Rev J Autism Dev Disord (2017) 4:50–60
DOI 10.1007/s40489-016-0097-6

REVIEW PAPER

Interventions to Improve Personal Care Skills for Individuals with Autism: A Review of the Literature

Jennifer L. Wertalik[1] · **Richard M. Kubina Jr.**[1]

Received: 24 May 2016 / Accepted: 19 October 2016 / Published online: 3 November 2016

Abstract Individuals with autism spectrum disorder (ASD) often experience learning challenges that impact their ability to navigate the social and vocational world of adults without disabilities. Lack of independent functioning correlates with poor postschool outcomes for many individuals with ASD. In order to improve social and vocational outcomes, instruction must focus on teaching personal care skills. Personal care skills (i.e., grooming/hygiene, dressing, eating) represent a foundational set of skills needed for individuals with ASD to achieve independence and improve quality of life. The present literature review examines and summarizes interventions to teach personal care skills to individuals with ASD. The interventions fall into four categories based on intervention components: (a) video-based instruction, (b) behavioral in vivo procedures, (c) audio cuing, and (d) social stories. The results of the reviewed studies indicated improved performance for all participants across intervention categories for a variety of personal care skills. Additional discussion includes limitations and suggestions for future research.

Keywords Daily living skills · Self-help skills · Self-care skills · Hygiene skills · Autism or ASD

According to the National Autism Indicators Report: Transition into Young Adulthood (2015), approximately 50,000 students with autism spectrum disorder (ASD) exit high school each year and experience difficulties across a variety of outcomes (Roux et al. 2015). Recent reports indicate that individuals with ASD have low rates of college completion, employment, independent living, and friendships following high school graduation. As a whole, individuals with ASD leave high school unequipped for adult life and do not experience the autonomy or independence needed for a successful transition to adulthood (Wehman et al. 2014). Therefore, many individuals with ASD remain largely dependent on others to provide basic needs and for support in day-to-day activities through adulthood (Gray et al. 2014; Wehman et al. 2014).

In order to improve outcomes, it becomes critical for individuals with ASD to acquire the skills needed to live as independently as possible. Daily living skills comprise a skill area essential to enhancing independence and an area crucial to a person's ability to take part in the larger world (Liss et al. 2001). Daily living skills refer to age-appropriate practical skills needed for an individual to become self-sufficient and autonomous in his/her environment. Daily living skills include three subdomains of personal (i.e., dressing, eating, personal hygiene, toileting), domestic (i.e., cooking, cleaning), and community (i.e., time management, money management, job skills) (Sparrow et al. 2005).

Acquisition, maintenance, and generalization of the previously mentioned skills allow individuals with ASD to care for themselves, meet daily challenges, increase their quality of life, and decrease their dependence on others (Briggs et al. 1990; Cameron et al. 1992). However, many individuals with ASD experience challenges acquiring the daily living skills needed for independent living (Hendricks and Wehman 2009). Although these skills can improve as an individual gets older, significant impairments still exist for many (Hong et al. 2015). In addition, the level of performance in daily living skills for individuals with ASD remains lower than their IQ-matched peers without ASD (Liss et al. 2001). As a result,

✉ Jennifer L. Wertalik
jenniferwertalik@gmail.com

Richard M. Kubina, Jr.
rmk11@psu.edu

[1] The Pennsylvania State University, State College, PA, USA

many individuals with ASD do not have the skills to care for their daily needs, thus inhibiting integration into postschool settings and resulting in dependence on others (Hendricks and Wehman 2009). Therefore, individuals with ASD need extensive instruction in daily living skills in order to live as independently as possible (Carothers and Taylor 2004).

Although instruction should focus on skills in all domains of daily living, one must develop and apply a hierarchy of importance. A well-established "criterion of ultimate functioning" (i.e., whether the individual can function as an adult without being able to perform a skill) can provide guidance in determining where to start (Brown et al. 1976). The area of personal care encompasses an initial fundamental set of skills needed for individuals with ASD to function as an adult. The basic skills of eating and drinking, dressing and undressing, personal hygiene, and toileting all fall within the personal care domain and can directly affect one's quality of life (Stokes et al. 2004).

Acquisition of personal care skills has important implications for individuals with ASD. The skills promote maintenance of physical health and well-being as well as form the foundation for other essential skills to follow (Lucker 2009). Additionally, the development of personal care skills increases an individual's ability to function independently across multiple environments and influences the level of support needed in the future (Liss et al. 2001). Lastly, past research suggests that students who demonstrated high levels of personal care skills engaged more in employment (Carter et al. 2012), postschool education, and independent living (Blackorby et al. 1993).

Given the poor postschool outcomes for many individuals with ASD, identification and use of effective instructional methods to teach daily living skills has great importance. Recognizing this, a number of recent reviews have examined daily living skills for individuals with ASD. For instance, Ninci et al. (2015) conducted a meta-analytic review to evaluate the effectiveness of various types of interventions for improving functional living skills for individuals with ASD. Across the 52 included studies, interventions fell into four main categories: video modeling, behavioral in vivo procedures, visual cues, and audio cuing. Results indicated moderate to strong effect sizes for each category of intervention for improving functional living skills for individuals with ASD.

In another recent review, Hong et al. (2015) investigated the quality of research on interventions designed to improve daily living skills for individuals with ASD. As in the review of Ninci et al. (2015), the primary intervention approaches used to teach daily living skills included video modeling, behavioral in vivo procedures, visual cues, and audio cuing. Results demonstrated that only video modeling appeared to meet the standards for evidence-based practices.

Lastly, Neely et al. (2016) conducted a review and meta-analysis specifically focusing on the generalization and maintenance of functional living skills for individuals with ASD. Results indicated that only 12 of the 32 included studies assessed generalization effects on functional living skills; however, researchers in 28 studies collected maintenance data after the intervention ended. Additionally, results suggested that employing generalization and maintenance strategies may lead to larger gains and sustained use of skills over time.

While a number of reviews have synthesized the literature on interventions to improve daily living skills for individuals with ASD, the majority of reviews have collectively synthesized the daily living skill literature including skills from all three subdomains (i.e., personal, domestic, community) for individuals with ASD. Thus, little information exists to assist practitioners in choosing the intervention and intervention components given the specific target skill being addressed. A narrative review allows for the synthesis of results and intervention components of interventions used to improve personal care skills for individuals with ASD and may lead to recommendations useful to practitioners. Therefore, the field stands to benefit from a narrative review of the intervention literature on daily living skill subdomains, specifically personal care skills that represent an important set of foundational skills.

The present narrative literature review examined the research on interventions designed to improve personal care skills for individuals with ASD. The following questions guide the review: What interventions have researchers used to teach personal care skills to learners with autism? What personal care skills did researchers target? And, what outcomes did the researchers report?

Methods

Inclusion/Exclusion Criteria

The following inclusion criteria determined which studies qualified for review. The study needed to (a) include at least one participant identified as having autism, autism spectrum disorder (ASD), or Asperger's syndrome; (b) target acquisition of a personal care skill as a dependent measure (defined as grooming tasks, hygiene tasks, dressing tasks, independent eating); (c) use a single-case research design (e.g., multiple baseline, alternating treatments, reversal, multiple probe); and (d) be published in a peer-reviewed journal. The authors excluded studies containing a dependent measure related to toileting, as recent researchers have presented that information (see Levato et al. 2016; Kroeger and Sorensen-Burnworth 2009). Additionally, the authors excluded studies containing a dependent measure related to feeding (i.e., food consumption, acceptance of new foods) due to the specialized intervention components associated with these interventions.

Literature Search

The search process consisted of an electronic search of two academic databases (PsycINFO and Proquest Educational Journals) using the following keywords: *Autis**, *ASD*, and *Asperger* combined with the terms *daily living skills*, *self-help*, *self-care*, *hygiene*, *functional skill**, and *independent living*. The first author reviewed the abstracts of the studies returned from the electronic database search and retained articles meeting the inclusion criteria. Next, the first author reviewed the reference lists of the studies meeting the inclusion criteria in order to identify any additional studies the electronic search may have missed. Finally, the first author screened all articles included in related literature reviews (i.e., Hong et al. 2015; Ninci et al. 2015; Neely et al. 2016) against the inclusion criteria. As a result of the search procedures, 23 articles were identified for possible inclusion in this review. The articles were then assessed to determine whether it met the inclusion criteria. Ultimately, a total of 13 articles qualified for the review.

Data Extraction

The first author summarized the following features of the included studies: (a) number of participants with ASD, (b) participant gender and age range, (c) experimental design, (d) personal care skill targeted, (e) components of intervention procedures, and (f) intervention outcomes (including measures of generalization and maintenance). Treatment outcomes as well as design and methodological characteristics were summarized as reported by the authors of the study.

Reliability of Inclusion and Data Extraction

The initial screening identified 23 articles for possible inclusion. The first author examined the initial set of 23 articles to determine whether each met the inclusion criteria. A second rater independently assessed the 23 articles against the inclusion and exclusion criteria. Agreement on inclusion and exclusion of studies was initially obtained for 21 of the 23 studies (91%). Upon instances of disagreement, the two raters made a collaborative decision to include an article in the review. After discussion, the raters reached a consensus to include 13 studies in the review.

After identification of articles included in the present review, the first author extracted information to summarize the studies. An independent rater checked the accuracy of the summaries by responding to the following questions: (a) Does this represent an accurate report of the number of participants with ASD?; (b) Does this represent an accurate summary of the participants?; (c) Does this represent an accurate report of the experimental design?; (d) Does this represent an accurate report of the personal care skills targeted?; (e) Does this represent an accurate description of the intervention components and procedures?; and (f) Does this represent an accurate summary of the results of the study? The above procedure resulted in 78 possible items on which agreement or disagreement could occur (i.e., six items for each of the 13 studies). Results indicated 100% agreement for each of the coded items.

Results

The following section is divided into two subsections. The first section identifies the personal care skills experimenters targeted. The second describes the interventions experimenters used to teach personal care skills and presents the outcomes of each study. Table 1 summarizes participant demographics, study characteristics, and results.

Targeted Personal Care Skills

Across all studies included in the review, targeted personal care skills could be classified into three categories: (a) grooming/hygiene skills, (b) dressing skills, and (c) eating skills. Experimenters in ten studies included interventions designed to improve grooming/hygiene skills such as hand washing (Campbell et al. 2015; Hagiwara and Myles 1999; Mays and Heflin 2011; Ohtake et al. 2015; Parrott et al. 2000; Rosenberg et al. 2010), tooth brushing (Charlop-Christy et al. 2000; Matson et al. 1990; Mays and Heflin 2011; Rayner 2010), face washing (Charlop-Christy et al. 2000), combing hair (Matson et al. 1990), and shaving (Lasater and Brady 1995). Experimenters in four studies focused on the category of dressing and evaluated skills such as putting on clothing items (i.e., shirt, pants, socks) (Matson et al. 1990; Ohtake et al. 2015), shoe tying (Matson et al. 1990; Rayner 2011), and zippering (Norman et al. 2001). One study addressed independent eating skills. Bledsoe et al. (2003) used an intervention designed to improve mealtime behaviors such as wiping one's face and decreasing spilling food or drink.

Intervention Procedures and Outcomes

Video-Based Instruction Experimenters in nine studies implemented a form of video-based instruction (i.e., video modeling, video prompting, video self-modeling, and computer-based video instruction). Ohtake et al. (2015), Rosenberg et al. (2010), and Campbell et al. (2015) applied video modeling as the sole intervention to improve participants' performance on personal care skills. However, elements of the videos and instructional procedures differed. Ohtake et al. used an animated cartoon hero as the model and filmed the video through a third person perspective (i.e., spectators' perspective) with verbal narration of each step. In

Table 1 Summary of studies

Author(s)	Participants (*n*; gender; age)	Research design	Independent variable	Dependent variable	Targeted skill(s)	Outcomes
Bledsoe et al. (2003)	*n* = 1; 1M; age: 13	ABAB	Social story	Frequency	Spilling (food or drink) Wiping face	Spilling decreased from median frequency of 4 in baseline to 1 during intervention; wiping face increased from 0 in baseline to 1 during intervention
Campbell et al. (2015)	*n* = 2; 1M, 1F; ages: 19	Multiple baseline across participants	Video modeling	% of independence	Hand washing	Improvements in hand washing for both participants
Charlop-Christy et al. (2000)	*n* = 1; 1M; age: 7	Multiple baseline across participants	In vivo modeling Video modeling	Number of correct responses	Face washing Tooth brushing	Participant met criterion in both intervention conditions; participant met criterion for generalization probes during video modeling condition across different persons, settings, and stimuli
Hagiwara & Myles (1999)	*n* = 2; 2M; ages: 7 and 9	Multiple baseline design across settings	Multimedia social story intervention	% of steps completed independently	Hand washing	Improvements in hand washing for both participants; participant 1 demonstrated generalization of skill in one setting
Lasater and Brady (1995)	*n* = 1; 1M; age: 14	Multiple baseline design across tasks	Video self-modeling and feedback	Number of independent steps per minute; percentage of steps performed accurately	Shaving	Improved accuracy from 10% during baseline to 94% during intervention; after withdrawal performance remained high and continued to increase; accuracy remained at 100% at follow-up probes
Matson et al. (1990)	*n* = 3; 2M, 1F; ages: 4, 9, and 11	Multiple baseline within subjects and across behaviors	Instructional package (modeling, verbal instruction, prompting, reinforcement)	Number of independent steps	Tying shoes Brushing teeth Combing hair Putting on shirt Putting on pants	Participant 1 improved performance for 2 targeted tasks Participant 2 met mastery criterion on 1 of 2 tasks Participant 3 met mastery criterion for all 4 tasks
Mays and Heflin (2011)	*n* = 4; 2M, 2F; ages: 6, 11, 7, and 11	Multiple-baseline design across students	Self-operated auditory prompts	% of steps completed independently	Tooth brushing Hand washing	All 4 participants improved performance on both targeted tasks
Norman et al. (2001)	*n* = 1; 1M; age: 12	Multiple probe across behaviors	Instructional package (CTD procedure with video modeling and prompting)	% correct responses	Zippering jacket	Participant met mastery criterion; maintained 100% accuracy for 1 week
Ohtake et al. (2015)	*n* = 1; 1M; age: 12	Multiple baseline design across behaviors	Video hero modeling	Performance levels	Drying hands Tucking in shirt	Participant met mastery criterion; continued to demonstrate correct responses for one behavior for more than 2 months

Table 1 (continued)

Author(s)	Participants (*n*; gender; age)	Research design	Independent variable	Dependent variable	Targeted skill(s)	Outcomes
Parrott et al. (2000)	*n* = 1; 1F; age: 6	Multiple probe across subjects design	Simultaneous prompting	% of correct responses	Hand washing	Participant met mastery criterion; continued to respond with 100% accuracy after 1- and 2-week maintenance probes
Rayner (2010)	*n* = 1; 1M; age: 12	ABA	Video modeling	% of steps completed independently	Tooth brushing	Improved performance from mean of 35% of steps during baseline to mean of 55% during intervention
Rayner (2011)	*n* = 3; 3M; ages: 9, 10, and 10	Variation of a multiple baseline across subjects design and an alternating treatments design	Video prompting and backward chaining	% of steps in task completed correctly	Shoelace tying	2 of 3 participants met criterion for completing all steps in chain and 1 participant met mastery criterion by demonstrating behavior in generalization probes and maintained 100% accuracy at 1 month maintenance probe
Rosenberg et al. (2010)	*n* = 3; 3M; ages: 3–5	Concurrent multiple baseline across participants	Video modeling	Number of steps completed correctly	Hand washing	1 of 3 participants met mastery criterion with commercial video; remaining 2 participants demonstrated improvement with addition of custom video; 2 of 3 participants maintained performance at 1 month follow-up

contrast, Rosenberg et al. examined the effects of using a commercially available video and a customized video to teach hand washing. The commercial video included an unknown peer as the model in third person perspective without verbal narration of steps. The custom video consisted of a familiar peer as the model filmed from a third person perspective, contained verbal narration of each step, and an enthusiastic praise statement at the end of the video. Campbell et al. did not provide a description of the model or elements of the video used to teach hand washing in their study.

Experimenters in two studies (Ohtake et al. 2015; Rosenberg et al. 2010) followed the general procedure of instructing the participants to watch the video of the model performing the task and then provided an opportunity for the participants to perform the task. However, Rosenberg et al. (2010) had the participants watch the video two times before giving them the opportunity to perform the task. Additionally, during instruction, Ohtake et al. (2015) delivered verbal praise via an instructor as deemed fit. Campbell et al. (2015) reported that participants viewed the video model on a handheld device during intervention but did not include any further description of the instructional procedures used.

Experimenters in all three studies reported gains in the target behavior. Ohtake et al. (2015) found that performance for hand drying and tucking in shirt tasks immediately increased with the video modeling procedures. Additionally, after withdrawal of intervention, the participant continued to exhibit correct responses for more than 2 months. Rosenberg et al. (2010) found two out of the three participants did not learn from the commercially made tape. With introduction of a custom-made tape, the two participants demonstrated some acquisition and one of those participants immediately mastered the skill. Also, two of the three participants maintained or improved performance at 1-month follow-up probe. And Campbell et al. (2015) found that upon introduction of the video model, both participants demonstrated increases in hand-washing skill levels. Although each participant improved performance, neither participant mastered the skill within the course of the study.

Charlop-Christy et al. (2000) also used video modeling; however, the experimenters compared the effectiveness video modeling with in vivo modeling to teach daily living skills to one participant with ASD. For both the video modeling and in vivo conditions, a familiar adult served as the model. The experimenters filmed the video for the video modeling condition from a third person perspective and the model demonstrated the target behavior at an exaggeratedly slow pace. During intervention, experimenters implemented the exact same procedures for both the video modeling and in vivo modeling conditions, with the only difference being the manner in which the model was presented. Initially, the participant watched the model perform the task two times before the experimenter provided the instruction to engage in the task. If the participant looked away from the model, the experimenter provided a prompt in order to redirect him back to the task and delivered verbal praise for attending to the model. The experimenter did not provide prompts or deliver reinforcement for the target behavior during either condition.

Results indicated that the participant met performance criterion with both interventions; however, video modeling resulted in quicker acquisition. Additionally, video modeling resulted in the participant reaching criterion for generalization across different persons, settings, and stimuli, whereas demonstration of generalization did not occur with in vivo modeling.

In contrast to using video modeling as the sole intervention component, four experimenters combined video modeling with additional intervention components. Lasater and Brady (1995) combined video modeling with self-assessment and feedback to teach shaving to one participant. The participant served as the model and the intervention consisted of six components: (a) video self-modeling, (b) the instructor questioning about the behaviors seen in each vignette, (c) discrimination training, (d) behavioral rehearsal, and (e) debriefing/feedback by instructor. Results indicated that video self-modeling and self-assessment via videotape feedback combined with behavioral rehearsal substantially increased accuracy on a shaving task from 10% of steps performed accurately during baseline to 94% during intervention. Furthermore, after removing the intervention, performance remained high and continued to increase. Follow-up probes indicated that accuracy remained at 100%.

Rayner (2010) and Norman et al. (2001) both combined video modeling and video prompting (i.e., a form of video modeling in which a video shows each step of the task followed by an opportunity to perform the step separately) procedures to teach personal care skills. Both experimenters used an unfamiliar adult as the model and filmed the video from the third person perspective. However, Rayner embedded symbols and text of the task directions into the video, whereas Norman et al. verbal narration of the directions with graphics.

Instructional procedures also differed across the two studies. Rayner (2010) applied four different phases of intervention: (a) video modeling including video being viewed one time, (b) video modeling including video being watched two times, (c) video prompting, and (d) video prompting plus a live model. In contrast, Norman et al. (2001) used a two-part procedure. First, the instructor presented a video of the total task sequence to the participant in a small group setting. The instructor then implemented video prompting using a constant time delay and delivered verbal praise for correct responses on a continuous reinforcement schedule.

Norman et al. (2001) found that the instructional package increased performance and the participant met criterion of 100% accuracy after 31 instructional sessions. Additionally,

the participant maintained 100% accuracy for 1 week after ending the intervention. In contrast, Rayner (2010) found limited success in teaching the participant to brush his teeth using the video modeling and video prompting interventions. However, the participant did consistently complete more steps of tooth brushing during intervention (mean of 55% of steps) than baseline (mean of 35% of steps).

Similarly, Rayner (2011) applied an intervention using video prompting and a backward chaining procedure. Video prompting intervention included three different videos of the task: peer as model, adult as model, and adult as model using two color laces. All videos included seven slides with embedded text of task directions. The experimenter implemented instruction across four different conditions: (a) video prompting with peer model, (b) video prompting with adult model, (c) video prompting with two colors for laces, and (d) backward chaining with live model and verbal cues.

Results indicated that only two participants benefited from video prompting procedures in terms of shoelace tying performance and no participant reached mastery as a result of video prompting procedures alone. Backward chaining procedures resulted in gains for all three participants. Two of the three participants met criterion of completing the total number of steps for the task and one participant demonstrated mastery of the task by continuing to complete all steps during the withdrawal and generalization probe conditions as well as maintained mastery after an interval of 30 days.

Experimenters in one final study (Hagiwara and Myles 1999) implemented a video-based intervention that utilized a computer-based social story to teach hand washing. The multimedia social story program had a book-like format, that contained text of the social stories, movies of the participants' actions corresponding to social story sentences, and audio capability that read aloud sentences. During intervention, the participants operated the multimedia social story program daily just prior to entry into the appropriate environment when behavior would occur. The experimenters found no consistent effect of the multimedia social story intervention. The multimedia social story program increased the skill levels of some of the participants in certain settings and some of the participants showed generalization of newly acquired information to other settings.

Behavioral In Vivo Procedures Experimenters in four studies used behavioral in vivo procedures (e.g., reinforcement, fading, prompting) to improve personal care skills. Matson et al. (1990) employed an instructional package including modeling, verbal instructions, prompting, and edible and social reinforcement. Sessions consisted of three trials: (a) the instructor modeled the entire sequence and verbally described it; (b) opportunity for the child to perform the target behavior, while the instructor physically and verbally prompted the child as needed, and delivered reinforcement at the end of the sequence; and (c) the instructor asked the child to independently complete the sequence, while recording the number of steps successfully completed. Shortly after intervention, all three participants demonstrated treatment gains for all target behaviors. One of the three participants demonstrated mastery on all four selected tasks and participant 2 reached the mastery criterion for one of two tasks. Although two out of the three participants did not successfully complete the entire sequence for the tasks, they showed noticeable increases in performance for each skill.

Likewise, Parrott et al. (2000) used prompting and reinforcement procedures to improve performance on hand washing. Instructional procedures consisted of the experimenter delivering the task direction followed immediately by a physical prompt. The experimenter delivered descriptive verbal praise after completion of the step. The experimenter then quickly provided the task direction and physical prompt for the next step and continued in this manner until task completion.

The data indicated that the procedure effectively taught the participant the hand-washing skill. The participant demonstrated the ability to perform the 16-step task analysis to criterion levels after 50 training sessions. After finishing instruction, generalization data indicated that the participant responded with 100% accuracy across three different instructors. Furthermore, the participant responded with 100% accuracy after 1- and 2-week maintenance probes.

Audio Cuing Mays and Heflin (2011) evaluated the effectiveness of an auditory prompting procedure for teaching hand washing and tooth brushing. The experimenters used prerecorded verbal prompts on a student-operated tape recorder instead of the teacher providing verbal prompts. During intervention, the instructor pointed to the cassette tape player while providing a verbal cue (i.e., "wash your hands" or "brush your teeth"). If the student skipped a step necessary for the next step (e.g., taking off the cap of the toothpaste before putting toothpaste on the toothbrush), the instructor prompted the necessary step. Results indicated that all four participants showed marked improvement in their performance of hand washing and tooth brushing immediately following the use of the self-operated audio prompt procedure. Data also showed that three out of the four participants performed better on hand washing than tooth brushing.

Social Stories Experimenters in one study examined the effectiveness of a social story intervention for improving personal care skills. Bledsoe et al. (2003) assessed the effectiveness of a social story treatment to improve participants' lunchtime eating behavior. During intervention, the experimenter read the social story daily to the participant immediately prior to lunch. Additionally, the participant had access to the story upon request or occasionally by teacher suggestion. The

experimenters reported that the social story intervention enhanced the participants' lunchtime eating behavior. The median frequency for spilling decreased from 4.0 in baseline to 1.0 during intervention. Furthermore, the median frequency for mouth wiping increased from 0 at baseline to 1.0 in intervention.

Discussion

The present review sought to examine the research on interventions designed to improve personal care skills for individuals with ASD. The review focused on three specific research questions: (a) What interventions have researchers used to teach personal care skills to learners with autism? (b) What personal care skills did researchers target? (c) What outcomes did the researchers report? The following section provides a discussion of the conclusions in relation to each research question.

Intervention Procedures

Results indicate that experimenters used four main types of interventions (i.e., video-based instruction, behavioral in vivo procedures, audio cuing, social stories) and implemented a variety of experimental approaches to improve personal care skills for participants. Notably, experimenters in nine out of the 13 studies used a form of video-based instruction as the primary intervention. Moreover, each of the studies incorporated the use of a video model to demonstrate the steps needed to perform the task. Advances in technology and the benefits it offers for learners and instructors can explain increased use of video-based instruction with individuals with ASD.

Given the advances in technology over the past two decades, it may not come as a surprise that video-based instructional techniques have grown increasingly more common. Video technology has become easily obtainable and economically feasible not only for researchers but for educators and parents as well. Additionally, advances have made this technology easy to use and portable (Goldsmith and LeBlanc 2004). As a result, video technology requires minimal training and permits use in a variety of settings. Therefore, advances have allowed researchers and educators to utilize video-based instruction to teach a variety of skills, including conversational speech (e.g., Charlop et al. 2008), cooking-related skills (e.g., Shipley-Benamou et al. 2002), domestic skills (e.g., Van Laarhoven et al. 2009), and vocational skills (e.g., Allen et al. 2010).

In addition to advances in technology contributing to the increased use of video-based instruction, interventions such as video modeling provide instruction that focuses on the learning strengths of students with ASD. Many researchers describe individuals with ASD as having strong visual processing abilities (Quill 1997) as well as having a preference for visual information as compared to auditory alone (Corbett and Abdullah 2005; Gardner and Wolfe 2013; Happe 1994; McCoy and Hermansen 2007). Moreover, individuals with ASD may respond to visual input as the primary way of receiving information (Cihak 2011). Hence, a strength of video modeling includes providing visually cued instruction and, as a result, gears instruction toward the learning strengths and sometimes preferred style of instruction of individuals with ASD (Gardner and Wolfe 2013).

Video modeling interventions also address some of the core impairments that many individuals with ASD exhibit (Delano 2007; Gardner and Wolfe 2013). Individuals with ASD often have impairments with attention and exhibit difficulty attending to socially relevant stimuli (Corbett and Abdullah 2005; Prior and Ozonoff 1998). Video modeling draws upon visually cued instruction aimed at improving attention for the modeled behaviors by restricting the field of focus. Therefore, video modeling procedures allow the student to focus on the relevant stimuli associated with the task (Corbett and Abdullah 2005).

Video modeling also provides many benefits to the instructor, namely, an efficient method in terms of instructional time. Video modeling may prove less time intensive than in vivo procedures. Charlop-Christy et al. (2000) found that video modeling took approximately one third of the time when compared to in vivo modeling. Also, an instructor can reuse a video model with other students as well as use it in a group setting. For example, Norman et al. (2001) used an instructional package in which presentation of a video model occurred during small group instruction and resulted in improvements in the participant's ability to zipper a jacket.

The use of a video model allows for minimal staff training on instructional delivery, which gives instructors more time to devote to instruction for the students. Additionally, video modeling permits consistent implementation by staff across practice sessions. Once created, instructors can use the video repeatedly and ensures that the delivery of the lesson occurs in a standardized manner (Ayres and Langone 2007). Thus, video modeling provides greater control over the modeling procedures and enhances the use of systematic instruction.

Targeted Personal Care Skills

Across all studies, the personal care skills experimenters targeted fell into one of three categories: grooming/hygiene, dressing, and eating. All three categories represent skills necessary for individuals with ASD to acquire in order to create the foundation for a successful transition into adulthood. However, the majority of experimenters ($n = 10$) focused on the category of grooming/hygiene. The importance of good grooming/hygiene behavior may explain why most of the skills fell into this category. Proper hygiene and grooming skills represent critical skills necessary for socialization,

employment, and accessing community resources (Lucker 2009). Yet, within this category, experimenters examined a narrow range of skills with the majority identifying hand washing as the behavior to improve.

Furthermore, for individuals with ASD, appropriate dressing and eating behaviors contribute the person's ability to function as independently as possible in adulthood. However, experimenters in only four studies focused on dressing skills (Matson et al. 1990; Norman et al. 2001; Ohtake et al. 2015; Rayner 2011) and only one study on eating skills (Bledsoe et al. 2003). Again, the skills selected (i.e., putting on clothing items, shoe tying, zippering, using a napkin, spilling food/drink) did not represent the many behaviors that fall within the two categories.

As discussed previously, the review found only a narrow range of skills addressed by experimenters within the personal care domain. Acquisition, maintenance, and generalization of personal care skills can potentially affect one's quality of life. For example, proper hygiene correlates with an individual's health status, impacts the nature and extent of social relationships, and plays a significant role in employment (Stokes et al. 2004). Having the ability to independently bathe, dress, and feed oneself can lead to an individual being able to reside in the least restrictive environment (Matson et al. 1990). Thus, if personal care skills serve as initial fundamental skills needed for individuals with ASD to increase the likelihood of positive functional outcomes in adulthood, concern emerges that targeted skills did not encompass a broader range.

Although results indicated a narrow range of personal care skills, a possible explanation exists. The setting in which interventions took place may have impacted the selection of skills. The majority of studies took place within a school environment where instruction on skills such as bathing, washing hair, and dressing may not prove feasible.

Outcomes

Acquisition Overall, experimenters in all studies reported improved performance in personal care skills for each participant. Across all intervention categories (i.e., video-based instruction, behavioral in vivo procedures, audio cuing, social stories), participants performed more steps in the tasks after intervention than during the initial baseline phase. However, level of acquisition (i.e., total number or percentage of steps completed) varied across participants and within the studies. Specifically, findings revealed that 62% of participants did not acquire all of the steps needed to complete the task independently within the course of the study. As a result, the students continued to remain dependent on another person to provide assistance to complete the task.

Thus, one must use caution when interpreting positive findings reported by experimenters. Although interventions improved performance, many participants did not demonstrate mastery of the skills. Therefore, the question remains about whether or not the above-mentioned categories of interventions will effectively teach individuals with ASD personal care skills to full independence.

Generalization and Maintenance Assessment of generalization and maintenance varied across studies. Of the 13 studies, four assessed generalization of skills to other settings and/or people (Charlop-Christy et al. 2000; Hagiwara and Myles 1999; Parrott et al. 2000; Rosenberg et al. 2010). Results from the studies indicated that five of the six participants demonstrated generalization to at least one setting and/or with at least one person. Although results suggest some generalization of skills, the lack of generalization assessment becomes particularly concerning as individuals typically use personal care skills within home (e.g., bathing, dressing) and community settings (e.g., eating). Therefore, limitations exist in terms of conclusions formed regarding the overall effectiveness of the interventions.

By comparison, experimenters more frequently reported maintenance data; eight studies reported collection of maintenance data after cessation of intervention (Lasater and Brady 1995; Matson et al. 1990; Norman et al. 2001; Ohtake et al. 2015; Parrott et al. 2000; Rayner 2010, 2011; Rosenberg et al. 2010). Results indicated that experimenters in six of the studies reported performance maintained or improved for all participants during maintenance probes. The experimenters also found behavior maintained for a range of time including 1 week (Norman et al. 2001), 2 weeks (Parrott et al. 2000), 1 month (Rayner 2010, 2011; Rosenberg et al. 2010), 2 months (Ohtake et al. 2015), and 10 months (Matson et al. 1990). Five of the six studies that reported positive results for all participants utilized a form of video-based instruction, hence suggesting the potential of video-based instruction to facilitate maintenance of skills after termination of intervention.

Although findings suggest that interventions incorporating video-based instruction and simultaneous prompting may promote maintenance of skills over time, one important factor for consideration appears. Experimenters in only two studies (Matson et al. 1990; Ohtake et al. 2015) included maintenance data collected beyond 1 month. Therefore, interpreting maintenance data from the studies represents only short-term outcomes.

Limitations

Across the present review, ten of the 13 studies contained only one or two participants who met the inclusion criteria of having a diagnosis of ASD, thus limiting the generality of the experimenter's conclusions. In addition, experimenters across all studies included in the review implemented interventions with multiple components. For example, Norman et al. (2001) used an instructional package combining a constant time delay

procedure with video modeling and video prompting, therefore making it impossible to draw conclusions as to the effectiveness of individual components.

Last, experimenters in three studies (Rayner 2010, 2011; Rosenberg et al. 2010) implemented multiple phases of intervention conditions. Consequently, one cannot rule out the possibility of sequence effects (i.e., if the effects on participants' behavior in a given condition are the result of their experience with a prior condition).

Future Directions

Future studies could expand upon the present research in a number of ways. Researchers may wish to expand the range of selected personal care skills. For instance, ten of the 13 studies focused on skills within the grooming/hygiene category. Exploration of a wider range of personal care skills may provide practitioners more guidance in terms of utilizing effective interventions to teach the array foundational skills that encompass the personal care domain.

Considering that all of the studies included in this review contained multicomponent interventions, future studies could also investigate the effectiveness of the particular components of the interventions in order to determine the effects of individual procedures. Future researchers should also use research designs appropriate for analyzing the effects of multiple interventions or direct comparisons of interventions such as an alternating treatments design. Therefore, one could determine which interventions produce more effective results.

Given the importance of improving outcomes for individuals with ASD, it proves imperative for future researchers to not only assess generalization and maintenance of skills in order to determine the long-term outcomes of the intervention but to actively program for generalization. Acquisition of a skill does not guarantee that generalization will automatically take place (Stokes and Baer 1977). For instance, Neely et al. (2016) found that interventions to teach daily living skills for individuals with ASD that included generalization strategies such as training in a natural setting, training to criterion, and training common stimuli (Stokes and Baer 1977) resulted in larger performance gains that maintained over time. Therefore, future researchers should focus on incorporating strategies to promote generalization and maintenance into the intervention from the onset.

Conclusion

Given the poor postschool outcomes for individuals with ASD, it becomes critical for individuals with ASD to acquire the skills needed to live as independently as possible while they are in school. Instruction in daily living skills can decrease an individual's dependence on others and increase one's quality of life. The personal care domain represents an initial fundamental set of skills necessary for individuals with ASD to function independently as adults. Considering the importance of acquiring personal care skills, identifying and utilizing effective instructional methods becomes imperative in order to improve outcomes for individuals with ASD. Based on the results of the present review, the need for effective interventions in personal care skills remains a concern for both the research community and practitioners who can benefit from the identification of evidence-based practice.

References

Allen, K. D., Wallace, D. P., Renes, D., Bowen, S. L., & Burke, R. V. (2010). Use of video modeling to teach vocational skills to adolescents and young adults with autism spectrum disorders. *Education & Treatment of Children, 33*, 339–349.

Ayres, K. M., & Langone, J. (2007). A comparison of video modeling perspectives for students with autism. *Journal of Special Education Technology, 22*, 15–30.

Blackorby, J., Hancock, G. R., & Siegel, S. (1993). *Human capital and structural explanations of post-school success for youth with disabilities: a latent variable exploration of the National Longitudinal Transition Study*. Menlo Park: SRI International.

Bledsoe, R., Smith, B., & Simpson, R. L. (2003). Use of a social story intervention to improve mealtime skills of an adolescent with Asperger syndrome. *Autism, 7*, 289–295.

Briggs, A., Alberto, P., Sharpton, W., Berlin, K., Mckinley, C., & Ritts, C. (1990). Generalized use of a self-operated audio prompt system. *Education and Training in Mental Retardation, 25*, 381–389.

Brown, L., Nietupski, J., & Hamre-Nietupski, S. (1976). The criterion of ultimate functioning. In M. A. Thomas (Ed.), *Hey don't forget about me: new directions for serving the handicapped* (pp. 2–15). Reston: Council for Exceptional Children.

Cameron, M. J., Ainsleigh, S. A., & Bird, F. L. (1992). The acquisition of stimulus control of compliance and participation during an ADL routine. *Behavioral Residential Treatment, 7*, 327–340.

Campbell, J. E., Morgan, M., Barnett, V., & Spreat, S. (2015). Handheld devices and video modeling to enhance the learning of self-help skills in adolescents with autism spectrum disorder. *OTJR: Occupation, Participation and Health, 32*, 95–100.

Carothers, D. E., & Taylor, R. L. (2004). How teachers and parents can work together to teach daily living skills to children with autism. *Focus on Autism and Other Developmental Disabilities, 19*, 102–104.

Carter, E. W., Austin, D., & Trainor, A. A. (2012). Predictors of postschool employment outcomes for young adults with severe disabilities. *Journal of Disability Policy Studies, 23*, 50–63.

Charlop, M. P., Gilmore, L., & Chang, G. T. (2008). Using video modeling to increase variation in the conversation of children with autism. *Journal of Special Education Technology, 23*, 47–66.

Charlop-Christy, M. H., Le, L., & Freeman, K. A. (2000). A comparison of video modeling with in vivo modeling for teaching children with autism. *Journal of Autism and Developmental Disorders, 30*, 537–552.

Cihak, D. F. (2011). Comparing pictorial and video modeling activity schedules during transitions for students with autism spectrum disorders. *Research in Autism Spectrum Disorders, 5*, 433–441.

Corbett, B. A., & Abdullah, M. (2005). Video modeling: why does it work for children with autism? *Journal of Early and Intensive Behavior Intervention, 2*, 2–8.

Delano, M. E. (2007). Video modeling interventions for individuals with autism. *Remedial and Special Education, 28*, 33–42.

Gardner, S., & Wolfe, P. (2013). Use of video modeling and video prompting interventions for teaching daily living skills to individuals with autism spectrum disorders: a review. *Research and Practice for Persons with Severe Disabilities, 38*, 73–87.

Goldsmith, T. R., & LeBlanc, L. A. (2004). Use of technology in interventions for children with autism. *Journal of Early and Intensive Behavior Intervention, 1*, 166.

Gray, K. M., Keating, C. M., Taffe, J. R., Brereton, A. V., Einfeld, S. L., Reardon, T. C., & Tonge, B. J. (2014). Adult outcomes in autism: community inclusion and living skills. *Journal of Autism and Developmental Disorders, 44*, 3006–3015.

Hagiwara, T., & Myles, B. S. (1999). A multimedia social story intervention teaching skills to children with autism. *Focus on Autism and Other Developmental Disabilities, 14*, 82–95.

Happe, F. G. E. (1994). Wechsler IQ profile and theory of mind in autism. *Journal of Child Psychology and Psychiatry, 35*, 1461–71.

Hendricks, D. R., & Wehman, P. (2009). Transition from school to adulthood for youth with autism spectrum disorders: review and recommendations. *Focus on Autism and Other Developmental Disabilities, 24*, 77–88.

Hong, E. R., Ganz, J. B., Ninci, J., Neely, L., Gilliland, W., & Boles, M. (2015). An evaluation of the quality of research on evidence-based practices for daily living skills for individuals with autism spectrum disorder. *Journal of Autism and Developmental Disorders, 45*, 1–24.

Kroeger, K. A., & Sorensen-Burnworth, R. (2009). Toilet training individuals with autism and other developmental disabilities: a critical review. *Research in Autism Spectrum Disorders, 3*, 607–618.

Lasater, M. W., & Brady, M. P. (1995). Effects of video self-modeling and feedback on task fluency: a home-based intervention. *Treatment of Children, 18*, 389–407.

Levato, L. E., Aponte, C. A., Wilkins, J., Travis, R., Aiello, R., Zanibbi, K., … & Mruzek, D. W. (2016). Use of urine alarms in toilet training children with intellectual and developmental disabilities: a review. *Research in Developmental Disabilities*, *53*, 232–241.

Liss, M., Harel, B., Fein, D., Allen, D., Dunn, M., Feinstein, C., … & Rapin, I. (2001). Predictors and correlates of adaptive functioning in children with developmental disorders. *Journal of Autism and Developmental Disorders, 31*, 219–230.

Lucker, K. D. (2009). A review of *Self-help skills for people with autism: a systematic teaching approach*, by Stephen R. Anderson, Amy L. Jablonski, Marcus L. Thomeer, and Vicki Madaus Knapp. *Behavior Analysis in Practice*, *2*, 65–67.

Matson, J. L., Taras, M. E., Sevin, J. A., Love, S. R., & Fridley, D. (1990). Teaching self help skills to autistic and mentally retarded children. *Research in Developmental Disabilities, 11*, 361–378.

Mays, N. M., & Heflin, L. J. (2011). Increasing independence in self-care tasks for children with autism using self-operated auditory prompts. *Research in Autism Spectrum Disorders, 5*, 1351–1357.

McCoy, K., & Hermansen, E. (2007). Video modeling for individuals with autism: a review of model types and effects. *Education and Treatment of Children, 30*, 183–213.

Neely, L. C., Ganz, J. B., Davis, J. L., Boles, M. B., Hong, E. R., Ninci, J., & Gilliland, W. D. (2016). Generalization and maintenance of functional living skills for individuals with autism spectrum disorder: A review and meta-analysis. *Review Journal of Autism and Developmental Disorders, 3*, 37–47.

Ninci, J., Neely, L., Hong, E., Boles, M., Gilliland, W., Ganz, J., & Vannest, K. J. (2015). Meta-analysis of interventions to improve functional living skills for people with autism spectrum disorder. *Review Journal of Autism and Developmental Disorders, 2*, 184–198.

Norman, J. M., Collins, B. C., & Schuster, J. W. (2001). Using an instructional package including video technology to teach self-help skills to elementary students with mental disabilities. *Journal of Special Education Technology, 16*, 5–18.

Ohtake, Y., Takahashi, A., & Watanabe, K. (2015). Using an animated cartoon hero in video instruction to improve bathroom-related skills of a student with autism spectrum disorder. *Education and Training in Autism and Developmental Disabilities, 50*, 343–355.

Parrott, K. A., Schuster, J. W., Collins, B. C., & Gassaway, L. J. (2000). Simultaneous prompting and instructive feedback when teaching chained tasks. *Journal of Behavioral Education, 10*, 3–19.

Prior, M., & Ozonoff, S. (1998). Psychological factors in autism. In F. R. Volkmar (Ed.), *Autism and developmental disorders* (pp. 64–108). Cambridge: Cambridge University Press.

Quill, K. A. (1997). Instructional considerations for young children with autism: the rationale for visually cued instruction. *Journal of Autism and Developmental Disorders, 27*, 697–714.

Rayner, C. S. (2010). Video-modelling to improve task completion in a child with autism. *Developmental Neurorehabilitation, 13*, 225–230.

Rayner, C. (2011). Teaching students with autism to tie a shoelace knot using video prompting and backward chaining. *Developmental Neurorehabilitation, 14*, 339–347.

Rosenberg, N. E., Schwartz, I. S., & Davis, C. A. (2010). Evaluating the utility of commercial videotapes for teaching hand washing to children with autism. *Education and Treatment of Children, 33*, 443–455.

Roux, A. M., Shattuck, P. T., Rast, J. E., Rava, J. A., & Anderson, K. (2015). *National Autism Indicators Report: transition into young adulthood*. Philadelphia: A. J. Drexel Autism Institute, Drexel University.

Shipley-Benamou, R., Lutzker, J. R., & Taubman, M. (2002). Teaching daily living skills to children with autism through instructional video modeling. *Journal of Positive Behavior Interventions, 4*, 165–175.

Sparrow, S. S., Cicchetti, D. V., & Balla, D. A. (2005). *Vineland adaptive behavior scales* (2nd ed.). Circle Pines: AGS Publishing.

Stokes, T. F., & Baer, D. M. (1977). An implicit technology of generalization. *Journal of Applied Behavior Analysis, 10*, 349–367.

Stokes, J. V., Cameron, M. J., Dorsey, M. F., & Fleming, E. (2004). Task analysis, correspondence training, and general case instruction for teaching personal hygiene skills. *Behavioral Interventions, 19*, 121–135.

Van Laarhoven, T., Zurita, L. M., Johnson, J. W., Grider, K. M., & Grider, K. L. (2009). Comparison of self, other, and subjective video models for teaching daily living skills to individuals with developmental disabilities. *Education and Training in Developmental Disabilities, 44*, 509–522.

Wehman, P., Schall, C., Carr, S., Targett, P., West, M., & Cifu, G. (2014). Transition from school to adulthood for youth with autism spectrum disorder: what we know and what we need to know. *Journal of Disability Policy Studies, 25*, 30–40.