REVIEW

Video-Based Interventions for Adolescents and Young Adults with Autism Spectrum Disorder: A Systematic Review

Mohammed Al Jaffal*

Department of Special Education, College of Education, King Saud University, Riyadh, 12372, Saudi Arabia
*Corresponding Author: Mohammed Al Jaffal. Email: moaljaffal@ksu.edu.sa

ABSTRACT

Many individuals with autism spectrum disorder (ASD) experience delays in the development of social and communications skills, which can limit their opportunities in higher education and employment resulting in an overall negative impact to their quality of life. This systematic review identifies 15 studies that explored the effectiveness of Video-Based Interventions (VBIs) for those with ASD during the critical years of adolescence and young adulthood. The 15 studies described herein found this to be an effective intervention for this population for the improvement of their vocational, daily living, and academic skills. In addition, VBIs allow for the maintenance and generalization of the different target behaviors that were examined. The majority of the studies located by this review also investigated the social validity of the intervention method with participants and caregivers and found these VBIs to have high social validity. Although a few studies that implemented VBIs to improve academic skills were located, the research on their use in this area was found to be lacking, indicating a gap in the research on VBIs. Increased usage of VBIs—including video modeling and video prompting—with the target population of those aged 15–28 with ASD is recommended with specific attention given to the use of VBIs to improve the academic and social skills of adolescents and young adults with ASD.

KEYWORDS

Autism spectrum disorder; adolescents; young adults; vocational rehabilitation/training; higher education; video-based intervention; academic skills

Introduction

A The Centers for Disease Control and Prevention [1] estimates 1 in 44 children in the United States may be identified as having Autism Spectrum Disorder (ASD), a developmental disorder which, in addition to certain other traits, is characterized by deficits in social communication skills. This specific trait of the condition means that those with ASD frequently experience challenges in social settings, including school and work, which can impact their achievement later in life in post-secondary education and adult careers [2,3]. This indicates the need for vocational programs specifically tailored for those on the spectrum that support and prepare them for adulthood [4–6]. The provision of such programs and interventions is also required by legislation such as the Individuals with Disabilities Education Act [7] and the Every Student Succeeds Act [8], which amended the Elementary and Secondary Education Act [9]. Each of these acts includes language directing educators to support students with disabilities, including those with ASD, using appropriate technology to develop effective programs, curricula, and interventions to assist them in succeeding both in school and in adulthood.

Moreover, studies have shown the need for such programs and interventions to enhance the vocational, daily living, and academic skills of adolescents and young adults with ASD [10,11]. It is of great importance to better understand the findings of technology research related specifically to the enhancement of the vocational skills for adolescents and young adults with ASD [12]. One evidence-based practice associated with positive outcomes for

students with ASD is the use of interventions that incorporate video modeling and video prompting [13,14].

Video-Based Intervention

Types and usage of video in intervention

Video-based intervention (VBI) is widely recognized as a promising strategy that can be used to improve the development of the social and communication skills of students diagnosed with ASD, who often lag behind their peers in these areas. The strategy can be used to promote the learning of social and play skills through the concepts of Arthur Bandura's [15,16] social learning theory and social cognitive theory, which were in turn based on B. F. Skinner's theory of behaviorism [17], first described in 1938. The strategy can be conceptualized as using video demonstration to engage the individual with ASD in social learning, where a targeted behavior is demonstrated in the video (modeled) to elicit the person with ASD to demonstrate the same behavior. In other words, a child with ASD who has deficits in social and communications development learns through observing and imitating a desired behavior that they might not be able to comprehend on their own due to their lag in the understanding of non-verbal cues [18]. Moreover, video modeling is particularly suited to this population as it can be easily individualized to meet specific needs and preferences. Consequently, the strategy can provide more targeted learning compared to that available through any mass-produced video [19]. This type of intervention is generally conducted by presentation of an individualized video using current technologies (e.g., laptop, mobile phone, tablet), and can be accompanied by prompts, reward systems, and instructions to facilitate the acquisition of the skill.

VBI can be presented through conventional video modeling (i.e., video model depicts a targeted situation), video self-modeling (i.e., video model displays the individual themself by means of video editing), and point-of-view modeling (i.e., an event from the child with ASD's point of view is presented). This flexibility of VBI delivery allows teachers to provide an individualized approach to presenting an evidence-based practice that requires little expertise in the technology on the part of the interventionist [19]. VBI can also take the form of video prompting, which presents step-by-step video instruction on how to complete a multi-step task. In this scenario, the individual with ASD observes the video prompt on a single step of the task, carries out the step on their own, and then moves on to observe the next video prompt of the next step, and so on until they have followed through on the entire task [20]. Video prompting has been found to be useful to the development of functional skills, the acquisition of which are frequently a component of Individualized Education Programs (IEPs), as these are skills an individual is deemed to require to successfully live independently [20,21].

Types of skillsets presented with VBI

Since it is simple to individualize VBIs to present one-on-one direction to young people with ASD, the method can be applied to teach a variety of skills. One area of task instruction that can incorporate VBIs is the development of daily living skills in those with ASD to support independent living. For example, due to the sensory issues that are often a trait of those on the spectrum, children with ASD may struggle to maintain appropriate hygiene. Some studies have noted that people with ASD may experience greater challenges maintaining proper oral hygiene habits [22,23]. Similarly, those with ASD often indicate difficulty with showering and hand-washing. Piccin et al. [24] conducted an abbreviated review of the research utilizing video modeling to support young children and adolescents on applications for hygiene practices and found that VBIs are successful in supporting these children with ASD in developing these positive daily living skills. Positive hygiene practices are not just important for personal well-being and quality of life, they are also important for social acceptance and integration—two aspects of human society that are critical to success in work and career. Other skills required for independent living include things like being able to cook and clean for oneself. Different types of VBIs can also be used to improve the social skills of people with ASD, which has application to future success in the higher education and vocational settings. However, much of the research in this area with VBIs has focused on children much younger than the population examined in this review [25,26].

Another area where the unique traits of those with ASD can create challenges is that of academic skills development, which is sometimes combined with functional skills development because certain academic skills, such as proficiency with math, are applicable to the ability to successfully live independently and do things such as budgeting for necessities (e.g., groceries, transit expenses, hygiene products) [27]. Again, the majority of the research in this area has focused on the K–12 years and achievement in school. However, again, the failure to develop academic skills by adolescence and young adulthood will impact an individual's ability to succeed in the higher education and adult career settings [28]. In addition, these skills tend to be taught in the context of achievement for testing and assessment rather than in regard to how they are necessary for independent adult life.

Purpose of the study

While previous research has established the effectiveness of VBI for children with ASD, there has been little analysis of the research on how it can be used to support students with ASD in adolescence and young adulthood in the acquisition of the skills necessary to succeed in post-secondary education and/or future careers [6,29,30]. As the numbers of individuals with ASD diagnoses increases, more individuals with delays in the social and communication skills development required to succeed in adulthood will require support during the high school years to acquire the necessary skills and understanding to achieve to their potential and enjoy appropriate quality of life [1,31,32].

The objective of this systematic review is to examine the effectiveness of VBIs—including video modeling and video prompting—for adolescents and young adults with ASD through a survey of the publications found through a

search of certain major databases. To further support the goals of this research, which involved the specific focus on the need to prepare individuals with ASD in different skills for their future lives in higher education and/or adult careers, the age range established was 15–28 years. The age range of adolescence is generally considered to be ages 10–19 and young adulthood is generally considered to end around age 26 at the latest [33,34]. However, due to the social skills delay that is often experienced by those with ASD, it was felt that it was appropriate to set the age range as 15–28 for the purposes of this review, so as to allow for as many relevant VBIs as possible to be identified and described.

Methodology

Search strategy
A systematic database search was conducted to locate works regarding the use of VBIs with young adults and adolescents with ASD to assess how beneficial such interventions are for this population in supporting their success in higher education and career. In March of 2021, a comprehensive search of several databases was conducted in compliance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines [35]. A keyword search was conducted on the ERIC, Academic Search Ultimate, PubMed, and PsycINFO databases. The keywords utilized were "Video Model*" OR "Video Technology*" AND "Autistic*" and "Video Model*" OR "Video Prompt*" AND "Autism*"; the search was designed to ensure that all studies about VBIs on individuals with ASD were identified (see Fig. 1). Initially, the term "Adolesc*" was to be included, however there was a concern that the term was too specific and might cause relevant articles to be excluded. Through this initial search, 474 articles were returned. Next, a screening process was conducted based on (PRISMA) to winnow the list to only those that met the inclusion criteria.

Inclusion and exclusion criteria
Certain criteria were established for this systematic review, which were:

1. Participants in the study must have a diagnosis of autism spectrum disorder.
2. Study involves participants within the 15–28 age range.
3. Study must employ some type of single-case research design.
4. Study must involve a video-based intervention, including studies that compared VBIs to other types of interventions.
5. Articles must be peer-reviewed.
6. Articles must be published in English.
7. Articles must have been published 2008–2021.

The exclusion criteria were: (a) all studies that involved participants with any additional diagnosis besides ASD; (b) studies that involved any participants younger than 15 years of age or over the age of 28; (c) studies published before 2008; and (d) all studies presented as standard reports,
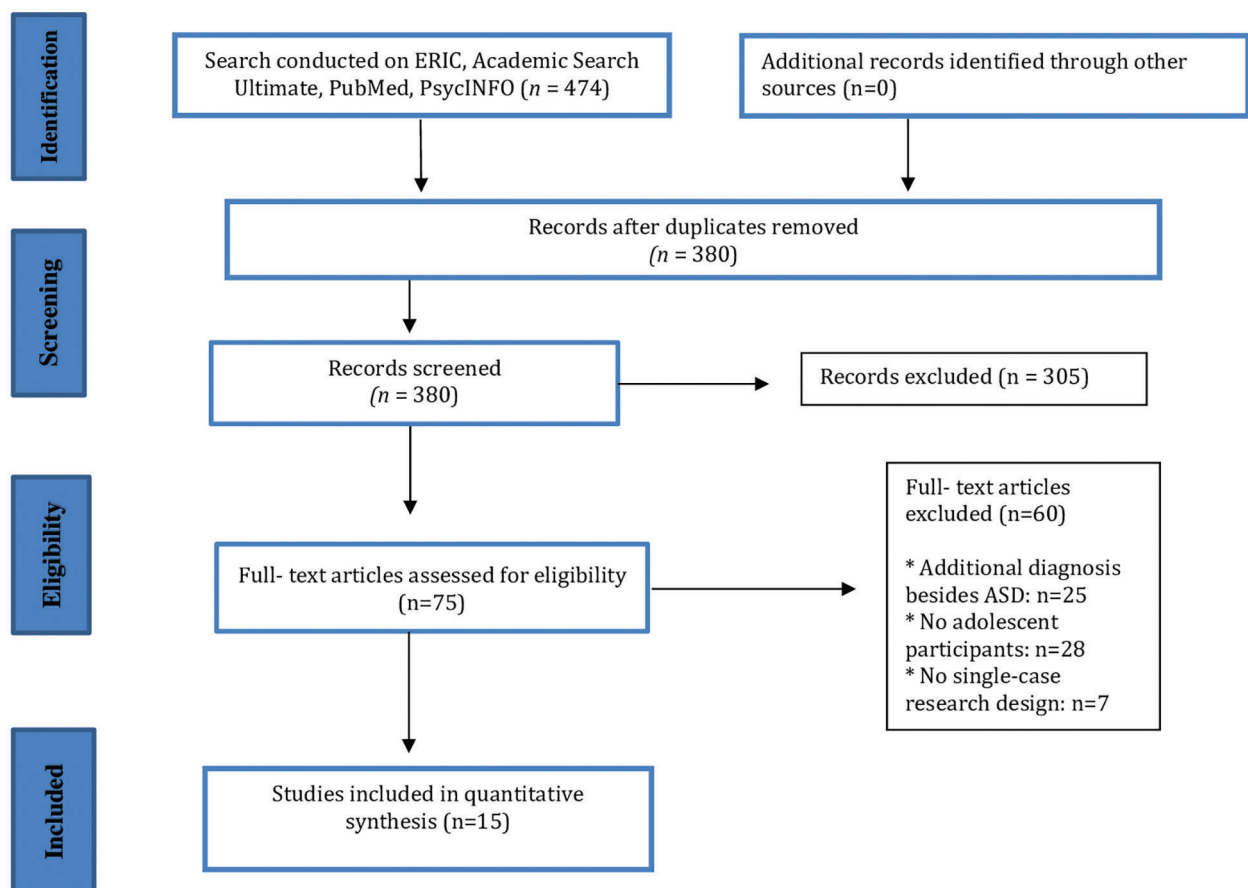

FIGURE 1. PRISMA flow diagram.

TABLE 1

Presentation of data from the systematic review of the research

Study	Title/theme area	Participants	Methodology/type of study	Purpose and findings
Allen et al. (2010) [36]	"Community-based vocational instruction using videotaped modeling for young adults with autism spectrum disorders performing in air-inflated mascots." Theme: Vocational skills	Three participants with ASD aged 16–25	Multiple baseline design	Authors found that the video modelling of the skillset required to perform the job had a positive impact on the three participants, on whom data were collected before and after they watched the video model demonstration.
Allen et al. (2010) [37]	"Use of video modeling to teach vocational skills to adolescents and young adults with autism spectrum disorders." Theme: Vocational skills	Four participants with ASD aged 17–22	Multiple baseline design	A University of Nebraska collaboration with a local business that examined the impact of video modelling a skillset— performing in costume to attract customers—found that four participants with ASD had positive results from the intervention.
Bennett et al. (2016) [13]	"Comparison of screen sizes when using video prompting to teach adolescents with autism." Theme: Vocational skills	Three participants with autism aged 16–18	Adapted alternating treatments design	This study investigated whether screen size (phone *vs.* tablet) impacts the effectiveness of VBI. As with past studies on this topic, the results were mixed, as one participant did better on the VBI with a larger screen but the other two participants did equally well with the smaller and larger screens. The skill that was examined was using a photocopier.
Bereznak et al. (2012) [38]	"Video self-prompting and mobile technology to increase daily living and vocational independence for students with autism spectrum disorders." Themes: Daily/Independent living skills; Vocational skills	Three male participants with ASD aged 15–18	Multiple probe across behaviors design	The authors examined the use of video self-prompting with an iPhone to teach skills used in daily living. All of the participants exhibited an increase in the "percent of steps performed independently" and two of them "were able to learn how to self-prompt" (p. 269).
Bross et al. (2019) [39]	"Video modeling to improve customer service skills of an employed young adult with autism." Theme: Vocational skills	One participant aged 18 with autism.	Multiple baseline across behaviors design	In this study, the participant, who has autism, was already employed as a cashier. The authors found an improvement in the participant's customer service skills through the use of VBI, specifically involving video modeling. Applications for improving employment opportunities for this demographic with autism are presented.
Burke et al. (2013) [40]	"Tablet-based video modeling and prompting in the workplace for individuals with autism." Theme: Vocational skills	Four participants with ASD aged 19–28	Multiple baseline across subjects design	This study examined the effectiveness of a specific VBI (VideoTote) in supporting individuals with ASD in the workplace in "rates of completion with a complex, 104-step shipping task" (p. 1). The authors found positive results with the video modeling/prompting app and also obtained positive feedback from both the individuals with ASD and their parents regarding the appropriateness and utility of the tool.
Campbell et al. (2015) [47]	"Handheld devices and video modeling to enhance the learning of self-help skills in adolescents with autism spectrum disorder." Theme: Daily/Independent living skills	Three participants with ASD aged 17–19	Multiple baseline across participants design	This study focused on the use of a smaller screen to deliver a VBI that involved video modeling on handwashing. The authors found notable improvement in the ability of all three participants to independently engage in an increased

(Continued)

TABLE 1 (continued)

Study	Title/theme area	Participants	Methodology/type of study	Purpose and findings
				number of the 13 steps of handwashing after the introduction of the VBI on the portable handheld device as compared to the number of steps they had each engaged in during their individual baseline phases. The authors suggest that the use of the smaller device/screen is useful to this population.
English et al. (2017) [41]	"Effects of video modeling with video feedback on vocational skills of adults with autism spectrum disorder." Theme: Vocational skills	Three participants aged 18–23	Multiple probe design across skills	The authors employed video modeling (with video feedback incorporated) to support three young adults with ASD in acquiring skills required for work in gardening. The basic intervention that involved video modeling with video feedback was successful for two individuals while the remaining individual with ASD achieved success in acquiring the skills with the addition of video prompting. Overall, the results were positive for all three, their skills acquisition was maintained over time, and social validity data showed that the intervention was positive and appropriate.
Kellems et al. (2012) [42]	"Using video modeling delivered through iPods to teach vocational tasks to young adults with autism spectrum disorders." Theme: Vocational skills	Three participants aged 16–22	Multiple probe design across behaviors	The authors examined the use of VBI delivered by iPod to teach vocational skills to the four participants with ASD. Not only did the study find "that using the iPod was associated with immediate and substantial gains in the percentage of steps completed correctly" (p. 155), the researchers also evaluated the social validity of the VBI and found it to be positive.
Mechling et al. (2013) [46]	"Comparing the effects of commercially available and custom-made video prompting for teaching cooking skills to high school students with autism." Theme: Daily/Independent living skills	Four male participants with autism aged 15–19 (high school-aged)	Adapted alternating treatments design	The authors examined whether there was a difference in effectiveness based on whether the VBI used to teach cooking skills was a commercially available or custom-made. In this study, both types of VBI that involved video prompts were effective, however, greater achievement in the area of independent task completion was observed with the custom videos.
Mechling et al. (2009) [45]	"Using a personal digital assistant to increase independent task completion by students with autism spectrum disorder." Theme: Daily/Independent living skills	Three participants aged 16–17	Multiple probe design	This study involved the use of a PDA and video prompting to teach three adolescents an independent living skill, namely the process for following a recipe for cooking. The authors found "that the students with ASD were able to adjust the prompt levels used on the PDA and to maintain their ability to use the device to independently complete recipes over time" (p. 1420).

TABLE 1 (continued)

Study	Title/theme area	Participants	Methodology/type of study	Purpose and findings
Mechling et al. (2008) [43]	"Comparison of static picture and video prompting on the performance of cooking-related tasks by students with autism." Theme: Daily/Independent living skills	Six male participants with autism aged 15–21	Adapted alternating-treatment design	The authors examined the comparative effectiveness of different methods of instructing the participants in cooking skills. The baseline involved verbal instruction whereas photographs and video prompting were used as interventions. "Participants independently completed a greater number of tasks when using video prompting… each student further increased his level of performance when using video prompting with sets of tasks receiving static picture prompts" (p. 31).
Morlock et al. (2015) [30]	"Video modeling and word identification in adolescents with autism spectrum disorder" Theme: Academic skills	Three male high school participants with ASD aged 17–18	Single-case multiple baseline experimental design across participants	The researchers had identified a gap regarding the effectiveness of the use video modeling with high school students with ASD. In addition, some individuals with ASD experience challenges with reading development, so this VBI involved "the development of word recognition" (p. 101). The finding was that the VBI "was effective in facilitating word recognition and pronunciation" (p. 101).
Wertalik et al. (2018) [48]	"Comparison of TAGteach and video modeling to teach daily living skills to adolescents with autism." Theme: Daily/Independent living skills	Three participants with autism aged 17	Adapted alternating treatments design	This study focused on support of daily hygiene practices by three high school-aged male adolescents. The authors compared the TAGteach program, which involves a device that makes a sound to signal when the desired behavior has been done right, and video modeling. The finding was that both methods were successful in improving the specific hygiene practices of all three.
Yakubova et al. (2015) [44]	"Video-based intervention in teaching fraction problem-solving to students with autism spectrum disorder." Theme: Academic skills	Three high school students with ASD aged 17–19	Multiple-probe across students design	The authors utilized "point-of-view video modeling" for solving word problems with fractions (mathematics). The finding was that all three students performed better with the intervention and that all three also "maintained accuracy levels at a 1-week follow-up" (p. 2865).

conference proceedings, and/or dissertations. To ensure the reliability of the collected data, two reviewers with expertise in special education independently conducted coding based on the eligibility criteria. Any disagreements were resolved through discussion between the two reviewers and the researcher.

Findings of screening process
The initial search of the databases identified 474 articles based on PRISMA guidelines. The first step was to eliminate all duplicated articles. Next, the titles/abstracts were checked to confirm that the article involved a VBI and participants with ASD. After this, the inclusion/exclusion criteria were applied to the remaining studies. This resulted in the identification of 12 articles. The full text of these 12 were

then reviewed closely and it was determined that three additional studies mentioned articles that were part of this group of 12 should be added. This meant that a total pool of 15 studies was then achieved (see Fig. 1). To ensure the reliability of the findings, two reviewers independently conducted coding based on the eligibility criteria. Any disagreements were resolved through discussion between the two reviewers and the researcher.

Results

Once the 15 peer-reviewed articles that met the inclusion criteria of the study had been identified, certain data were extracted from each (see Table 1). The total number of participants involved in the different studies was 50 and

they ranged in age from 15 to 28 years. Over half of the studies (*n* = 8; 53.33%)—including one that also examined teaching a daily living skill—focused on using VBI techniques to support the development of vocational skills in adolescents and/or young adults with ASD (e.g., [13,36–42]). The next most common focus was on teaching independent living skills, including the one study that focused on both these skills and vocational skills, for a total of six studies (40.00%). Finally, the least common skillset was that of academic skills, where only two studies were found (13.33%). In the following studies, by referencing the data obtained during the maintenance and generalization phases, it could be seen that the participants were able to effectively maintain and generalize the target behaviors through the VBIs: Morlock et al. [30], Allen et al. [36], Allen et al. [37], Bereznak et al. [38], English et al. [41], Mechling et al. [43], and Yakubova et al. [44]. All but one of the identified studies (*n* = 14; 93.33%) also evaluated the social validity of the VBI employed; only the Bereznak et al. [38] study did not reference social validity.

Through the review of the 15 identified studies, the effectiveness of VBIs with the subject population of adolescents and young adults with ASD was determined. In addition, the particular VBI application, whether vocational, academic, or related to independent living skills, was also identified. For example, the two studies with Allen as lead author—Allen et al. [36] and Allen et al. [37]—evaluated video modeling to teach a specific job-related skillset, namely the way to act as an engaging and entertaining "mascot" for a retail business, to two sets of participants with ASD. The results of both of these studies found video modeling to be an effective intervention in teaching the required skills. In a study focused on video prompting, Bennett et al. [13] explored whether screen size (phone *vs.* tablet) was a factor in the delivery of a VBI on photocopying with three individuals with ASD aged 16–18. The overall VBI method was found to be effective, with one of the participants exhibiting even better achievement using the larger screen size. Bereznak et al. [38] also focused on video prompting as well as video self-prompting, investigating a VBI using an iPhone to support the development of daily living and vocational skills in three adolescent males (15–18 years). Again, the VBI was successful for all three and two were found to have mastered self-prompting through the VBI. A study by Bross et al. [39] that aimed to promote the customer service skills of an individual with ASD through video modeling also achieved positive results for the participant. Research conducted by Burke et al. [40] evaluated the use of VBI in job training and performance with four people with ASD aged 19–28. The shipping skillset involved a very complicated multi-step process that the VBI was found to be very successful in supporting the four participants. In addition, the particular method, which is called VideoTote, was found to be very easy to use by the participants. In a study by English et al. [41], again the acquisition of vocational skills was examined; the specific area of work was gardening. Two of the participants had success with just the basic VBI that involved video modeling with video feedback; the other individual with ASD required video prompting to fully learn the vocational gardening skills being taught. Not only was

the VBI found to be effective—the participants all maintained the acquired skills—but it also achieved positive social validity as an effective and appropriate intervention. Vocational applications of VBI were also examined by Kellems et al. [42], using a VBI delivered using iPod with four young adults with ASD. All were found to have acquired the target tasks. In this case, the VBI incorporated written instructions.

As noted, there were a number of studies that investigated VBIs and their use to promote skills required for independent living. For example, Mechling et al. [43] compared the effectiveness of video prompting and static photographs to increase the independent cooking task performance of six individuals with autism. The authors reported both interventions were effective, yet video prompting resulted in more improvement. A later study on VBI use for teaching cooking skills, Mechling et al. [45], used a multiple probe design. The authors reported that the three participants learned the needed skills and that the VBI was effective in teaching multi-step tasks. Similarly, Mechling et al. [46] again examined VBI, this time incorporating video prompts, with cooking skills with a participant pool of four male high school students with autism. This study examined differences in achievement based on whether the VBI in question was commercially available or custom made. While both VBIs obtained positive outcomes for the participants, the use of the custom-made videos generated more independent steps.

Some of the daily living studies focused on hygiene practices, which as mentioned can be a challenge for those with ASD. In Campbell et al. [47], the seemingly simple task of handwashing was the focus of the study and specifically, the researchers sought to determine if there was benefit to the utilization of the smaller screen of a "portable handheld device" for the delivery of the VBI. While handwashing might seem like a basic skill that most children easily master, the sensory challenges that people with ASD sometimes experience can cause them to avoid washing their hands. However, this aspect of hygiene is critical to successfully functioning in social settings such as school and work. This study involved three adolescents (aged 17–19) with ASD and employed a multiple baseline across participants design. The study, which was presented by occupational therapists, was conducted over 4 weeks and obtained positive results with all three participants. The first student improved from completion of seven of 13 steps (53.85% independent completion) in his 1-week baseline to 12 of 13 steps (92.31% independent completion) after the introduction of the VBI. After the 2-week baseline, the second participant was completing eight of 14 steps (57.14% task completion) independently; after the introduction of the video presented on the portable device, this participant with ASD was demonstrating an additional five steps (92.86% task completion). Finally, the baseline of the third participant after 3 weeks was eight out of 13 steps (61.54% task completion) on the handwashing task analysis, which improved to 11 out of 13 (84.62%) after the introduction of the VBI. The authors concluded video modeling on a handheld device improves the acquisition of handwashing task completion for adolescents with autism. Another study whose focus was hygiene practices, Wertalik et al. [48],

compared a different type of intervention with video modeling. This study found both methods to be successful in teaching the three participants positive hygiene practices for daily living.

In terms of the research that focused on the development of academic skills, this was found to be limited. Morlock et al. [30] examined the effectiveness of video modeling to facilitate the development of word recognition and pronunciation in three male high school students with ASD. The authors found that video modeling was effective in teaching word recognition and pronunciation. Based on the data, the authors were confident about the effectiveness of video modeling in teaching academic skills. Yakubova et al. [44] examined the efficacy of a point-of-view video modeling intervention to teach mathematics word problems to three high school students with ASD. The authors reported that all three students demonstrated greater accuracy in solving these problems that involved fractions.

Results of the quality assessment of all included articles in this review are (see Table 1). After reviewing the included full text in this review, the researcher reviewed the following data to reduce bias: Participants, age, sample size, skills, social validity, interventions, results.

Discussion

Based on the results of this review of 15 articles, it is clear that VBIs, including both video modeling and video prompting, are an effective intervention tool for adolescents and young adults with ASD. The studies found that all participants benefited from the interventions and acquired the target skills. The majority of the studies conducted focused on vocational skills and daily/independent living skills (n = 13; 86.67%). Given the importance of certain academic skills to success in career and independent living, this indicates a need for further examination of the use of VBI to support the development of academic skills in adolescents and young adults with ASD. One area where the research was found to be completely lacking was that on the use of VBI to mitigate behavioral issues in the target population with ASD. In addition, the findings could be interpreted as indicating that researchers feel there is a greater need to support vocational and daily living skills development in this age group (15–28), because these skills are necessary to successfully transition to adulthood [49]. The findings do point to the strong need for supporting individuals in the ASD Level 1 category, who are sometimes determined to require little to no additional support in the academic setting. Particularly, these individuals might still require support in social and self-advocacy skills development. As the number of individuals in this category grows, more and more of them will be entering higher education and higher-end careers [1,31,50]. This emphasizes the need for researchers to focus more on the effectiveness of VBI to enhance the success of this population after they exit high school [4].

Conclusion

The purpose of this systemic review was to identify the research available from 2008–2021 on the effectiveness of video-based intervention for adolescents and young adults with ASD. The findings indicate that these interventions show strong efficacy in supporting this age group in the acquisition of academic, vocational, and daily living skills. Most of the selected studies included a maintenance phase and a few also quantified the ability of the participants to generalize the skills they had learned. In these studies, it was typically found that the participants could maintain and generalize the target behaviors. Future studies on VBIs with this population should take steps to include examination of maintenance and generalization of the target behaviors, since individuals with ASD struggle to generalize learning skills that involve, for example, following a series of steps to achieve a positive conclusion. In addition, it is recommended that more research on the use of VBIs, which have found to be effective with individuals with ASD, is needed to support skills development in all three areas identified in this review—academic, vocational, and daily living—since all of these skills are critical for the successful transition to adulthood and for the achievement of positive quality of life.

Limitations

This systematic review was limited by the age of the participants in the studies that were examined (15–28 years). In addition, this work only covered studies that utilized single subject design, which by its nature typically involves fewer subjects/participants. Furthermore, it is possible that important research on the use of VBIs with this population was produced prior to 2008, however this was out of the scope of the current review. Finally, this review was limited to articles published in the English language, which means that research in other languages that investigated the use of VBIs with the target population would have been omitted.

Author Contributions: The author confirms that all contribution to the paper is solely his. The author reviewed the results and approved the final version of the manuscript.

Conflicts of Interest: The author declares that he has no conflicts of interest to report regarding the present study.

References

1. Maenner MJ, Shaw KA, Bakian AV, Bilder DA, Durkin MS, Esler A, et al. Prevalence and characteristics of autism spectrum disorder among children aged 8 years—Autism and developmental disabilities monitoring network, 11 Sites, United States, 2018. MMWR Surveill Summ [Internet]. 2021;70(11):1–6. doi:10.15585/mmwr.ss7011a1.

2. American Psychiatric Association. Autism spectrum disorder. In: Diagnostic and statistical manual of mental disorders [Internet]. 5th edition. Washington DC: American Psychiatric Association; 2013. doi:10.1176/appi.books.9780890425596.

3. Sani Bozkurt S, Vuran S. An analysis of the use of social stories in teaching social skills to children with autism spectrum disorders.

Educational Sciences: Theory & Practice [Internet]. 2022;14(5):1875–92. doi:10.12738/estp.2014.5.1952.

4. Flegenheimer C, Scherf KS. College as a developmental context for emerging adulthood in autism: a systematic review of what we know and where we go from here. J Autism Dev Disord [Internet]. 2022;52(5):2075–97. doi: 10.1007/s10803-021-05088-4.

5. Hendricks D. Employment and adults with autism spectrum disorders: challenges and strategies for success. J Vocat Rehabil [Internet]. 2010;32(2):125–34. doi:10.3233/JVR-2010-0502.

6. Kirby AV, Diener ML, Dean EE, Darlington AN, Myers A, Henderson J. Autistic adolescents' and their parents' visions for the future: how aligned are they? Aut Adulthood: Chall Manage [Internet]. 2022;4(1):32–41. doi:10.1089/aut.2020.0061.

7. Individuals with Disabilities Education Act, 20 U.S.C. § 1400. Available from: https://sites.ed.gov/idea/statute-chapter-33/subchapter-i/1400. [Accessed 2004].

8. Every Student Succeeds Act, 20 U.S.C. § 6301. Available from: https://congress.gov/114/plaws/publ95/PLAW-114publ95.pdf. [Accessed 2015].

9. Elementary and Secondary Education Act of 1965, Pub. L. No. 89-10. Available from: https://www.govinfo.gov/content/pkg/STATUTE-79/pdf/STATUTE-79-Pg27.pdf. [Accessed 1965].

10. Auld C, Foley KR, Cashin A. Daily living skills of autistic adolescents and young adults: a scoping review. Aust Occup Ther J [Internet]. 2022;69(4):456–74. doi:10.1111/1440-1630.12806.

11. McDonald TA, Machalicek W. Systematic review of intervention research with adolescents with autism spectrum disorders. Research in Autism Spectrum Disorders [Internet]. 2013;7(11):1439–60. doi:10.1016/j.rasd.2013.07.015.

12. Sarri K, Syriopoulou-Delli CK. Tech-aided interventions for vocational skills in adolescents and young adults with autism spectrum disorder. In: The 4th ETLTC International Conference on ICT Integration in Technical Education (ETLTC2022) [Internet]. Fukushima, Japan; SHS Web of Conferences doi:10.1051/shsconf/202213905001

13. Bennett KD, Gutierrez AJ, Loughrey TO. Comparison of screen sizes when using video prompting to teach adolescents with autism. Educ Train Autism Dev Disabil [Internet]. 2016;51(4):379–90. Available from: https://eric.ed.gov/?id=EJ1120338.

14. DeBar RM, Kane CL, Amador JL. Video modeling instruction for individuals with autism spectrum disorder. In: Leaf JB, Cihon JH, Ferguson JL, Weiss MJ, editors. Handbook of applied behavior analysis interventions for autism [Internet]. Cham: Springer; 2022. p. 227–50. doi:10.1007/978-3-030-96478-8_13

15. Bandura A. Self-efficacy: toward a unifying theory of behavioral change. Psychol Rev [Internet]. 1977;84(2):191–215. doi:10.1037/0033-295X.84.2.191.

16. Bandura A. Human agency in social cognitive theory. Am Psychol [Internet]. 1989;44(9):1175–84. doi:10.1037/0003-066X.44.9.1175.

17. Skinner BF. The behavior of organisms: an experimental analysis. Appleton-Century [Internet]. 1938. Available from https://psycnet.apa.org/record/1939-00056-000.

18. Mason RA, Ganz BG, Parker RI, Boles MB, Davis HS, Rispoli MJ. Video-based modeling: differential effects due to treatment protocol. Res Autism Spectr Diso [Internet]. 2013;7(1):120–31. doi:10.1016/j.rasd.2012.08.003.

19. Wilson K. Incorporating video modeling into a school-based intervention for students with autism spectrum disorders. Lang Speech Hear Serv Sch [Internet]. 2013;44(1):105–17. doi:10.1044/0161-1461(2012/11-0098).

20. Johnson JW, Blood E, Freeman A, Simmons K. Evaluating the effectiveness of teacher-implemented video prompting on an iPod Touch to teach food-preparation skills to high school students with autism spectrum disorders. Focus Autism Other Dev Disabl [Internet]. 2013;28(3):147–58. doi:10.1177/1088357613476344.

21. Yakubova G, Taber-Doughty T. Effects of video modeling and verbal prompting on social skills embedded within a purchasing activity for students with autism. J Spec Educ Technol [Internet]. 2013;28(1):35–47. doi:10.1177/016264341302800104.

22. da Silva Moro J, Rodrigues TD, Kammer PV, de Camargo AR, Bolan M. Efficacy of video modeling technique as a facilitator of non-invasive dental care in autistic children: randomized clinical trial. J Autism Dev Disord [Internet]. 2022;134(4):140. doi:10.1007/s10803-022-05820-8.

23. Stein LI, Polido JC, Mailloux Z, Coleman GG, Cermak SA. Oral care and sensory sensitivities in children with autism spectrum disorders. Spec Care Dentist [Internet]. 2011;31(3):102–10. doi:10.1111/j.1754-4505.2011.00187.x.

24. Piccin S, Crippa A, Nobile M, Hardan A, Brambilla P. Video modeling for the development of personal hygiene skills in youth with autism spectrum disorder. Epidemiol Psychiatr Sci [Internet]. 2018;27(2):127–32. doi:10.1017/S2045796017000610.

25. Alzyoudi M, Sartawi A, Almuhiri O. The impact of video modeling on improving social skills in children with autism. Br J Spec Educ [Internet]. 2015;42(1):53–68. doi:10.1111/1467-8578.12057.

26. Plavnick JB, MacFarland MC, Ferreri SJ. Variability in the effectiveness of a video modeling intervention package for children with autism. J Posit Behav Interv [Internet]. 2015;17(2):105–15. doi:10.1177/1098300714548798.

27. Burton CE, Anderson DH, Prater M, Dyches TT. Video self-modelling on an iPad to teach functional math skills to adolescents with autism and intellectual disability. Focus Autism Other Dev Disabl [Internet]. 2013;28(2):67–77. doi:10.1177/1088357613478829.

28. Gelbar NW, Smith I, Reichow B. Systematic review of articles describing experience and supports of individuals with autism enrolled in college and university programs. J Autism Dev Disord [Internet]. 2014;44(10):2593–601. doi:10.1007/s10803-014-2135-5.

29. Howlin P, Charman T. Autism spectrum disorders: interventions and outcome. In: Howlin PA, Charman T, Ghaziuddin M, editors. The SAGE handbook of developmental disorders [Internet]. Los Angeles: SAGE; 2011. p. 307–28. doi:10.4135/9781446201107.n16.

30. Morlock L, Reynolds JL, Fisher S, Comer RJ. Video modeling and word identification in adolescents with autism spectrum disorder. Child Lang Teach [Internet]. 2015;31(1):101–11. doi:10.1177/026565901351757331.

31. Farahani MV, Tootee A. High-functioning individuals with autism spectrum disorders in Middle Eastern societies. MECPsych [Internet]. 2022;29(1):81. doi:10.1186/s43045-022-00248-3.

32. Nicholas DB, Attridge M, Zwaigenbaum L, Clarke M. Vocational support approaches in autism spectrum disorder: a synthesis review of the literature. Autism [Internet]. 2015;19(2):235–45. doi:10.1177/1362361313516548.

33. Bonnie RJ, Stroud C, Breiner H. Investing in the health and well-being of young adults [Internet]. Washington DC: National Academies Press; 2015. Available from: https://www.ncbi.nlm.nih.gov/books/NBK284787/.

34. World Health Organization. Adolescent health [Internet]. Available from: https://www.who.int/health-topics/adolescent-health#tab=tab_1. [Accessed 2023].

35. Moher D, Liberati A, Tetzlaff J, Altman DG, Group P. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. PLoS Med [Internet]. 2009;6(7):e1000097. doi:10.1371/journal.pmed.1000097.

36. Allen KD, Wallace DP, Greene DJ, Bowen SL, Burke RV. Community-based vocational instruction using videotaped modeling for young adults with autism spectrum disorders performing in air-inflated mascots. Focus Autism Other Dev Disabl [Internet]. 2010;25(3):186–92. doi:10.1177/1088357610377318.

37. Allen KD, Wallace DP, Renes D, Bowen SL, Burke RV. Use of video modeling to teach vocational skills to adolescents and young adults with autism spectrum disorders. Education and Treatment of Children [Internet]. 2010;33(3):339–49. doi:10.1353/etc.0.0101.

38. Bereznak S, Ayres KM, Mechling LC, Alexander JL. Video self-prompting and mobile technology to increase daily living and vocational independence for students with autism spectrum disorders. Journal of Developmental and Physical Disabilities [Internet]. 2012;24(3):269–85. doi:10.1007/s10882-012-9270-8.

39. Bross LA, Travers JC, Munandar VD, Morningstar M. Video modeling to improve customer service skills of an employed young adult with autism. Focus Autism Other Dev Disabl [Internet]. 2019;34(4):226–35. doi:10.1177/1088357618805990.

40. Burke RV, Allen KD, Howard MR, Downey D, Matz MG, Bowen SL. Tablet-based video modeling and prompting in the workplace for individuals with autism. J Vocat Rehabil [Internet]. 2013;38(1):1–4. doi:10.3233/JVR-120616.

41. English DL, Gounden S, Dagher RE, Chan SF, Furlonger BE, Anderson A et al. Effects of video modeling with video feedback on vocational skills of adults with autism spectrum disorder. Developmental Neurorehabilitation [Internet]. 2017;20(8):511–24. doi:10.1080/17518423.2017.1282051.

42. Kellems RO, Morningstar ME. Using video modeling delivered through iPods to teach vocational tasks to young adults with autism spectrum disorders. Career Development and Transition for Exceptional Individuals [Internet]. 2012;35(3):155–67. doi:10.1177/0885728812443082.

43. Mechling LC, Gustafson MR. Comparison of static picture and video prompting on the performance of cooking-related tasks by students with autism. J Spec Educ Technol [Internet]. 2008;23(3):31–45. doi:10.1177/016264340802300304.

44. Yakubova G, Hughes EM, Hornberger E. Video-based intervention in teaching fraction problem-solving to students with autism spectrum disorder. J Autism Dev Disord [Internet]. 2015;45(9):2865–75. doi:10.1007/s10803-015-2449-y.

45. Mechling LC, Gast DL, Seid NH. Using a personal digital assistant to increase independent task completion by students with autism spectrum disorder. J Autism Dev Disord [Internet]. 2009;39(10):1420–34. doi:10.1007/s10803-009-0761-0.

46. Mechling LC, Ayres KM, Foster AL, Bryant KJ. Comparing the effects of commercially available and custom-made video prompting for teaching cooking skills to high school students with autism. Remedial and Special Education [Internet]. 2013;34(6):371–83. doi:10.1177/0741932513494856.

47. Campbell JE, Morgan M, Barnett V, Spreat S. Handheld devices and video modeling to enhance the learning of self-help skills in adolescents with autism spectrum disorder. Occup Ther J Res [Internet]. 2015;35(2):95–100. doi:10.1177/1539449215570040.

48. Wertalik JL, Kubina RM. Comparison of TAGteach and video modeling to teach daily living skills to adolescents with autism. J Behav Educ [Internet]. 2018;27(2):279–300. doi:10.1007/s10864-017-9285-4.

49. Volkmar FR, Solomon C. Youth with autism spectrum disorder and the transition to adulthood. In: Crockett LJ, Carlo G, Schulenberg JE, editors. APA handbook of adolescent and young adult development [Internet]. Washington, DC: American Psychological Association; 2023. p. 457–68. doi:10.1037/0000298-028.

50. Madaus J, Cascio A, Delgado J, Gelbar N, Reis S, Tarconish E. Improving the transition to college for twice-exceptional students with asd: perspectives from college service providers. Career Development and Transition for Exceptional Individuals [Internet]. 2023;46(1):40–51. doi:10.1177/21651434221091230.