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ENHANCING JOB-SITE TRAINING OF SUPPORTED WORKERS WITH AUTISM: A REEMPHASIS ON SIMULATION

L. PERRY LATTIMORE AND MARSHA B. PARSONS

J. IVERSON RIDDLE DEVELOPMENTAL CENTER

AND

DENNIS H. REID

CAROLINA BEHAVIOR ANALYSIS AND SUPPORT CENTER

Currently recommended practice in supported work emphasizes training job skills to workers with severe disabilities while on the job. Early behavioral research indicated that skills needed in natural environments could also be trained in simulated settings. We compared job-site plus simulation training for teaching job skills to supported workers with autism to provision of training exclusively on the job. Job-site training occurred in a small publishing company during the regular work routine, and simulation training occurred in an adult education site for people with severe disabilities. Two pairs of workers received training on two job skills; one skill was trained at the job site and the other was trained using job-site plus simulation training. Results indicated that for 3 of the 4 comparisons, job-site plus simulation training resulted in a higher level of skill or more rapid skill acquisition than did job-site-only training. Results suggested that job-site training, the assumed best practice for teaching vocational skills, is likely to be more effective if supplemented with simulation training. Directions for future research include expanding applications of behavioral technologies to other aspects of the current support paradigm.

DESCRIPTORS: supported work, simulation training, autism

Recommended practice regarding vocational endeavors for adults with severe disabilities currently emphasizes supported work placements in community jobs. The benefits of supported work in real jobs relative to sheltered work and prevocational programs have been noted previously (Olney & Kennedy, 2001; Rusch & Hughes, 1989). Despite the recognized advantages of supported work, most adults with severe disabilities (e.g., severe or profound cognitive disabilities and autism) have not benefited from the supported work movement (West, Revell, & Wehman, 1998). Persons with severe disabilities represent at most 10% of workers in supported employment (Mank, Cioffi, & Yovanoff, 1998); the majority of this population work in sheltered settings (Johnson, McGrew, Bloomberg, Bruininks, & Lin, 1997; West et al., 2002).

The difficulties encountered by adults with severe disabilities in supported work have resulted in calls to examine more effective ways of providing workplace supports for these potential workers (Hood, Test, Spooner, & Steele, 1996; Kregel, 1995). One area in which research seems warranted pertains to how workers with severe disabilities are trained to perform job duties. These individuals usually require intense training in relevant work skills (Wehman & Parent, 1996), which can be an obstacle to their supported work success (Hood et al.).

Current training efforts in supported work focus on job-site training in which workers receive instruction while on the job (Inge, Dymond, & Wehman, 1996). Job-site training coincides with the general support movement in developmental disabilities that espouses training adults in natural community environments in contrast to segregated, readiness-type settings

Requests for reprints should be addressed to Dennis H. Reid, Carolina Behavior Analysis and Support Center, P.O. Box 425, Morganton North Carolina 28680.

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(Thompson et al., 2004, chap. 1). The focus on job-site training also exists due to well-discussed failures of these ''train-and-place'' models that recommend training job skills in nonwork environments prior to placing individuals in real jobs (Langford & Lawson, 1994; Wehman, Brooke, & Inge, 2001). Job-site training is likewise recommended because of the difficulties individuals with severe disabilities experience in generalizing skills acquired in nonwork settings to actual job sites (Inge et al.).

Although the current focus on job-site training has widespread professional acceptance and is philosophically aligned with the overall support paradigm, this approach may warrant scrutiny when considering the relative lack of success of adults with severe disabilities in supported work. How training is provided should be considered in light of the part-time nature of most supported work placements for workers with severe disabilities (Conley, 2003). Due to the part-time basis of many job placements, there is often insufficient time to adequately train workers in relevant work skills while on the job (Flynn, Wacker, Berg, Green, & Hurd, 1991).

Prior to the emphasis on supported work, a considerable amount of behavioral research focused on training community survival skills to people with disabilities in simulated situations. Classrooms were rearranged to simulate various community settings such as a fast food restaurant (van den Pol et al., 1981) or city streets (Neef, Iwata, & Page, 1978; Page, Iwata, & Neef, 1976). These simulated settings incorporated stimuli found in the community to foster response generalization (e.g., a simulated ordering counter, models of streets with movable cars, pictures of street-crossing signals). Instruction then occurred in the classrooms along with probes in community settings to assess and ensure generalization. This research resulted in an effective technology for teaching useful skills to people with severe disabilities and for promoting generalization (see Repp, Favell, & Munk, 1996, for an evaluative summary).

Simulation-based teaching technology is commonly recommended for students with severe disabilities (e.g., Cihak, Alberto, Kessler, & Taber, 2004) but appears to have been ignored for training adults in supported work. Some support for the simulation approach in work situations stems from an investigation on reducing job-coach assistance given to supported workers with multiple disabilities by providing instruction and work-material adaptations when the workers were not on the job (Parsons, Reid, Green, & Browning, 2001). However, the impact of simulated instruction per se could not be determined because the program included making tasks easier through material adaptations to accommodate physical disabilities (over 90% of the task steps were altered through material modifications) that were then transferred to the work site. Also, systematic instruction was not provided at the job site prior to or during the off-site changes, so that the changes could not be compared to training provided on the job.

The behavior-analytic research on simulation teaching implies that it may be an effective procedure to supplement job-site training for adults in supported work. Providing instruction in a simulated setting could allow additional instructional trials on new work tasks that cannot be easily provided at work because instructional time spent with new tasks on the job can interfere with completion of existing duties. The part-time nature of job placements likewise imposes difficulties in arranging sufficient time for on-the-job instruction for new skills. The purpose of this investigation was to compare the effects of job-site training supplemented with simulation training to the effects of job-site training alone on the acquisition of new job skills among supported workers with autism.

METHOD

Settings and Participants

The job site was a small publishing company in which the 4 participants (supported workers)

were employed on a part-time basis. Work duties involved clerical tasks and office cleaning. The simulation training setting was an adult education program on the grounds of a residential campus for persons with developmental disabilities. The supported workers attended the adult education program on weekdays when not at work at the publishing company. In this program they received other educational services. The simulation training occurred in a classroom and adjacent areas (e.g., a meeting room) in the main education building on the campus. Intervention procedures were carried out by the job coach (first author) who routinely worked with the supported workers. The job coach had 9 years of experience working with adults with severe disabilities in community jobs.

Each supported worker had been diagnosed with autism and severe or profound mental retardation on at least two independent evaluations, and each was nonvocal. Mr. Mack (29 years old) also had a diagnosis of Fragile X syndrome. Mr. Mack, Mr. Jones (30 years old), and Mr. Russ (32 years old) responded to simple vocal directions accompanied by manual signs and gestures. Mr. Gray (40 years old), who had a severe hearing loss, responded to simple gestures and a small number of manual signs. Each worker's expressive communication primarily involved pointing to or leading support personnel to desired objects, although Mr. Gray also used a small number of manual signs. All workers displayed stereotypic behavior such as rocking and body rubbing. All workers also had histories of challenging behavior such as aggression, property destruction, and self-injury, although such behavior occurred infrequently while they were at work. These individuals were selected for the investigation because they all worked part time in the same company. In addition, the workers were about to begin new job tasks at the company as requested by the company manager.

Response Definitions, Observation, and Interobserver Agreement

Each supported worker received training on two tasks during the study. Mr. Gray and Mr. Mack were trained to prepare envelopes for mailing books (e.g., stamping a return address on the envelope, stuff a book and advertising fliers into the envelope, stamping a "media rate" insignia on the envelope) and to empty trash cans (e.g., closing the can liner with trash inside, removing the liner, taking the trash to an outdoor trash can). Mr. Jones and Mr. Russ were trained to prepare packing paper (e.g., shredding paper, packaging the shredded paper into a small plastic bag, sealing off the bag once full) and prepare envelopes for mailing books. Each of these tasks was task analyzed. The envelope preparation, trash emptying, and packing tasks consisted of 18, 19, and 18 steps, respectively. The dependent measure was percentage of task steps performed independently. To be scored as performed independently, a task step had to be completed by the worker without a preceding prompt (vocal, gestural, or physical) that directed the worker to complete the designated step, and had to be completed correctly (as written in the task analysis).

Each worker was observed individually during observation probes as he worked on an assigned task, and each task-analyzed step was recorded as being completed independently or with job-coach assistance. A probe was initiated by placing the materials needed to begin a task in the worker's view or escorting the worker to work materials (for emptying trash cans). The job coach then gave the worker a general vocal cue ("work") or, for Mr. Gray, gave the sign for "work." The general cue to begin work was not considered a prompt to perform a specific step for recording purposes. If after 10 s the worker did not respond by correctly initiating the first step of the task analysis, the job coach completed the step out of view of the worker so that the materials would be ready for the worker to initiate the second step of the task

analysis (cf. Snell, Lewis, & Houghton, 1989). This process involved the job coach taking the materials necessary to complete the step, turning his back to the worker so that the worker could not see the job coach's actions, completing the step with the materials, and then replacing the materials in front of the worker. If the worker made a response other than correctly completing the first step in the task analysis, the job coach interrupted the response and completed the step out of the worker's view. Each time the job coach completed a step for the worker, the job coach then repeated the general cue to work so that the worker had the opportunity to complete the next step in the task analysis. If a worker completed a step independently, the job coach did not interact with the worker and let the worker continue proceeding through the routine. The process continued until the task was completed. Hence, during each probe, a worker had an opportunity to complete each step in the task analysis once; if the worker did not complete the step independently, the job coach completed the step. Following a probe on a new target task, the worker returned to his routine job assignment with another job coach in a different area of the company. A maximum of two probes occurred on any workday per new task for each worker.

Interobserver agreement data were recorded on 30% of all probes at the work site for each worker with each task and each experimental condition. Interobserver agreement for independently completed steps was determined on a step-by-step basis and was calculated by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100%. An agreement was scored only if both observers recorded the occurrence of a correctly completed step or both observers recorded the nonoccurrence of a correctly completed step. Overall agreement for independently completed task steps averaged 97% (range, 88% to 100%) across participants, occurrence agreement averaged 90% (range, 0% to 100%), and nonoccurrence agreement averaged 89% (range, 0% to 100%). The low range for both occurrence and nonoccurrence was due to one observation in which there was a single disagreement.

Experimental Conditions

Baseline. During baseline the workers followed their usual work schedules. They worked for approximately 1.5 hr per workday. Mr. Mack and Mr. Gray worked 2 mornings per week, and Mr. Jones and Mr. Russ worked 1 morning per week at the publishing company. During the regular work time, probes were conducted on the new tasks assigned to each worker as described earlier. When not participating in a probe session, the other workers worked on other tasks with another job coach, which involved tasks that the workers had been performing for at least 3 years prior to the study (primarily putting tabs and labels on advertising fliers and collating manual pages).

Job-site training. Job-site training sessions occurred during a worker's routine work hours and were conducted by the same job coach who conducted the performance probes. Initially, job-site training sessions required approximately 15 min to complete, with the time decreasing slightly as the worker became more proficient with the target task. This amount of daily training time represented the general amount of time allotted to training a new work skill to a supported worker such that sufficient time was available for completing other existing work duties at the company. No more than one job-site training session was conducted for a given worker per workday at the publishing company. Job-site training sessions were conducted each day a worker was at the company. When a worker was not receiving job-site training on a target task, he followed the usual work routine with another job coach and existing work tasks.

Following the first training session in this condition, each subsequent session began with a probe conducted as in baseline. No additional

probes were conducted until the worker reported to work the next workday and was about to begin a job-site training session. Following the probe, each training session consisted of three training trials. At the onset of training, the job coach positioned himself close to the worker to provide physical guidance. The materials needed to begin the task were placed in the worker's view, and the worker was given a cue to begin work. If the worker did not initiate a given step in the task analysis within 10 s of the general cue to work or began to make an error on any step, the job coach physically guided the worker through completion of the step. Physical guidance involved the job coach placing his hands on the worker's hands and moving the worker's hands through the movements necessary to complete the step (cf. MacDuff, Krantz, & McClannahan, 1993). As the worker became more proficient (i.e., began to correctly complete a step without any physical assistance by the coach), full physical guidance was reduced to partial physical guidance and then to shadowing (MacDuff et al.). Partial physical guidance involved the job coach placing his hands on the worker's arms or elbows such that some but not all of the worker's movements necessary to complete the step could be guided by the job coach. Shadowing involved the job coach keeping his hands within approximately 9 cm of the worker's arms throughout the worker's movements. Partial physical guidance and shadowing were conducted in a manner that allowed the job coach to immediately interrupt a worker's incorrect action and prevent any step from being completed incorrectly. Interruption occurred as soon as a worker made an incorrect movement associated with a task step, such as picking up the return-address stamp upside down. The physical guidance and shadowing were faded to vocal and gestural prompts as the worker continued to become more proficient (e.g., after a worker completed a step with shadowing and no physical prompting, the job coach discontinued the shadowing on the next trial and provided only vocal or gestural prompts if the worker began to make an error). However, if incorrect actions continued after a vocal or gestural prompt, the job coach then interrupted the worker's movements and provided a physical prompt. Prevention of errors was considered critical to minimize incorrect performance and material waste when work products would be considered unusable (e.g., putting a return address stamp upside down on a book mailing envelope). A total task procedure (Cooper, Heron, & Heward, 1987, chap. 15) was used in which training occurred on each subsequent step in the task analysis during each training session in the manner just described. Praise was provided either vocally or with signing for approximately every fourth step completed correctly and occasionally for attempts to complete steps.

The goal for job-site training was that a respective worker would complete at least 80% of the steps of the job task analysis independently on at least two consecutive probes. The 80% independence criterion had been previously established as an acceptable performance level for workers who attended work with the support of a job coach.

Job-site plus simulation training. In this condition, job-site training occurred in an identical manner as that just described, with the addition of simulation training at the adult education site. In an attempt to maintain consistency, the same job coach who conducted job-site training also conducted all in simulation training. To enhance generalization from the simulation site to the job site, the simulation training sessions were designed to build in stimuli common with the job site (Stokes & Baer, 1977). Specifically, the same trainer from the job-site sessions conducted the simulation sessions using the same teaching procedures. In addition, task materials used at the job site were taken to the adult education building to use in the simulation training sessions. When task

materials could not be easily transported to the simulation site (e.g., various trash cans from the publishing company offices), materials were used that were as similar to the job-site materials as possible. Hence, except for the different physical location, minor material variations, and time of day, the simulation training sessions occurred in the same manner as the job-site training sessions (one other exception was that no probes were conducted at the beginning of each simulation training session). Simulation training sessions occurred once or twice each weekday, including on the afternoons of days on which a worker worked at the publishing company in the morning, unless previously scheduled activities at the adult education program that interfered with a training session could not be canceled or rescheduled (average of six simulation training sessions per week per supported worker, range of four to nine per week, throughout this condition). Job-site plus simulation training continued until the worker completed at least 80% of the task steps independently during at least two consecutive probes that were conducted at the beginning of each job-site training session that occurred in conjunction with the simulation training.

Routine job. When a worker completed at least 80% of a given job's steps independently on two probes (i.e., was considered trained), the worker then began performing that task as part of the regular job routine. A company supervisor made periodic checks of the quality of the completed work as part of the usual work routine to ensure that the work products were usable. Throughout the investigation, the company deemed usable all work products completed by a supported worker when working at the 80% criterion during the daily work routine.

Experimental Design

Effects of job-site training and job-site plus simulation training relative to baseline were evaluated using a multiple probe design across work tasks and supported workers. To compare the relative effects of the two teaching approaches, the following procedures were used. First, the 2 supported workers who worked 2 days per week (Mr. Gray and Mr. Mack) were paired together, and the 2 workers who worked 1 day per week (Mr. Jones and Mr. Russ) were paired together. Baseline probes were then initiated for the two work tasks for each of the 4 workers. Next, for Mr. Gray and Mr. Mack, one task was arbitrarily selected and Mr. Gray received job-site plus simulation training on that task while Mr. Mack received job-site training on the same task. Baseline continued for the other task; subsequently, Mr. Gray received job-site training on the second task while Mr. Mack received job-site plus simulation training on the second task. The other pair of workers, Mr. Jones and Mr. Russ, remained in baseline during the intervention phases for Mr. Gray and Mr. Mack, and then received the same sequence of interventions. Hence, for each pair of workers, one worker received job-site plus simulation training on one work task and job-site training on another task. However, the tasks for which each worker received the two training interventions were counterbalanced across the 2 workers of each pair. Following criterion performance during training, probes were then initiated during the routine job.

RESULTS

Effects of the job-site training and job-site plus simulation training on independent step completion during probes at the publishing company are shown in Figure 1 for the pair of supported workers who worked 2 days per week (Mr. Gray and Mr. Mack) and in Figure 2 for the pair who worked 1 day per week (Mr. Russ and Mr. Jones). Three of the four comparisons (total of two comparisons for each pair of workers) between the two training approaches revealed either a higher level of task performance or more rapid progress for the worker who received job-site plus simulation training. The most consistent difference was found in the

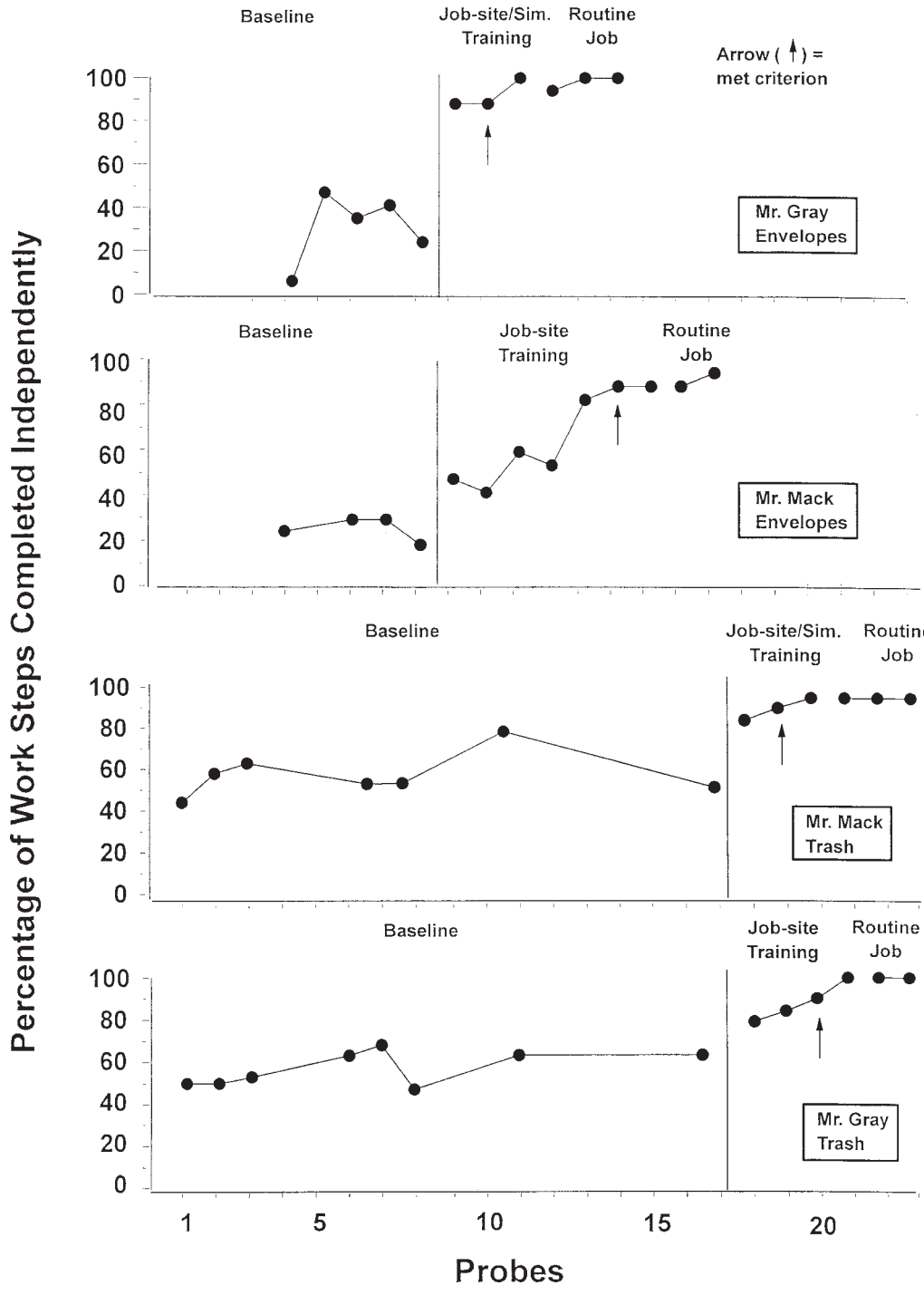

Figure 1. Percentage of work steps completed independently by each worker during each probe during each experimental condition for each work task (both workers worked 2 days per week). The arrows indicate when a worker met training criterion.

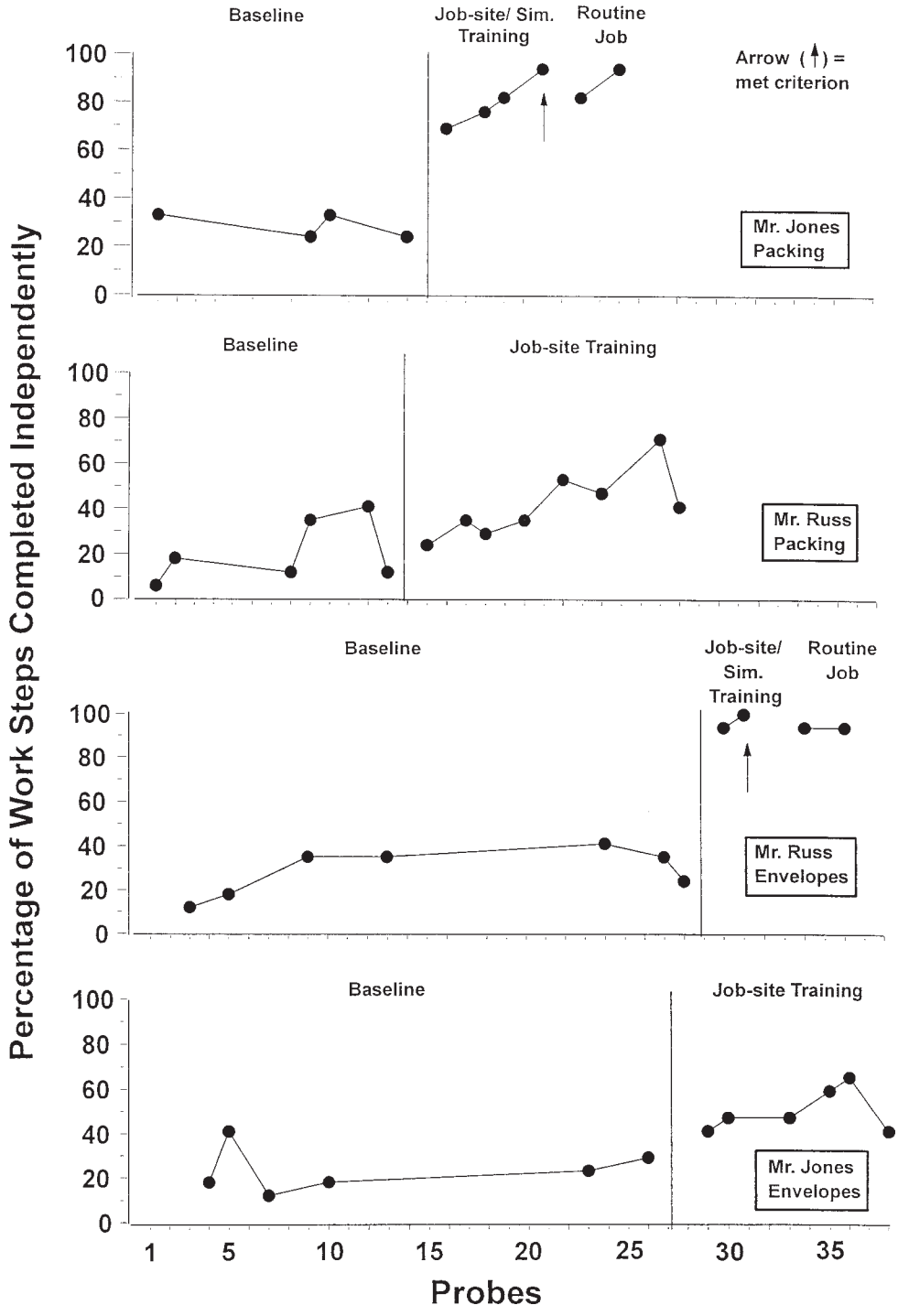

Figure 2. Percentage of work steps completed independently by each worker during each probe during each experimental condition for each work task (both workers worked 1 day per week). The arrows indicate when a worker met training criterion.

envelope-preparation task. Envelope preparation was consistently low during baseline for all 4 workers. However, the worker from each pair who received job-site plus simulation training (Mr. Gray and Mr. Russ) showed immediate improvement and met the 80% training criterion in a maximum of three probes. In contrast, for the workers who received job-site-only training, Mr. Mack required six probes to meet criterion and Mr. Jones never met criterion (across six probes of job-site-only training). Once the workers met the training criterion, their performance during probes as part of the regular job routine was always above criterion (averaging at least 88% independently completed steps for each worker).

Differences between job-site and job-site plus simulation training are also apparent with the packing task for the 2 workers who worked 1 day per week (Figure 2). During baseline neither worker showed progress. When job-site plus simulation training was provided for Mr. Jones on the packing task, he met criterion in four probes, whereas Mr. Russ never met criterion during job-site-only training across eight probes. Subsequent to job-site plus simulation training, Mr. Jones continued to perform above criterion during the probes conducted during the regular job routine.

In contrast to the envelope-preparation and packing tasks, there was little difference between job-site training and job-site plus simulation training with the trash-removal task for the workers who worked 2 days per week and received training on that task (Figure 1). Although neither worker showed consistent progress during baseline with the trash-removal task, both workers completed more steps of that task independently during baseline (averages of 57% and 58% and ranges of 47% to 68% and 44% to 79%) relative to the baseline levels for the other two work tasks. Both Mr. Gray and Mr. Mack made progress during subsequent training and met the 80% criterion. Mr. Mack met criterion in the job-site plus simulation training condition in two probes, whereas Mr. Gray met criterion in three probes in the job-site-only training condition. Both workers performed above criterion during the routine job probes following training.

DISCUSSION

Results suggested that the adults with autism tended to acquire work skills in a community job more quickly when job-site training was supplemented with simulation training relative to exclusive reliance on job-site training. Across three of the four applications of the two training approaches, the supported worker who received job-site plus simulation training made progress and met the performance criterion more quickly than the worker who received training only while on the job. Once the training criterion was met, all workers performed their tasks above criterion levels during subsequent routine job duties. The fourth application of the two training approaches (trash-removal task with the pair of workers who worked 2 days per week) was accompanied by minimal, if any, differences in progress.

The relative effectiveness of job-site plus simulation training was more pronounced for the 2 workers who worked only 1 morning per week. They met criterion on the tasks trained on-site and in simulation within 4 and 2 work weeks, but never met criterion with job-site-only training across 6 and 8 weeks. Simulation training may have produced criterion-level performance of these tasks but was not provided with the latter skills because the acquired skills of the workers who had met criterion were sufficient to complete the targeted tasks at a quantity desired by the employing company. Based on the premise that a difficulty with most supported jobs of workers with severe disabilities is that the part-time aspect of employment can provide insufficient opportunities to learn work skills on the job (Flynn et al., 1991), it seems logical that the 2 workers who worked once per week would have more difficulty with

job-site-only training than the 2 workers who worked twice per week. The social significance of the differences in the two training approaches is less clear with the latter 2 workers, who met criterion only 0.5 and 2 weeks faster with job-site plus simulation training. The latter results suggest that job-site plus simulation training was more effective than job-site-only training with only 1 of these workers. However, the significance of the differences may be heightened when considering the importance of performance during initial employment on overall job success (Kregel, 1995). It seems likely that the more quickly a worker acquires a job skill, the more successful the worker will be during initial weeks of employment.

The current focus on job-site training in supported work is due in large part to well-recognized problems with the more traditional train-and-place approach. Our investigation should not be interpreted as a call to reevaluate the train-and-place approach. Rather, results suggest that the current place-and-train approach espoused in the supported work field can be enhanced if it is supplemented with training in other locations when workers are not at work. Specifically, when a community job is obtained for an adult with autism, learning new work skills may be expedited if training is provided both on and off the job.

It should also be noted that the simulated nature of training might not have been as relevant to enhanced skill acquisition as simply receiving more training trials. That is, amount of instruction time was not controlled for when the workers received simulation training plus job-site training; these workers received more instructional time than they did during job-site-only training. If more instructional trials were provided on the job, the workers may have acquired the skills more quickly during job-site training. However, providing additional training on the job can be problematic. In supported work, a limited amount of time can be directed to training new skills relative to time spent on existing duties. If completion of existing duties is deterred due to time spent training new skills, there are at least two possible undesired outcomes. First, job coaches perform duties that supported workers are expected (and paid) to perform (Parsons et al., 2001), defeating the purpose of obtaining community jobs for adults with disabilities. Second, job duties are not completed, which jeopardizes employment. In contrast, providing additional training trials when workers are not at work does not interfere with job duties. Nevertheless, future research should evaluate the relative contributions of simulation training per se (i.e., away from the work site) and simply receiving more instructional trials on the job when possible.

As implied above, the results seem to be expected; more training (i.e., job-site plus simulation training) should result in more rapid skill acquisition than less training (job-site-only training). Nonetheless, descriptions of recommended practice in supported work repeatedly emphasize job-site training, with essentially no recommendation of simulation training (for summaries, see Gaylord-Ross, Salzberg, Curl, & Storey, 1991; Wehman & Parent, 1996). The contribution of this investigation is not in the development of a new or refined technology per se, but in reemphasizing the importance of a previously developed technology (behavioral simulation training) within a currently valued venue (supported work in community jobs).

Results suggest that continued research on simulation training is warranted with supported work. Investigations could examine the relative amounts of simulation and on-the-job training that are most effective. In this regard, we did not evaluate exclusive use of simulation training. In light of success of other behavioral research on simulation training of community skills and promotion of generalization to community settings, it may be that new skills could be trained exclusively in simulation once the skills are initially identified. The workers may then be proficient in the skills when their

job duties are expanded to include the new skills on the job (provided simulation training is adequately provided with components to enhance generalization to the work site). Additional research is also needed to examine the benefits of job-site plus simulation training with other workers with autism as well as workers who have disabilities other than autism, and with other types of jobs. Some jobs may not lend themselves to simulation training due to difficulty in simulating job duties away from the work site.

In essence, the supported work movement coincides with the overall support paradigm in developmental disabilities that espouses placing people with severe disabilities in natural environments and providing whatever supports are needed to promote success in those environments (Thompson et al., 2004). However, there is not always an underlying scientific basis to substantiate the effectiveness of recommended supports (cf. Banks & Renzaglia, 1993). Expanded application of technologies developed through behavior-analytic research seems to represent one means of incorporating procedures with empirically substantiated effectiveness within the overall support process.

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