

A Review of Research on Teaching People With Significant Disabilities Vocational Skills

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Abstract

Although an important part of adult life, individuals with significant disabilities experience low rates of gainful employment. The purpose of this review was to summarize and analyze the literature on teaching vocational skills to individuals with significant disabilities. Sixty-two articles (with 75 experiments) included in this review were published between 1969 and 2014, and indicated that most participants were successfully taught to engage in a variety of vocational skills in a range of settings. Unfortunately, this review also determined that the research on teaching vocational skills to individuals with significant disabilities is steadily decreasing, with only 15 new studies published since 2000. Potential directions for future research will be proposed.

Keywords

vocational skills, teaching, literature review, significant disabilities

Although employment is a critical need for individuals with significant disabilities (Human Services Research Institute, 2012), they continue to experience high rates of unemployment (Butterworth et al., 2012). Moreover, many individuals with significant disabilities demonstrate deficits in vocational skills and self-determination that limit their ability to obtain gainful employment in integrated settings, which may have negative effects on their overall quality of life (e.g., Wehmeyer, 2014). The ability of individuals with significant disabilities to acquire desired living and working outcomes may be unattainable until they can complete various vocational skills (Heller, Bigge, & Allgood, 2005). Furthermore, findings from the National Longitudinal Transition Study–2 (NLTS-2) indicate that post-school outcomes for individuals with intellectual and developmental disabilities are among the poorest of any disability group (Newman, Wagner, Cameto, Knokey, & Shaver, 2010). According to the NLTS-2 (2009), only 54% of people with intellectual disability, 47% of people with multiple disabilities, and 48% of people with autism report having worked for pay outside of the home in the last 2 years, compared with an average of 78% for all respondents with disabilities in any category.

Although the outcomes for individuals with significant disabilities are discouraging, there is a national push to provide access to employment for all individuals with disabilities in community settings. For example, the Employment First Initiative was designed to provide assistance to states to encourage the full inclusion of individuals with significant

disabilities into fully integrated community employment (www.dol.gov/odep/topics/EmploymentFirst.htm). In addition, Section 503 of the Rehabilitation Act (1973) recently implemented a rules change requiring federal contractors and subcontractors to take steps to include workers with disabilities at all levels (i.e., entry-level through administrative; www.dol.gov/compliance/guide/503.htm).

To prepare students with disabilities for employment, the Individuals With Disabilities Education Act (IDEA; 2004) has been revised several times to include transition services and planning related to employment, independent living, and post-secondary education. For example, starting no later than age 16, the individualized Education Program (IEP) team must begin planning for a student's transition from school to adult life. Based on the goals of the student, vocational experiences (e.g., internships, job shadows) can be planned and implemented for the duration of a student's time in high school to better prepare him or her for post-school employment. To properly support students with significant disabilities, IEP teams need to begin coordinating with adult service providers early in the transition process (Wehman, 2006).

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Given the poor outcomes of individuals with significant disabilities, it is clear that more needs to be done to improve their long-term employment outcomes. Since the mid-1950s, researchers have evaluated various methods for teaching vocational skills to individuals with significant disabilities (e.g., Hughes & Rusch, 1989; Irvin & Bellamy, 1977). For example, Jens and Shores (1969) taught three school-age participants to efficiently assemble a hinge mechanism using instruction, contingent reinforcement, and behavioral graphing. Using a reversal design, they found that all three participants acquired the skill and increased their rate using behavioral graphing. Many examples provide evidence that individuals with significant disabilities can be taught various vocational tasks, but it is unclear whether consensus exists among researchers about appropriate training methods or locations and whether any interventions targeting vocational skills have resulted in long-term employment.

Previous reviews on vocational training for students with disabilities have included vocational training as one of several domains of transition and post-secondary education (e.g., Alwell & Cobb, 2006), or have focused on attitudes of employers (e.g., Vornholt, Uitdewilligen, & Nijhuis, 2013). Thus far, there has not been an effort to collect and evaluate the body of intervention literature with a specific focus on individuals with significant disabilities. To determine the current state of intervention research related to employment and vocational preparation for individuals with significant disabilities, we sought to answer the following research questions:

Research Question 1: What are the demographics of the participants included in the studies?

Research Question 2: What, where, and how are vocational skills being taught to individuals with significant disabilities?

Research Question 3: Were the interventions effective in increasing, maintaining, and/or generalizing the specific skill targeted?

Research Question 4: Do the author's report of results align with calculated success estimates?

Research Question 5: Did the interventions lead to long-term employment for the participants?

Method

Searches

Electronic searches were conducted in the following databases: Academic Search Complete, Academic Search Premier, Education Research Complete, Education Full Text, ERIC, PsycINFO, and the Psychology and Behavioral Sciences Collection. Key terms fit into three categories. The first category included job, vocational, employment, and

work. The second included teach and intervention. The third included the terms severe disability, severe intellectual disability, severe mental retardation, profound disability, profound intellectual disability, and profound mental retardation. The truncated version of each keyword was used (e.g., disab*, interven*), and each iteration of the three categories of keywords was searched, resulting in 48 independent searches. We also performed a hand search of *Career Development and Transition for Exceptional Individuals* and the *Journal of Vocational Rehabilitation*. Following the electronic and hand searches, forward and ancestral searches were conducted with each included article. Forward searches were completed using the "cited by" feature in Google Scholar and checking each reference that had cited the original article. Ancestral searches were conducted by hand searching the reference sections of each included article.

Inclusion and Exclusion Criteria

To be included in the review, the article had to (a) be published in a peer-reviewed journal, (b) include a quasi-experimental or experimental design, (c) include participants with significant disabilities, (d) teach or enhance a vocational skill, and (e) be available in English. Experimental designs could include either group or single-subject research designs (including AB designs, which offer a systematic way to observe behavior and can demonstrate that the change in behavior is not simply a function of time [Gast, 2010]). With respect to participants, we included studies with participants whose IQ score was 40 or below (*Diagnostic and Statistical Manual of Mental Disorders* [4th ed., text rev.; *DSM-IV-TR*; American Psychiatric Association, 2000]). If no IQ score was provided, but the authors identified the participants as having a severe or profound disability, the study was included. Although the level of intellectual disability is no longer determined by IQ score, given that the included studies spanned over 50 years, this was one measure that was consistently presented across the literature that provided an objective means for including or excluding a study. In addition, if some but not all participants had a significant disability, the study was included only if participant data could be disaggregated. Studies that met some, but not all, of the inclusion criteria were excluded. In addition, studies that incorporated vocational skills but targeted a different behavior were excluded.

Coding

Study demographics. We collected information on the number of participants with significant disabilities, their disability label, their ages, and gender. We also collected data on the intervention location, the dependent and independent variables, and the research design used. We coded whether

or not generalization data were collected, what aspect of the target skill was generalized (i.e., setting, task, person), and whether or not the skill successfully generalized. We coded a study as including maintenance measures when the intervention was removed following skill acquisition, and we coded follow-up when part or all of intervention was kept in place, but data were collected at increasing intervals. For each study, we coded how long data were collected and whether or not the behavior maintained.

Author-reported results. We recorded whether authors reported the results as positive, negative, or mixed. We coded results as positive if the authors reported that the intervention was successful with all participants who had significant disabilities. We coded results as negative if the authors reported that the intervention was not successful for any of the participants with significant disabilities. We coded results as mixed if the results were reported as positive for some, but not all, of the participants with significant disabilities. We also coded whether or not the authors reported long-term outcomes of the intervention (e.g., Did the participants gain employment) and, if reported, what they were.

Summary of experimental effects. To further explore the experimental effects of each single-subject study, we visually inspected the graphs from each experiment to determine success estimates (Reichow & Volkmar, 2010). We chose this method because of questions surrounding the validity of other methods for quantitatively synthesizing single-subject research designs (Wolery, Busick, Reichow, & Barton, 2010). Success estimates use visual analysis to give an estimate of the rate of success across participants and/or behaviors. They are determined by creating a ratio of successful implementations of the independent variable to the total number of attempted implementations (Reichow & Volkmar, 2010).

To calculate the success estimate for each single-subject study, we visually analyzed the graphs for each experiment to determine whether a demonstration of a planned experimental effect was present or absent. Each phase change was considered an opportunity to demonstrate an experimental effect. We reviewed level, trend, and stability in our visual analysis and determination of the presence or absence of an experimental effect (Gast, 2010). For example, if a study used a multiple baseline design across three participants with significant disabilities, each change from baseline to intervention presented one opportunity to demonstrate an experimental effect. Three studies used an alternating treatments design, so we calculated three different success estimates for these studies. We determined the first two success estimates by examining the effect of each intervention independently (e.g., the effect of each intervention from baseline to intervention). We determined the final success estimate

by examining the separation of the effect of the two independent variables. We considered a condition change from intervention to maintenance as an opportunity to demonstrate experimental effect, but not a condition change from intervention to follow-up. Finally, we calculated success estimates for generalization separately from the general experimental data.

Fifty-eight studies (with 76 total opportunities to calculate success estimates) provided visual data appropriate for independent analysis. In all, 61 were experimental success estimates, and 15 were calculated for generalization opportunities. We calculated agreement for all opportunities, and initial agreement was 86% (65 agreements out of 76 opportunities). We discussed all disagreements until we came to consensus.

Intercoder Agreement

We each coded the same 13 variables (e.g., demographics, experimental design) for 30% of the articles. An agreement was scored for each item on the coding sheet if we coded the same thing, and a disagreement was scored if we did not. We calculated overall agreement for each article by adding the number of agreements by the total number of items to be coded and multiplying by 100. Average agreement was calculated to be 96% (range = 91%–100%). We resolved disagreements by consulting the article in question and reaching a consensus.

Results

Overview of Studies

A total of 62 articles containing 75 individual experiments were included in this review and split into five categories (see Table 1). The first category included studies that used standard instructional procedures (e.g., least-to-most prompting, constant time delay [CTD]). The second included studies that used technology as the primary independent variable (e.g., video-assisted training). In the third, we placed studies that focused on teaching participants to manage their own intervention (e.g., self-monitoring). The fourth included studies that compared two different interventions (e.g., site-based vs. motion-based task analyses). The fifth included studies that used multiple interventions simultaneously.

Teaching. Thirty experiments used standard instructional practices to increase the job skills of participants (e.g., Latimore, Parsons, & Reid, 2006). Teaching strategies included behavioral graphing (e.g., Jens & Shores, 1969), prompting (e.g., Woolcock, Lyon, & Woolcock, 1987), peer training or modeling (e.g., Wacker & Berg, 1984b), among others.

Table 1. Studies Listed by Category With Setting, Task, and Success Estimates.

Intervention	Article	Setting	Task	Success estimate		
				X out of Y	%	
Teaching	Agran, Fodor-Davis, Moore, and Deer (1989)	Classroom	Janitorial	8 of 14 correct 11 of 14 self-instruction	57 ^a 79	
	Agran, Fodor-Davis, Moore, and Martella (1992)	Community	Restaurant work	2 of 5 correct 1 of 5 self-instruction	40 ^a 20 ^a	
	Agran, Salzberg, and Stowitschek (1987)	Workshop	Job support skills	3 of 4	75 ^a	
	Beare, Severson, and Brandt (2004)	Community, workshop	Miscellaneous	3 or 3	100	
	Certo, Mezzullo, and Hunter (1985)	Community	Restaurant work	8 of 8	79 ^a	
	Gaylord-Ross, Forte, and Gaylord-Ross (1986)	Community	Miscellaneous	—	—	
	Gold (1976)	Not given	Assembly	—	—	
	Heller, Allgood, Ware, Arnold, and Castelle (1996)	Community	Job support skills	1 of 1	100	
	Irvin and Bellamy (1977)	Not given	Assembly	—	—	
	Jens and Shores (1969)	Classroom	Assembly	3 of 3	100	
	Karen, Eisner, and Endres (1974)	Workshop	Assembly	—	—	
	Lin and Browder (1990)	Workshop	Clerical	6 of 6	100	
	Lattimore, Parsons, and Reid (2006)	Community, workshop	Clerical, janitorial	6 of 8	75 ^a	
	Parsons, Reid, Green, and Browning (1999)	Community	Assembly	4 of 4	100	
	Maciag, Schuster, Collins, and Cooper (2000)	Workshop	Assembly	12 of 13	92	
	M. Martin and Horsfall (1987)	Community	Restaurant work	6 of 6	100	
	O'Neill and Bellamy (1978)	Workshop	Assembly	3 of 3	100	
	Reichle et al. (2005)	Not given	Assembly	2 of 3 assembly 0 of 3 assistance	66 0	
	Renzaglia, Wehmann, Schutz, and Karan (1978) Experiment 1	Workshop	Packaging	3 of 3	100	
	Renzaglia et al. (1978) Experiment 2	Workshop	Assembly	8 of 9	89	
	Rusch et al. (1988)	Community	Job support skills	6 of 7	86	
	Saunders and Saunders (1997) Experiment 1	Classroom	Assembly	3 of 3	100	
	Saunders and Saunders (1997) Experiment 2	Classroom	Assembly	2 of 4	50 ^a	
	Saunders and Saunders (1997) Experiment 3	Classroom	Assembly	5 of 5	100	
	Simmons and Flexer (1992)	Workshop	Janitorial	3 of 3	100	
	Steed and Lutzker (1997)	Community, workshop	Janitorial	9 of 9	100	
	Wacker and Berg (1983)	Classroom	Assembly	15 of 15	100	
	Wacker and Berg (1984b)	Community	Clerical	8 of 9	89	
	West and Patton (2010)	Community	Miscellaneous	3 of 3	100	
	Wilson, Schepis, and Mason-Main (1987)	Community	Packaging	5 of 8	63 ^a	
	Woolcock, Lyon, and Woolcock (1987)	Workshop	Janitorial	9 of 9	100	
	Self as teacher	Bates, Renzaglia, and Clees (1980) Experiment 1	Workshop	Assembly	13 of 15	87
		Bates et al. (1980) Experiment 2	Workshop	Assembly	6 of 8	75 ^a
Lagomarcino and Rusch (1989)		Community	Packaging	2 of 4	50 ^a	
McNally, Norusis, Gentz, and McConathy (1983)		Workshop	Package	3 of 3	100	
Moore, Agran, and Fodor-Davis (1989)		Workshop	Miscellaneous	12 of 24	50 ^a	
Salend, Ellis, and Reynolds (1989)		Workshop	Assembly	4 of 4	100	
Sowers, Verdi, Bourbeau, and Sheehan (1985)		Community	Job support skills	3 of 3	100	
Wacker and Berg (1984a)		Classroom	Packaging	9 of 9	100	
Wacker, Berg, Berrie, and Swatta (1985)		Classroom	Clerical, janitorial	24 of 30	80	

(continued)

Table 1. (continued)

Intervention	Article	Setting	Task	Success estimate		
				X out of Y	%	
Technology	Alberto, Sharpton, and Briggs (1986)	Classroom	Assembly	6 of 6	100	
	Chang, Kang, and Huang (2013)	Community	Restaurant work	1 of 1	100	
	Cihak, Kessler, and Alberto (2007)	Community	Restaurant work	8 of 8	100	
	Cihak, Kessler, and Alberto (2008)	Community	Restaurant work	4 of 4	100	
	Davis, Brady, Williams, and Burta (1992)	Community	Restaurant work	3 of 3	100	
	Kellems and Morningstar (2012)	Community	Janitorial	5 of 5	100	
	Lancioni, Campodonico, and Mantini (1998)	Not given	Assembly	4 of 4	100	
	Lancioni, Oliva, Meazzini, and Marconi (1993) Experiment 1	Not given	Assembly	4 of 4 computer aided 2 of 4 control program	100 50 ^a	
	Lancioni et al. (1993) Experiment 2	Not given	Assembly	4 of 4 with choice 4 of 4 without choice	100 100	
	Lancioni et al. (2014) Experiment 1	Not given	Job support skills	8 of 8	100	
	Lancioni et al. (2014) Experiment 2	Not given	Job support skills	3 of 3	100	
	Mechling and Ortega-Hurndon (2007)	Classroom, community	Miscellaneous	6 of 6	100	
	Comparison	Bambara, Ager, and Koger (1994) Experiment 1	Workshop	Job support skills	—	—
		Bambara et al. (1994) Experiment 2	Workshop	Job support skills	—	—
		Belfiore and Toro-Zambrana (1995) Experiment 1	Workshop	Packaging	—	—
Belfiore and Toro-Zambrana (1995) Experiment 2		Workshop	Packaging	15 of 16	94	
Browder, Lim, Lin, and Belfiore (1993)		Workshop	Clerical	6 of 6 (Standard TA) ^b 6 of 6 (Therblig TA) 3 of 3 (separation)	100 100 100	
Flexer, Newbery, and Martin (1979)		Not given	Assembly	4 of 11	36	
(i) Martin, Koop, Turner, and Hanel (1981) Experiment 1		Not given	Assembly	—	—	
Martin et al. (1981) Experiment 2		Not given	Assembly	—	—	
Lee, Belfiore, and Toro-Zambrana (2001)		Workshop	Packaging	6 of 7 (motion-based) 3 of 7 (site-based) 8 of 9 (separation)	86 43 ^a 89	
Toro-Zambrana, Lee, and Belfiore (1999) Experiment 1		Workshop	Miscellaneous	2 of 4 (motion-based) 4 of 4 (site-based) 5 of 6 (separation)	50 ^a 100 83	
Toro-Zambrana et al. (1999) Experiment 2		Workshop	Miscellaneous	—	—	
Combination		Bates et al. (1980) Experiment 3	Workshop	Assembly	12 of 16	75 ^a
		Bennett, Brady, Scott, Dukes, and Frain (2010)	Community	Misc.	4 of 4	100
		Connis (1979)	Workshop	Job support skills	2 of 2	100
		Furniss et al. (1999)	Community	Assembly	—	—
	Hughes and Rusch (1989)	Workshop	Job support skills	4 of 4	100	
	Mace, Shapiro, West, Campbell, and Altman (1986)	Workshop	Assembly	3 of 8	38 ^a	
	Mank and Horner (1987)	Community	Restaurant work	—	—	
	McCuller, Salzberg, and Lignugaris/Kraft (1987)	Workshop	Job support skills	9 of 18	50 ^a	
	Morgan and Salzberg (1992) Experiment 1	Workshop	Job support skills	19 of 24	79 ^a	
	Morgan and Salzberg (1992) Experiment 2	Workshop	Job support skills	31 of 38	82	
Wehman, Schutz, Bates, Renzaglia, and Karan (1978) Experiment 1	Workshop	Assembly	3 of 3	100		
Wehman et al. (1978) Experiment 2	Workshop	Packaging	3 of 4	75 ^a		

^aIndicates when the authors reported positive outcomes, but the success estimate was below 80%. ^bTA = task analysis.

Self as teacher. Ten experiments taught participants to self-monitor (e.g., Moore, Agran, & Fodor-Davis, 1989), self-reinforce (e.g., Bates, Renzaglia, & Clees, 1980), self-instruct (e.g., Hughes & Rusch, 1989), and/or self-prompt (e.g., Sowers, Verdi, Bourbeau, & Sheehan, 1985).

Technology. Thirteen experiments used technology to teach participants job skills, including audio prompts (e.g., Lancioni, Campodonico, & Mantini, 1998), video discrimination training (e.g., Mechling & Ortega-Hurndon, 2007), and picture prompts presented on a handheld device (e.g., Cihak, Kessler, & Alberto, 2008).

Comparisons. Eleven experiments compared different instructional techniques to determine if one technique led to improved job skills outcomes compared with another technique (e.g., Browder, Lim, Lin, & Belfiore, 1993).

Combinations. Twelve experiments used a combination of techniques described above, including teaching with self as teacher (e.g., Bates et al., 1980) and teaching or self as teacher paired with technology (e.g., Bennett, Brady, Scott, Dukes, & Frain, 2010).

Participant Demographics

A total of 244 people participated in the studies included in this review. Most (79%) were described as having a severe disability, 10% were described as having a profound disability, and 11% were described as having a severe to profound disability. Thirty percent ($n = 73$) were school age, and nearly two thirds of that group ($n = 44$) were between the ages of 19 and 22. The largest group ($n = 79$) included young adults in the decade after school (i.e., ages 23–32). Half ($n = 121$) were men, 25% were women, and 25% were not identified by gender.

Experimental Designs

The majority ($n = 72$) of experiments were conducted using single-subject designs. Multiple baseline designs ($n = 40$) accounted for over half of the studies. AB ($n = 6$), alternating treatments ($n = 5$), changing criterion ($n = 4$), multi-element ($n = 4$), reversal ($n = 12$), and group designs ($n = 3$) were represented in much smaller numbers.

Settings by Decade

The locations of the interventions were categorized as classrooms (any location in a K–12 school building), community (businesses in the community), workshop settings, or not given. The largest group—26 studies containing 33 experiments—was conducted in the workshop setting, followed closely by the community setting. Five articles did not

explicitly report their setting. The classroom setting was the least common setting, reported in only 13% of articles.

Job Type by Employment Setting

We identified seven different job task categories including packaging ($n = 9$), assembling ($n = 20$), clerical work ($n = 13$), domestic and janitorial work ($n = 13$), restaurant work ($n = 9$), miscellaneous community jobs ($n = 5$; for example, pet grooming), and job support skills ($n = 11$; for example, requesting assistance). These categories were implemented across three settings: community ($n = 28$), classroom ($n = 11$), and workshop ($n = 36$). Four studies did not report a setting.

Effects

Independent success estimates are provided in Table 1. For studies that used an alternating treatment design (e.g., Browder et al., 1993), the independent intervention success estimates are reported on the first two lines, and the success estimate of the separation of the data paths is provided on the third line. The authors reported positive results for 71 of 75 experiments. Of the 58 studies we visually analyzed, success estimates ranged from 0% to 100%. Thirty-two studies demonstrated an experimental effect with every available opportunity. Eighteen had one or more estimates lower than 80%. In each of these, the authors reported positive results. Of the 15 generalization phases, all had success estimates at 100%, with one exception (Steed & Lutzker, 1997), which had a success estimate of 83%. Authors reported mixed or negative results in four studies, but only one (Agran, Salzberg, & Stowitschek, 1987) provided data appropriate for individual visual analysis (success estimate = 75%, 3 out of 4).

Generalization and Maintenance

Fifteen (20%) experiments included a measure of generalization, with one examining generalization to another person, five examining generalization to another setting, and nine examining generalization to another stimulus. All participants successfully generalized their performance. Twenty-six (35%) studies included a measure of maintenance, seven (9%) included a follow-up measure, and the majority of studies reported positive skill maintenance.

Discussion

The purpose of this review was to summarize and analyze the literature on teaching vocational skills to individuals with significant disabilities. We found that studies published since the late 1960s have successfully taught participants with significant disabilities to assemble, package,

clean, do office tasks, complete various community-specific jobs, and learn to self-manage their own vocational performance across segregated and community employment settings. In the remainder of the discussion, we will address each of our research questions as well as provide possible directions for future research.

Participant Demographics

There were some ambiguities in authors' descriptions of participants, with both age and gender not being specified for a significant portion of the included participants. Of those whose gender was identified, there was a clear bias toward men. However, given that 61 participants (25% of the total) were unidentified, it is possible that the bias was much more severe or that the two genders were relatively equally represented. Of the 61 undesignated individuals, 51 were included in a single study (Irvin & Bellamy, 1977). Without more specific information on gender and more balanced groups of men and women, it is difficult to claim that findings in the literature are generalizable across the overall population.

Examining the participants included, there was also a clear bias toward participants with severe, rather than profound, disabilities. Given the greater degree of impairment that individuals with profound disabilities face, a more balanced effort should be put into identifying interventions that are effective and efficient at teaching these individuals. Given that individuals with more significant disabilities are more likely to be placed in sheltered workshops or day habilitation centers, it is essential that future research explore methods for teaching vocational skills to individuals with profound disabilities. In addition, with the move away from sheltered workshops, if research with this population is not conducted, it is likely that efforts to find employment for those with the most significant disabilities may not be taken or will be unsuccessful. The result would be the continued poor employment outcomes for this group.

Little of the included literature focused on early transition planning, when the IEP process requires that transition planning be addressed for all students with disabilities (IDEA, 2004). Rather, participants in these studies were more likely to be provided vocational rehabilitation (VR) services. Given the legal requirement, greater efforts should be put in toward verifying evidence-based practices appropriate for this younger population. If efforts are made during the transition from school to adult life to prepare students with significant disabilities for employment, there is a distinct possibility that their long-term employment outcomes would be enhanced and pressures placed on VR services lessened. Moreover, if school personnel collaborated with VR counselors while students are still covered under IDEA, the transition of services from one entity to the next would become more streamlined.

One program that has provided services to youth with the most significant disabilities in high school is Project SEARCH, which provides work experiences in the last year of high school. Unfortunately, there has been relatively little research done on Project SEARCH (e.g., Wehman et al., 2013), and none of the published research is experimental, so it is unclear whether the students being served do indeed have the most significant disabilities, how collaboration between school and VR staff is conducted and maintained, and what the long-term outcomes are for students who participate in Project SEARCH. No studies in this review examined an employment-training model for students with significant disabilities. Research on this and other models is needed to determine where enhancements can be made in providing vocational training to students while they are served under IDEA.

What, Where, and How Are Vocational Skills Being Taught?

There was a bias toward studies being conducted in the workshop setting, with 42% of studies (26 out of 62) taking place there. There was a corresponding bias toward jobs that are commonly completed in workshop settings (i.e., packaging and assembly). Although the specific vocational skills taught ranged considerably, the traditional workshop tasks of assembly and packaging accounted for 36% (29 out of 80) of the total skills taught. Assembly was the most commonly taught skill across all settings. There was also a clear correlation between the participants' disability status and the workshop setting. Of participants who were labeled as having a profound or severe-to-profound disability, 62% participated in studies set in an institution or a sheltered workshop. An additional 25% of participants with profound or severe-to-profound disabilities participated in studies where the setting was not provided, leaving only 13% of studies with those participants happening in classrooms or the community. Future research should address the clear gap in the literature of supporting individuals with the most profound needs in inclusive, community-based employment. If this work is not undertaken, as workshops are closed statute (<http://www.justice.gov/opa/pr/department-justice-reaches-landmark-americans-disabilities-act-settlement-agreement-rhode>), one likely outcome for individuals with the most significant disabilities may be that they no longer engage in vocational activities but rather participate only in day habilitation programs or simply remain at home.

Examining the literature focused on community employment, 38% of studies (24 out of 62) took place in a community setting. The skills taught varied more for this setting than any other, with at least one study targeting a skill in each skill category. The two most commonly taught skills in the community were clerical and restaurant work. The latter covered a wider range of tasks, including preparing food to

be cooked or served and other food service tasks such as washing dishes, refilling salt and pepper shakers, and lining trays. These studies support that, given an appropriate intervention, individuals with significant disabilities can be successful in community employment. Future research in this area could include studying the process for building relationships with local businesses as well as how to provide sufficient supports to both the community work site and the individuals with significant disabilities.

Only 13% of studies (8 out of 62) were conducted in a classroom setting. This is most likely due to the fact that 70% of the total participants were above the age of 22. Assembly and janitorial work were the two most commonly taught skills in the classroom, and none of the studies set in the classroom targeted job support skills, such as requesting assistance. This is surprising, as it seems logical that generic support skills (e.g., problem-solving common complications, requesting assistance from a supervisor) would be ideal to introduce early in a student's transition. Then, as the student progresses through school, more effort could be put into generalizing those skills across novel tasks and environments as well as creating robust, well-maintained behaviors through repeated practice. Job support skills are also essential in helping students adapt to the diverse and unpredictable nature of working in the community. For example, if a student is unable to ask for assistance from their coworkers, they may be unsuccessful in that job. Therefore, future research should target teaching vocational skills to 14- to 22-year-olds who are still receiving support under IDEA.

Examining how various skills were taught across several different environments, a variety of intervention types were used; however, interventions mostly relied on behavior analytic techniques. Traditional teaching methods (e.g., prompting, reinforcement) and training the participant how to self-manage were the most common interventions. Few studies compared established interventions. As the literature continues to identify evidence-based practices that are effective for teaching vocational skills, future researchers should conduct more detailed analyses (e.g., intervention efficiency, preference) to identify the most appropriate interventions in various contexts. Specifically, researchers should focus on analyzing which components of interventions are the most effective, as well as compare more interventions.

Likewise, surprisingly few studies examined using assistive technology as a primary intervention component (e.g., Mechling & Ortega-Hurndon, 2007). Given that the goals of assistive technology are to foster greater independence and provide accommodations for individuals to participate in more inclusive settings, technology is a good match to the current policy initiatives of increasing access to competitive community employment. Indeed, 7 of the 15 studies conducted with individuals with significant disabilities since 2000 used technology as the primary intervention.

Future research should continue to explore how technology can be used to enhance employment outcomes for individuals with significant disabilities, as well as how it can be used to decrease the amount of support needed from VR service providers.

The most important and disheartening finding of this review is that the overall number of studies focused on vocational training for this population has diminished significantly over time. Studies included in this review were published between 1969 and 2014, yet the majority of articles (41 out of 62) were published between 1980 and 1999. In fact, only 15 studies have been published in the last 14 years. Research on vocational skill acquisition with individuals with significant disabilities is quickly losing steam, when it should be gaining momentum. This may be due to greater focus on students with milder disabilities, the practical challenges of working in applied settings, or popular sentiment shifting away from sheltered workshop settings, where the majority of this research was conducted. It may also be that the funding stream and legislation focused on supported employment that was present in the 1980s and early 1990s are no longer providing financial support for this type of research. Regardless, this concerning trend in the research goes directly against current policy. The stated goals of the laws supporting individuals with disabilities are to promote competitive, community-based employment regardless of severity of needs (<http://www.dol.gov/odep/topics/employmentFirst.htm>). Unfortunately, current research on teaching job skills to individuals with significant disabilities is simply not keeping pace with the expectations of modern society. To remain relevant to this community, researchers need to concentrate considerably more effort on this topic.

Intervention Effects and Outcomes

In this review, we reported both the author's outcome report (i.e., positive, negative, or mixed) and calculated success estimates where possible. We considered there to be agreement between the author's report and the success estimate if the authors reported a positive outcome, and the success estimate was 80% or greater. When a success estimate could be calculated, we found that 72% ($n = 54$) of the authors' reports agreed with the success estimate. Of the 21 disagreements, only 3 occurred after 1992 (Lattimore et al., 2006; Lee, Belfiore, & Toro-Zambrana, 2001; Reichle et al., 2005), with most disagreements occurring in the 1980s.

Of the 75 experiments, only 2 reported mixed results (Mace, Shapiro, West, Campbell, & Altman, 1986; Mank & Horner, 1987) and 2 reported negative results (Gaylord-Ross, Forte, & Gaylord-Ross, 1986; Toro-Zambrana, Lee, & Belfiore, 1999). Moreover, given the relatively high level of agreement between the author report and the success estimates, it can be argued that there is a substantial body of evidence supporting the teaching of employment skills to

individuals with significant disabilities. Given that the majority of the studies included in this review utilized single-subject research designs, it is important that future researchers replicate these findings to enhance their generalizability. It is unfortunate, given the clear evidence that this population of people can learn to engage in vocational activities, that the number of studies targeting vocational skills in individuals with significant disabilities has been steadily decreasing.

Potentially more distressing is the lack of emphasis in this body of literature on the maintenance and generalization of the target skills. Only 20% ($n = 15$) of the included experiments assessed for generalization, 35% ($n = 26$) assessed for maintenance, and 9% ($n = 7$) included follow-up measures. Given that one might argue that a study targeting the instruction of employment skills is only really effective if the participants maintain the acquired skills over time in a community-based employment setting, it is clear that researchers must focus their attention in this area. Given the outcomes reported in the NLTS-2 (2009), it appears that even though individuals with significant disabilities can be taught vocational skills, they are not overwhelmingly successful at getting and keeping permanent, community-based employment.

The ultimate goal of any intervention targeting employment skills for individuals with significant disabilities is that the participants are gainfully employed and that they maintain that employment. It is surprising, then, that only four studies (Gaylord-Ross et al., 1986; Hughes & Rusch, 1989; Wacker & Berg, 1983; Wilson, Schepis, & Mason-Main, 1987) indicated whether their participants acquired and/or maintained gainful employment, though 58% of the included studies discussed long-term outcomes and noted that long-term positive outcomes were essential for individuals with significant disabilities with respect to employment. Future researchers should examine methods that go beyond simply teaching vocational skills. For example, researchers should explore ways to increase the long-term employment outcomes for individuals with significant disabilities in community settings. This will require researchers to examine the effects of interventions in community settings over longer periods of time.

Conclusion

Although the findings of this review indicate that a number of interventions have been used to successfully teach individuals with significant disabilities a variety of vocational skills, there is no clear indication that one intervention exists that is the most effective for promoting job skills. We also found that there is limited research supporting the long-term outcomes in employment, particularly community-based employment. Moreover, this review found that the amount of research focused on this much needed area has

been diminishing, even as policy initiatives are pushing for changes in outcomes for people with significant disabilities. Researchers must refocus their attention on vocational training with people with significant disabilities, especially during the transition planning process (ages 14–22) and in community settings. Without renewed focus, it is unlikely that employment outcomes for individuals with significant disabilities will improve in the near future.

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