Future research could compare the relative effect of video modeling versus video self-modeling on the acquisition of functional communication responses (as a replacement for problem behavior) in children with ASD.
References


Individuals with Disabilities Education Act of 2004 § Part 300, A § 300.8 (2004).


EVIDENCE-BASED PRACTICE AND AUTISM SPECTRUM DISORDERS IN THE CONTEXT OF THE DIFFUSION OF INNOVATION THEORY

Autism spectrum disorder (ASD) is a developmental disability characterized by restricted and repetitive patterns of behavior, interests, or activities (American Psychiatric Association [APA], 2013) that may include stereotyped motor movements, resistance to change during daily routine activities, fixated interests that are unusual in intensity, and atypical responses to sensory experiences. Individuals with ASD display behavioral differences in social communication and social interaction that may include failure to engage in reciprocal conversations, inability to use or understand gestures, and failure to adjust behavior to suit various social contexts (APA, 2013), yet show potential for specific cognitive strengths (e.g., visual-spatial processing; Diener, Wright, Smith, & Wright, 2014). Some of these characteristics can significantly impact an individual’s ability to learn and function successfully in daily environments (Autism Speaks, 2013).

To help remediate these pervasive deficits, it is critical for professionals to use effective intervention strategies in educational and treatment programs. If professionals use practices identified as the most effective, consumers (e.g., students or clients) should see improved outcomes for individuals with ASD (Cook & Odom, 2013). The challenge for education professionals is to determine which interventions will be the most effective to use with their students or clients. To select interventions with demonstrated evidence of effectiveness, professionals should be aware of the research support for any interventions they are considering for use. The various interventions for students with ASD that are currently available have differing levels of research support in terms of the amount of research evidence,
quality of the studies, and consistency of results across studies. Evidence-based practices (EBPs) are interventions with evidence of effectiveness. Being aware of EBPs allows professionals to make decisions that are more informed. The use of EBPs is standard in many fields (e.g., medicine and psychology) and has become increasingly standard in special education as well (National Autism Center, 2009).

Although members of the field of special education agree on the importance of using effective educational practices, differing ways of defining and describing EBPs have emerged. The Council for Exceptional Children (CEC, 2016b) has defined an EBP as “an intervention that is based in science” (para. 1). Definitions such as this one have been interpreted in different ways, leading to the existence of various frameworks for both identifying and categorizing EBPs (Cook & Odom, 2013).

In a seminal article, Horner et al. (2005) categorized practices in a dichotomous manner (i.e., evidence-based or not). Gersten et al. (2005) suggested that interventions be categorized in one of three levels (i.e., evidence-based, promising, or not evidence-based). The What Works Clearinghouse (WWC), a comprehensive resource for identifying EBPs in education (Cook & Odom, 2013), did not initially identify or classify EBPs for students with disabilities. However, they have recently begun to review research on early childhood special education, learning disabilities, and emotional and behavioral disorders. The WWC’s classification system includes six tiers: practices with (a) positive, (b) potentially positive, (c) mixed, (d) indeterminate, (e) potentially negative, and (f) negative effects (Cook & Odom, 2013). CEC also has published a five-level set of standards for evidence-based practices in special education. According to CEC’s (2016b) standards, interventions fall into one of the following categories: (a) evidence-based
practices, (b) potentially evidence-based practices, (c) having mixed effects, (d) having negative effects, and (e) having insufficient evidence to categorize their effectiveness. Recognizing the diversity in definitions and descriptions of EBPs, Cook and Odom (2013) recommended that special educators be aware of these various frameworks for defining EBPs.

Within the special education field, there are also various approaches for defining EBP and evaluating interventions specifically for students with ASD. In the ASD research literature, there are two broad categories of interventions and treatments: comprehensive treatment models (CTMs) and focused intervention practices. A CTM is a set of practices that are unified under a larger theoretical framework and designed to target the core deficit areas of ASD (Wong et al., 2014). As a treatment approach, a CTM can be operationally defined by the following criteria: (a) publication of a description of the model and its components; (b) availability of a manual, procedural guide, description, or curriculum; (c) organization around a theoretical framework; (d) the targeting of multiple behavioral or developmental domains representing the core deficits of ASD; (e) intensity (i.e., a significant amount of weekly intervention hours), (f) longevity (i.e., implemented for multiple years), (g) engagement (i.e., planned activities or procedures that involve the person with ASD in learning opportunities), and (h) implementation at a minimum of one site (Odom, Boyd, Hall, & Hume, 2010). Examples of CTMs include the TEACCH program and the UCLA Young Autism Program.

Focused interventions, the second category of treatment found in the literature, refer to single strategies intended to target a specific skill or goal. A focused intervention is conceptualized as being defined operationally, targeting a specific outcome, and tending to be used for a shorter period of time (i.e., until the specific outcome is achieved). Examples of
Focused interventions include discrete trial teaching and prompting. Focused interventions are individual components that are incorporated into CTMs (Wong et al., 2014).

Both CTMs and focused interventions can be evaluated as EBPs. As in other fields, ASD professionals have developed models for evaluating whether a practice can be considered evidence-based. These models can be used to evaluate interventions specifically targeted for individuals with ASD.

Recognizing the need for a comprehensive definition of EBP for the field of ASD research, Reichow, Doehring, Cicchetti, and Volkmar (2011) developed a model for determining which practices meet the criteria to be an EBP. The model consists of evaluation criteria for both single-subject and group-design research studies, with specific quality indicators for both types of research. While these indicators differ somewhat for single-subject and group designs, examples of their common characteristics are (a) describing participants in detail, (b) defining the research conditions and variables with replicable precision, (c) reporting procedural fidelity, (d) including generalization and maintenance, (e) demonstrating experimental control, and (f) describing social validity.

When an individual study has been evaluated based on these criteria, it can be described as strong, adequate, or weak. The conditions for determining this rating depend on the number of primary and secondary quality indicators an individual study meets. See Reichow et al. (2011) for a detailed description of the rating system criteria.

Applied Use of EBPs in Special Education and ASD

While many treatments and interventions have been identified as EBPs (utilizing the previously described evaluation systems), there has historically been less research attention
devoted to their implementation and applied use. A possible explanation for this is the assumption that school personnel would be eager to adopt identified EBPs (Cook & Odom, 2013), but this may not always occur automatically. Many researchers have noted the gap between research and practice in special education and are examining the attempts to bridge this gap through the applied use of EBPs (e.g., Cook & Odom, 2013). Various factors may account for how readily an EBP is adopted by educational systems. One framework for exploring these factors relating to the spread of new interventions into applied use is known as the Diffusion of Innovation Theory.

**Diffusion of Innovation Theory**

The Diffusion of Innovation Theory is a conceptual framework for understanding the process by which new technologies and ideas are spread and are adopted into social systems. Within this framework, an innovation is defined as “an idea, practice, or object that is perceived as new by an individual or other unit of adoption” (Rogers, 2003, Preface, para. 16). The theory is considered to have universal applications (Murray, 2009) since it is a general process not unique to any particular type of innovation, any specific society or culture (Rogers, 2004), or any particular discipline. The theory has been examined in a wide variety of fields, including psychiatry (e.g., Freedman, 2002), mental health programs (e.g., Graeff-Martins et al., 2008), public health, health services, social work, criminal justice, marketing, forestry, and education (Dearing, 2009).

Of particular interest is the theory’s potential application to the research-to-practice gap. Understanding how diffusion of innovations takes place can help researchers explore ways to facilitate the applied use of research results and connect EBPs with potential users (Rogers,
2003). According to the Evidence-Based Intervention Work Group (2005), the theory provides insight into both the process of change itself and potential ways to influence change.

History and Development of the Diffusion of Innovation Theory

Diffusion of innovations may be known by various terms (e.g., *technology transfer*, *knowledge utilization*, or *bridging the research-to-practice gap*; Gotham, 2004), but the overall concept has been explored and researched since the early 1900s. Although not specifically called diffusion of innovations at the time, the idea of examining the spread of innovations within a society was described as early as 1902 by a French sociologist and judge, Gabriel Tarde. In his work as a judge, Tarde made observations about the manner in which people coming to the court adopted new clothing fashion trends and used new slang terminology. He identified patterns of cumulative adoption of these trends as well as the influence of opinion leadership in the adoption process. During the same time period, a political philosopher named George Simmel explored how individual reactions to innovations were related to social network position. Considering these two perspectives together provided an explanation of the diffusion process at both the micro and macro levels and demonstrated how both individuals and social systems influence the diffusion process (Dearing, 2009).

Based on these early influences, anthropologists began to use diffusion theory to explain phenomena such as the continental drift of people, ideas, and primitive technology, as well as the spread of innovations in smaller social systems (e.g., within a community; Dearing, 2009). In the 1920s and 1930s, diffusion theory also influenced sociology, where it was used to explain topics such as how innovations and trends spread from cities to rural areas and from one region of the country to another (Katz, Levin, & Hamilton, 1963).
In the 1940s, formal research on diffusion of innovations began with the publication of a seminal article by Ryan and Gross (1943). Ryan and Gross applied the theory to the field of rural sociology and studied the spread of hybrid corn to farmers in Iowa. The 1960s brought another seminal work on application of the theory. Coleman, Katz, and Menzel (1966) studied the diffusion of a specific drug among doctors and factors that influenced the adoption of this drug in professional practice.

Perhaps the most well-known originator of the diffusion of innovation theory is Everett M. Rogers, who wrote a seminal book on the theory entitled *Diffusion of Innovations*. The book was first published in 1962 (Murray, 2009) and, as of 2017, is in its fifth edition. In this work, Rogers examined the theory itself, as well as its application in terms of the factors that influence whether an innovation will spread through a social group (Freedman, 2002).

Factors Explaining the Diffusion of Innovations

If, when, and how an innovation is adopted by a social group depends on a variety of factors, many of which center around the shared opinions of the individuals in the social system. It has been implied that learning about an innovation via a media channel (e.g., a peer-reviewed journal) is insufficient for the spread of an innovation (Murray, 2009; Rogers, 2003). Media channels can provide initial awareness of an innovation, but interpersonal networks have a greater role in forming and/or changing attitudes toward an innovation. The majority of individuals may form a viewpoint of any given innovation based on the opinions of members of their peer groups already using the innovation rather than on scientific research (Rogers, 2002).

Thus, the diffusion of innovations has a large social component, with emphasis on imitation of those individuals who have already adopted the innovation. When some
individuals in a social group adopt an innovation, it increases the likelihood that other people in the group will also adopt the innovation. This phenomenon appears to be particularly true if the initial adopters have favorable opinions of the innovation and if they are in leadership positions that influence other individuals in the group (Rogers, 2003).

Perceptions of the innovation itself can also play a role in the adoption process. How people perceive specific characteristics of the innovation impacts its diffusion into the social system. Rogers (2003) outlined five specific influential characteristics: (a) relative advantage (the extent to which the innovation is perceived as superior to what it is replacing); (b) compatibility (the extent to which the innovation is compatible with the beliefs, values, and experiences of individual members of the social system); (c) complexity (the extent to which people perceive the innovation as challenging to use and understand); (d) trialability (the extent to which potential users can test or try an innovation before fully adopting it); and (e) observability (how visible an innovation’s results are to others).

Even when potential adopters feel comfortable with these characteristics of an innovation, innovations are, by their nature, new. This novelty can create a sense of uncertainty for many potential adopters. A technological innovation represents less uncertainty because it embodies concrete information as opposed to an idea-only innovation. Thus, technological innovations may have a quicker adoption rate compared to novel ideas (Rogers, 2003). For either type of innovation, disseminating information alone (e.g., a workshop, presentation, or website) is generally not sufficient by itself to promote adoption of the innovation (e.g., Bero et al., 1998; Thompson, Estabrooks, & Degner, 2006). The social
components of diffusion, including the opinions of practitioners, play a larger role in the process.

In order to facilitate the implementation and applied use of innovations, it is important for researchers to understand the values and needs of practitioners prior to conducting research on new methods, treatments, or interventions. This helps ensure the research will be meaningful to practitioners (Murray, 2009), a possible component of narrowing the research-to-practice gap.

Professional Perspectives on EBP

Narrowing the research-to-practice gap is of particular interest to the field of special education. In recent years, research on methods, treatments, and interventions has increased the number of instructional techniques in special education that are considered evidence-based practices (EBPs). The movement from research to applied use of many of these EBPs can progress through the steps of the diffusion of innovation process as they are disseminated into widespread application. In order to help bridge the research-to-practice gap and guide pre-service and in-service training for special education professionals, it is important to understand the opinions of special education professionals on the use of EBPs in applied settings. These opinions relate to practitioner awareness, conceptualizations, interest, and perceived accessibility of EBPs.

Awareness of EBP

Overall Familiarity with EBPs

Several studies have examined issues related to EBP awareness among speech-language pathologists and occupational therapists. In a 2013 study, Plumb and Plexico surveyed speech-
language pathologists in the United States. The majority of participants reported that they were familiar with the current research on treatments for ASD. Among participants who were recent graduates of professional preparation programs (defined as 2006 or later), 87% indicated that they were very familiar or somewhat familiar with current ASD treatment research, and 96% of professionals who graduated prior to 2006 indicated the same.

Occupational therapists were surveyed by Graham, Robertson, and Anderson (2013) regarding EBPs in their field. Four-hundred and seventy-three occupational therapists located in New Zealand participated. The majority of these participants (67%) reported that they based their clinical reasoning on research evidence less than 50% of the time.

Research has also examined issues related to the awareness of EBPs among special education teachers. Hendricks (2011) surveyed 498 public school special education teachers in Virginia who had taught at least one student with ASD in the 5 years prior to the survey. The survey instrument focused on the teachers’ self-reported knowledge and strategy use in six domain areas: general autism knowledge, individualization and support strategies, communication, social skills, behavior, and sensory motor development. Results indicated low to intermediate levels of ASD knowledge and instructional practices. On self-reported knowledge, the highest score was in general ASD knowledge, which fell in the intermediate score level. The lowest scored areas were communication, social skills, and sensory motor development. Similarly, self-reported levels of implementation were also low-to-intermediate. The mean implementation scores for each domain area were above the low range, but failed to reach the intermediate range. The highest implementation score was in the domain area of
individualization and support strategies. The lowest reported implementation scores were in communication, social skills, and sensory motor development.

Interviews and examination of the classroom practices of 10 special education teachers in the United States were conducted by Guckert, Mastropieri, and Scruggs (2016). The authors categorized the teachers into three groups based on their awareness of EBPs: aware, partially aware, and unaware. Four of the 10 teachers were categorized in the aware group. They were reported to have a thorough understanding of EBPs and used relevant research sources to support their teaching practice. Three of the 10 teachers were considered partially aware, meaning that they were sometimes uncertain about whether the practices they were using were evidence-based. The remaining three teachers were categorized as unaware due to a lack of familiarity, use, and trust of EBPs in their teaching practice. This group expressed a skeptical perspective on the importance of using EBPs in their work with students with disabilities.

Among teachers of students who are deaf or have a hearing impairment (TOD), Borders, Bock, and Szymanski (2015) found wide variance in the familiarity with and use of the established intervention practices described in the National Standards Report (National Autism Center, 2009). They surveyed 68 certified TODs located in a Midwestern state in the United States. All of the survey respondents were familiar with three intervention strategies: prompting/cuing, live modeling, and schedules. The vast majority of respondents were also familiar with social narratives (95%), choice (90%), token economy (90%), contingency contracting (85%), and peer buddies (82%). Fewer respondents were familiar with the use of special interests (46%), behavioral toilet training (44%), errorless learning (44%), generalization training (31%), peer initiation training (28%), and joint attention (20%).
Definition and Conceptualization of Evidence

Based on a survey of occupational and physiotherapists in Sweden, Fristedt, Areskoug-Josefsson, and Kammerlind (2016) suggested that participants in both of these professions seemed unsure about how to define the concept of evidence in their fields. For special education teachers, Guckert et al. (2016) reported that all 10 teachers in their study were able to provide acceptable definitions of EBP and believed that they were using EBPs in their practice. In another study, the predominant, somewhat vague description of EBP that emerged from interviews of special education teachers was that someone had conducted research on a specific practice or program and determined that it was effective (Hudson et al., 2016). Other special education teachers interviewed by Greenway, McCollow, Hudson, Peck, and Davis (2013) included anecdotal and observational information in their conceptualization of evidence.

Sources of Evidence

Several studies were located that described the sources of evidence used by special education practitioners. In their interviews, Fristedt et al. (2016) suggested that occupational therapists and physiotherapists typically relied on what they learned during their coursework and basic training as EBP. Other reported sources of evidence included colleagues, libraries, research and development coordinators, and visits to other clinics. When Graham et al. (2013) surveyed occupational therapists, participants indicated that they predominantly relied on their own expertise (98%) when making clinical decisions. They also frequently consulted with colleagues (88%) and the research literature (56%).
Interest in EBP

Overall, professionals in various disciplines associated with the field of special education appear to hold favorable views of using EBPs in their professional practices. In a survey of 368 occupational therapists in Canada (Thomas & Law, 2014), most of the participants either strongly agreed or agreed that decision-making in professional practice should be made based on the three components frequently considered when defining EBP (best available research evidence, client preferences, and professional expertise). Lyons, Brown, Tseng, Casey, and McDonald (2011) suggested in their study of Australian pediatric occupational therapists that their 130 participants held an overall positive attitude toward research and saw the value in using EBPs to guide their clinical practice. Similar results were reported by Graham et al. (2013). In their survey of occupational therapists in New Zealand, they reported overall positive attitudes toward EBP use, with 84% of participants perceiving EBPs to be useful in their daily clinical practice and for increasing quality of client-centered care. Additionally, 96% of these occupational therapists believed that EBP is important to the practice of occupational therapy. Interviews with occupational and physiotherapists by Fristedt et al. (2016) revealed that many of these professionals associated the use of EBP with feelings of satisfaction, joy, meaningfulness, and security. Speech-language pathologists in Ireland reported similar positive perspectives on EBPs. O’Connor and Pettigrew (2009) indicated that only 6.3% of their survey respondents did not see the value of using research to inform their professional practice.

Interviews of 10 special education teachers in the United States by Guckert et al. (2016) indicated that the teachers believed in the value of research for decision-making in their profession. However, 10 novice special education teachers in the United States interviewed by
Jones (2009) reflected more varied perspectives on EBP. Jones categorized participants in three groups: definite supporters, cautious consumers, and critics. Four of the 10 teachers were considered definite supporters who believed that research is an essential component in the practice of special education. Three cautious consumers felt that research does have a place in special education, but they were unsure about the true value of research. The three teachers classified as critics appeared to have the viewpoint that research had little value and should not necessarily be relied on to guide professional practice in special education.

Sansosti and Sansosti (2013) examined the use and recommendations of evidence-based practiced for ASD among 978 school psychology practitioners in various U.S. states. The survey instrument asked respondents to indicate (using a Likert-type scale) how likely they were to recommend each of 13 interventions identified in the National Autism Center (2009) report as established or emerging. The instrument also included an open-ended response box for the respondents to list any other interventions they were likely to recommend for students with ASD. The interventions receiving the highest ratings were antecedent and behavioral strategies, modeling, story-based strategies, social skills strategies, structured teaching, and visual supports. Overall, the respondents were somewhat likely to recommend the interventions of computer-assisted instruction, counseling, peer-mediated approaches, and self-management. The open-ended question showed a high number of recommendations for sensory integration.

Some studies revealed professionals’ interest in professional development to increase their knowledge of effective practices. Special education teachers in the interviews by Greenway et al. (2013) expressed the desire to have additional professional development
opportunities. Additional training in EBPs was reported to be useful by 81% of occupational therapists surveyed by Graham et al. (2013).

Perceived Barriers to EBP Use

*Concerns about the Applicability of Research*

Professionals in various studies expressed concerns about the relevance of research to the unique and individual needs of their students. Some of the special education teachers interviewed by Greenway et al. (2013) were skeptical that research would apply to the specific populations with which they worked. Similar perspectives were expressed in interviews with special education teachers by Hudson et al. (2016). The most frequent concern from these teachers was the belief that research was more general in nature and might not be appropriate for the needs of the students in their specialized classroom settings. In a study by Jones (2009), novice special education teachers were skeptical about the applicability of research due to the controlled nature of the studies. They were doubtful that methods described in the model classrooms in the studies would work in actual special education classrooms. Some of these teachers also shared specific occurrences where they had used EBPs, but the EBPs failed to help their students.

*Concerns about the Amount and Quality of Research*

Two studies of occupational therapists indicate participant concerns about a lack of available research (Fristedt et al., 2016; Graham et al., 2013). Based on surveys from speech-language pathologists in Ireland, O’Connor and Pettigrew (2009) stated that 62.5% believe that existing research has inadequacies in methodology, and 56.3% expressed concerns that
research has not been replicated. Approximately half of these professionals (53.1%) did not believe that published research made clear implications for practice.

*Ability to Locate and Evaluate Research*

Another area of apprehension for professionals may be their own abilities in locating and evaluating research evidence. Challenges in finding research-based information were noted by special education teachers (e.g., Greenway et al., 2013; Hudson et al., 2016) and occupational therapists (Fristedt et al., 2016). Once research information has been obtained, professionals may feel unsure of their abilities to adequately interpret and use the research to inform their practice. Among the speech-language pathologists surveyed by O’Connor and Pettigrew (2009), 37.5% believed that research is not reported in a clear and readable way. One specific concern shared by 46.9% of the participants was that the statistical results presented in research studies were difficult to comprehend. Other professionals were also apprehensive about their abilities to evaluate or critically appraise research evidence (e.g., Fristedt et al., 2016; Lyons et al., 2011).

*Demands on the Professionals’ Time*

Professionals have also indicated a lack of available time as a barrier to EBP use. Fifty-nine percent of the speech-language pathologists surveyed by O’Connor and Pettigrew (2009) indicated that they have insufficient time for implementing new ideas. Both occupational therapists and physiotherapists interviewed by Fristedt et al. (2016) reported that they lacked motivation to search for research evidence, with a possible explanation being that they made client care their first priority. Professionals may also believe that they lack the time needed to learn about and effectively implement EBPs. A lack of time to read research was reported by
71.9% of speech-language pathologists surveyed by O’Connor and Pettigrew (2009). Similarly, 69.6% of occupational therapists surveyed by Thomas and Law (2014) reported that their employers did not provide time for them to read the research literature.

Discussion

Considering these studies collectively, it appears that professionals in fields related to special education have a general familiarity with EBP. Some uncertainty seems to exist in terms of specific definitions of EBP, which sources do or do not constitute evidence (e.g., anecdotal information), and whether the practices that professionals use are evidence-based. Overall, professionals seem to have favorable attitudes toward the use of EBP in their respective fields and consider EBP important to professional practice. Some professionals showed skeptical or critical attitudes, which may be reflected in perceived barriers to EBP use.

The literature reveals various perceived barriers about EBP expressed by special education professionals, including concerns about research applicability, research amount and quality, their own ability to find and evaluate research, and demands on their time. Some of these concerns (e.g., having time to review research and locating and critically evaluating research) might be addressed by pre-service training during professional preparation programs at colleges and universities, as well as professional development time and training provided by schools and organizations that employ these professionals. Additional research could explore effective training models specifically for giving professionals the skills necessary to effectively locate, interpret, and implement research on EBPs in their fields of work.

Apprehension about the applicability of research in real-world special education classrooms and settings for students with very individualized needs can be considered in the
context of the Diffusion of Innovation Theory. If educators feel distrustful of research or believe that it will not be effective outside of the tightly controlled research settings, it may represent a disconnect between researchers and practitioners. Murray (2009) emphasized the importance of ensuring that research will be meaningful to practitioners. It may be beneficial for researchers to expand their discussions of the implications for practice of their studies to include information about how it can be incorporated into classroom and clinical settings that may not exactly mirror the settings where the research took place.

Another relevant aspect of the Diffusion of Innovation Theory is the role of interpersonal networks in a person’s interest and willingness to use a new innovation (such as an EBP that they have not previously used). Rogers (2002) suggested that most individuals form their viewpoints on innovations based on the opinions of other individuals they personally know rather than on scientific research. Perhaps initiatives where practitioners can provide support and information on EBPs and effective practices to other practitioners can help close the research-to-practice gap. A recent example that could be used in this context is the newly released mentoring program from the Council for Exceptional Children (2016a), in which special education teacher candidates and new special education teachers can be paired with an experienced special education teacher for advice and support in the classroom. With an awareness of how EBPs can spread via the process outlined in the Diffusion of Innovation Theory, researchers can design studies that are relevant and meaningful to practitioners, as well as work with professional organizations to promote training and support initiatives (e.g., mentoring programs) to facilitate the use of effective educational practices in applied school and clinical locations.
References


Individuals with Disabilities Education Act of 2004 § Part 300, A § 300.8 (2004).


COMPREHENSIVE REFERENCE LIST


