

# The Effects of Covert Audio Coaching on the Job Performance of Supported Employees

Focus on Autism and Other  
Developmental Disabilities  
25(3) 173–185  
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sagepub.com/journalsPermissions.nav  
DOI: 10.1177/1088357610371636  
<http://focus.sagepub.com>



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## Abstract

The importance of employment in society is unmistakable, but for many people sustained employment remains elusive. The unemployment rate for individuals with disabilities is staggering, and the consequences of being unemployed affects those individuals, their families, and society. The effects of performance feedback delivered via covert audio coaching on the job performance of supported employees were examined in this investigation. A multiple baseline design across employees and work tasks was used to evaluate the effects of the intervention on work performance. Supported employees made substantial improvements on their work performance, and the improvements maintained for 4 to 5 weeks following the removal of the intervention. The results have implications for the use of covert audio coaching in employment and other settings.

## Keywords

supported employment, covert audio coaching, work performance, applied behavior analysis, intellectual disabilities

Employment is highly valued in our society, a contributing variable for a positive self-concept, and a major factor in how people are perceived by others (Berger, 2006; Wehman, Brooke, & West, 2006). People benefit from work by gaining greater independence, better financial standing, and more opportunities for social inclusion and relationship development (Brady & Rosenberg, 2002). For adolescents with disabilities, employment is a decisive factor for a successful transition to adult life (Bullis, Nishioka-Evans, Fredericks, & Davis, 1993). There are benefits of employment to society as well, including the social and economic advantages of high employment rates, a broadened tax base, and a reduced need for individual financial assistance (Johnson, 2004).

Unfortunately, employment remains elusive for many people with disabilities (Brown, Shiraga, & Kessler, 2006; Kennedy & Harris, 2003; Targett, 2006). To gain meaningful postschool employment, many adults with developmental disabilities require instruction and coaching beyond what they receive in high school. Although supported employment models were developed in response to the support needs of people with disabilities in community employment (Brown et al., 2006; Hillier et al., 2007; Keel, Mesibov, & Woods, 1997; Mawhood & Howlin, 1999), there are significant issues that require attention. Employment supports required by some people with disabilities are substantial

(Parsons, Reid, Green, & Browning, 2001), and job coaches historically have provided this function (Rogan, Banks, & Howard, 2000). However, Wehman (2006) noted that research on effective job coaching strategies is minimal and not always encouraging. For instance, job coaches often fail to transfer training responsibilities to supervisors and coworkers, and others fail to fade their presence from the supported employee (Cimera, Rusch, & Heal, 1998; Parsons et al., 2001). Furthermore, some job coaches complete work duties *for* supported employees, which can hinder the efforts of employees to maintain their jobs (Parsons et al., 2001; Parsons, Reid, Green, & Browning, 1999).

The practices of job coaches are critical to successful transitions of supported employees. Coaches play a central role in helping employees learn to perform their jobs to the expectations of their work supervisors. Job coaches also help integrate employees into the workplace culture. In recent years, employment professionals have adopted expectations for evidenced-based job-coaching practices. Effective job-coaching skills in supported employment

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frequently include such basic instructional design and delivery strategies as task analysis, prompting and fading techniques, verbal instruction, and demonstration (Rusch & Hughes, 1989). For example, Martella, Agran, and Marchand-Martella (1992) used prompting, cue cards, reinforcement, and error correction to teach workplace safety skills. Lattimore, Parsons, and Reid (2006) combined simulated work training with contextual training at a local business to teach adults with autism to prepare envelopes, empty trash cans, and prepare packaging paper. Each work skill was task analyzed, and delivery methods included chaining procedures, graduated guidance, spatial fading, verbal prompts, and error correction. Bucholz, Brady, Duffy, Scott, and Kontosh (2008) conducted two studies using literacy-based behavioral interventions to improve employability skills in adults with moderate to severe disabilities. The participants improved their work behaviors after reading short stories that delineated expected work behaviors, with explicit behavioral rehearsals following their personal stories. Finally, interventions that include performance feedback also are emerging as an effective job coaching strategy. For example, Reid, Green, and Parsons (2003) implemented an intervention combining both supportive and corrective feedback with job coaches as targets. Job coaches increased their choice-giving opportunities to employees as a result of the intervention.

### *Covert Audio Coaching as Performance Feedback*

As job coaches and other employment professionals build a body of evidence-based practices for supported employment, it is important to recognize that job-coaching strategies are needed that (a) build new work skills, (b) facilitate the maintenance of skills, and (c) increase work productivity and accuracy. Furthermore, Rogan, Luecking, and Grossi (2007) recommended that training and support be delivered as discreetly as possible. One mechanism that can facilitate the delivery of discreet, or covert, performance feedback is the use of covert audio coaching (CAC).

CAC technology consists of a two-way radio system, where the coach has a radio transmitter and the individual being supported has a radio receiver with an attached earpiece (also called a “bug in the ear”). This allows the coach to deliver feedback from a distance and in such a way that only the recipient can hear. CAC has been sporadically explored for several decades with counselors in training, medical students, parents, and teachers. In one of the earliest investigations, Korner and Brown (1952) used CAC to train clinical psychology interns during patient interviews, declaring it a promising practice. In related studies, Baum and Lane (1976) used CAC to train graduate students to administer intelligence tests and Hunt (1980) investigated it to train medical students to interview patients. In other

investigations, Crimmins, Bradlyn, Lawrence, and Kelly (1984) taught a “neglectful” parent to deliver positive attention to her young child and Ringeisen (1999) used it to teach families to implement behavior intervention plans with their children.

Not all of the CAC studies have reported successful outcomes. Giebelhaus (1994) reported conflicting results with student teachers and supervisors. Although participants reported positive impressions of the intervention, few actual improvements were observed in their teaching behaviors, and similar limitations were reported in a follow-up study by Lindell (2001). More recent applications of CAC have incorporated explicit behavioral coaching strategies, and these interventions increased the effectiveness of the CAC technology. For example, Scheeler and Lee (2002) found that CAC with immediate corrective feedback increased student teachers’ implementation of three-term contingency trials. Similar findings were reported by Scheeler, Bruno, Grubb, and Seavey (2008). However, difficulty with maintenance and generalization was noted for the preservice teachers once the radio equipment was removed. In a follow-up experiment within the same study, Scheeler et al. incorporated a generalization strategy (common stimuli), and the results were suggestive of stimulus generalization, with a degree of maintenance.

In another study, Goodman, Brady, Duffy, and Scott (2008) examined the effects of immediate explicit feedback delivered through CAC on the implementation of learn units (three-term contingency trials) by in-service teachers. They found that immediate, corrective feedback was effective in increasing the rate and accuracy of the delivery of learn units by novice teachers. Oliver and Brady (2010) replicated the Goodman et al. procedures with parents of children with autism. Parents in this study were taught to deliver praise statements and prompting strategies to their children as they engaged in self-care routines. As parents improved their prompt and praise skills, their children demonstrated improvements in the self-care routines. Furthermore, both the parents’ and the children’s skills generalized to novel routines.

### *Purpose of the Study*

To date, only one study has investigated the effectiveness of CAC for delivering explicit feedback directly to people with disabilities. Price, Martella, Marchand-Martella, and Clenthou (2002) employed CAC as a behavior management strategy to reduce vocalizations of a student with attention-deficit/hyperactivity disorder (ADHD). However, investigations of the CAC technology as a skill enhancement strategy for people with disabilities have been notably absent, particularly as a discreet coaching strategy as recommended by Rogan et al. (2007).

**Table 1.** Participant Characteristics

Employee	Age and gender	Disability	IQ	JOBS composite score <sup>a</sup>		Language summary
				QOP	TOS	
Paul	22 yrs, male	Autism	69	78	80	Speaks in complete sentences
Andy	30 yrs, male	Intellectual disability	38	96	94	Speaks in partial sentences in Creole and English
Daniel	42 yrs, male	Intellectual disability	55	89	89	Speaks in complete sentences

Note: JOBS = *Job Observation and Behavior Scale*.

a. Sheltered and supported employee standard scores: Quality of Performance (QOP) = 92, range = 30–150; Type of Support (TOS) = 112.4, range = 30–150.

CAC could serve as a discreet means of job coaching for supported employees. CAC allows direct interventions based on a variety of prompts, corrections, and reinforcers, all linked to the specific real-time performance of employees on the job. Although other job-coaching interventions have been effective, no previous research has been conducted to determine whether CAC might have potential in work settings. If so, this could be particularly valuable when direct interventions are required but need to be provided in a way that does not interfere with employees, coworkers, or others in the workplace. Because CAC limits the spoken feedback to brief and discreet comments (Goodman et al., 2008; Oliver & Brady, 2010), this intervention has promise in community work settings. Thus, the purpose of this investigation was to examine the effects of CAC on the job performance of supported employees in integrated places of community employment. Two research questions were addressed:

1. Does CAC improve the job skills of employees with disabilities in supported employment?
2. To what extent will improvements maintain once CAC is removed?

## Method

### Participants

Three individuals with disabilities participated in this study. All three had experience with supported employment, and two individuals (Andy and Daniel) were currently enrolled in supported employment programs funded by Vocational Rehabilitation. Participant demographics are summarized in Table 1.

All of the participants' IQ scores were obtained from their case files. All had been diagnosed with a disability as children by psychologists and had been enrolled in special education and adult services programs for many years. In addition, scores from the *Job Observation and Behavior Scale* (JOBS; Rosenberg & Brady, 2000) for Paul and Andy

were obtained from case files. Because Daniel did not have a JOBS score on record, the first author administered the assessment. JOBS scores provide a profile of participants' daily living skills, work performance, and work behavior in comparison to other supported and sheltered employees. These scores, combined with participants' IQ scores, were gathered for descriptive purposes only.

Local supported employment agencies and businesses were contacted to recruit participants. Paul and Daniel were nominated by their job coaches, and Andy was nominated by his supervisor. Participants in the study had to meet several criteria, including the following:

1. The individual participated in a supported employment program or was working toward that goal.
2. The employee was willing to wear an ear bud speaker and tolerated using it.
3. The work skills of concern were not in an initial acquisition phase.
4. The employee had been on the job for a minimum of 2 weeks.

Individuals who met the eligibility criteria were selected regardless of race, gender, or socioeconomic status. Participation was voluntary, and written consent was obtained from the participants. Written agreement also was obtained from each employment agency and place of employment.

### Setting and Task Selection

The study was conducted at the participants' job sites and consisted of an individual model of supported employment. Paul worked as part of an environmental cleaning crew in a two-story apartment building with tiled hallways separating two-bedroom living units. (Although Paul worked on a crew, his job required that he work alone for long periods.) Andy worked as a custodial assistant at a public school with a landscaped campus that had three buildings connected by covered walkways. Daniel worked at a food bank that

**Table 2.** Task Analyses of Targeted Skills

Paul, sweeping <sup>a</sup>	Andy, windows <sup>b</sup>	Daniel, crates <sup>c</sup>
1. Sets dust pan at end of the section	1. Gets material (beginning only)	1. Picks up crate
2. Walks to start of section	2. Turns off power (beginning only)	2. Carries crate to stack
3. Sweeps corners toward middle	3. Closes door (beginning only)	3. Aligns crate to stack
4. Sweeps edges toward middle	4. Sprays pane	4. Places crate on stack
5. Sweeps middle	5. Cleans corners	
6. Sweeps debris into dust pan	6. Cleans edges	
	7. Cleans middle	
	8. Turns on power (end of task)	

a. The hallway is divided into five sections; each section has the same task analysis steps.

b. Eight window panes inside and outside, totaling 16 panes. Each pane is composed of Task Analysis Steps 4–7.

c. These steps are repeated for each crate stacked.

operated out of a refrigerated semitrailer located near a driveway with car and van access.

A heuristic was used to identify potential work tasks for this study that included the following:

1. Tasks were nominated by supervisors, job coaches, or the participants.
2. The nominated tasks were part of the employees' regular job duties.
3. A researcher observed the participants engage in the nominated tasks to verify performance problems.
4. Performance data were compared to normative rates (details to follow).
5. Tasks were selected if their performance was below 70% of the normative rates or deemed unacceptable by the job coach or supervisor.

The selected task for Paul was sweeping the hallways of the apartment building. This was part of his regular job duties and was nominated by his supervisor and job coach. Two tasks selected for Andy included washing the windows of automatic sliding glass doors and collecting trash in the schoolyard. These tasks were nominated by his supervisor and had been a regular part of his job duties for several years. Stacking bread crates was selected for Daniel. Both his job coach and supervisor nominated this task, which had been part of his regular job duties since he began working at this job site. The sweeping, window washing, and crate stacking jobs were task analyzed. A task analysis for collecting pieces of trash was not developed in lieu of using a whole-task approach to intervention. Table 2 details these task analyses.

### Normative Rates of Selected Tasks

Normative data for each task were ascertained to compare the degree of accuracy and rates of performance between the participants and two individuals without disabilities.

These data were collected before baseline by observing the participants and individuals without disabilities perform the tasks. Accuracy and rate of task analysis steps completed and accuracy and rate of trash collected were the units of measure. These data are summarized in Table 3.

### Behavioral Measures

The dependent variables were percentage and rate of the task analysis steps completed correctly (sweeping the hallway, washing windows, and stacking crates) and percentage and rate of trash collected in the schoolyard. The independent variable was rate of performance feedback (i.e., rate of praise, guidance, and correction statements) delivered via CAC. This feedback consisted of a single sentence or single phrase comment without repetition.

*Praise* statements were defined as supportive phrases delivered contingent on accurate and timely performance (e.g., "You washed that window pane perfectly"). Praise statements were delivered on a fixed ratio schedule (FR 4). The rationale against using a continuous schedule of praise was that the tasks selected had to have been previously acquired with performance problems (e.g., inaccuracy).

*Guidance* statements were direct and specific verbal prompts intended to improve work accuracy and/or productivity (e.g., "Hold the handles when stacking crates") and were delivered both preventively and as a consequence. Guidance statements were delivered preventively when a participant made repeated errors (e.g., continually misaligning the crates). They were given preventively to establish a strategy for completing a task (e.g., placing the dust pan at the end of a section of the hallway). Guidance statements also were delivered immediately following errors when specific instructions were needed to prompt the correct response from the participants.

*Correction* statements were nonspecific comments regarding inaccurate performance delivered contingently

**Table 3.** Normative Data

Task	% correct		Rate (correct steps/min)	
	Normative	Participants	Normative	Participants
Sweeping				
<i>M</i>	100	18.6	4.41	0.27
Range		16–20		0.2–0.41
Washing windows				
<i>M</i>	100	28	13.25	2.46
Range		16–38	13.2–13.3	1.5–5.3
Stacking crates				
<i>M</i>	100	87.7	11.52	3.33
Range		69–100	9.73–13.3	1.8–6.2
Trash collected				
<i>M</i>	52	9.5	7.75 pieces/min	2.46 pieces/min
Range	38–65	4–19	4.6–10.9	1.25–5.6
Trash skipped				
<i>M</i>	n/a	n/a	10.35 pieces/min	24.69 pieces/min
Range			2.5–18.2	13.1–36.0

when an error occurred (e.g., missing a section of the hallway while sweeping). Corrections pointed out mistakes but did not directly guide employees with an action or a strategy to correct the error (e.g., “You missed some”). There were instances when guidance and correction statements were delivered in close proximity. This occurred when a correction statement did not produce the correct behavior and a specific verbal prompt was needed.

### Data Collection

All data were collected by one of three observers: the first author, a teacher with a graduate degree in special education, or a counselor employed by a program for children and adults with disabilities. The observers were trained to collect data before the beginning of the study. Practice coding took place until the observers reached at least 85% in agreement on each variable to be coded in the study. For Paul’s sweeping, Andy’s window washing, and Daniel’s crate stacking, an observer recorded the steps of the task analyses completed correctly and incorrectly during each session. These data were then converted to percentage of steps correct by dividing the number scored correct by the total numbered scored (correct and incorrect) and then multiplying by 100%. In addition, the data were calculated as the rate of correct steps by dividing the number of steps scored correct by the length of observation time.

An alternative data collection system was used to analyze the trash collected by Andy. An observer counted the number of items placed in a garbage bag during observation sessions. After each session, the observer scanned the yard and counted the trash pieces skipped. These data were then

converted to percentage of trash collected and skipped and the rate of trash collected.

The independent variable also was coded during the observation periods. The frequency of each type of statement was collected similarly to the dependent variables and then converted to a rate. For the sweeping, window washing, and crate stacking tasks, praise, guidance, and correction statements were recorded by writing the appropriate code(s) that corresponded to the step on which the participant was engaged. For instance, if Paul missed a corner while sweeping, a correction statement was given. However, if he immediately missed that same corner after the correction, a guidance statement could follow. Thus, it was possible for one statement to be coded for a step or multiple statements to be recorded dependent on the employee’s performance. For the data collection system used to record trash collecting by Andy, the frequency of praise, guidance, and correction statements was recorded in the order in which they occurred.

The duration of the observation sessions varied for each participant and task. This was because of (a) the amount of work available and/or (b) changes in the participants’ fluency across the duration of the study. The mean duration of baseline sessions ranged from 4.1 min to 19.7 min. Intervention sessions ranged from 6.5 min to 27.2 min, and during the follow-up observations the sessions ranged from 6.7 min to 13.2 min.

### Interobserver Agreement

During 35% of the observation sessions, independent observers simultaneously collected data to determine



**Table 4.** Interobserver Agreement Results (Dependent and Independent Variables)

Participant and task	Dependent variable	Independent variables		
		Praise	Guidance	Correction
Paul (sweeping)				
%	96.0	96.0	50.0	100.0
Range	86.6–100.0	83.3–100.0	0.0–100.0	
Andy (windows)				
%	97.7	100.0	85.7	81.8
Range	92.4–100.0		0.0–100.0	0.0–100.0
Daniel (crates)				
%	100.0	100.0	100.0	100.0
Range				
Andy (trash pickup)				
%	98.5	97.8	100.0	100.0
Range	87.5–100.0	92.3–100.0		
Andy (trash skip)				
%	91.3	n/a	n/a	n/a
Range	83.3–100.0			

interobserver agreement. These checks were conducted on all observation codes during all phases of the study.

**Dependent variable.** Point-by-point agreement (Kazdin, 1982) was used to determine observer agreement for sweeping, window washing, and crate stacking. For an agreement to be scored, the two observers had to identically record each step for each task analysis. Agreement was determined by dividing the number of agreements by the number of agreements and disagreements, then multiplying by 100%. For trash collecting and trash skipping, agreement was established using the total count protocol where the smaller frequency was divided by the larger frequency, then multiplied by 100% (Kazdin, 1982). Agreement across all dependent variable codes and across all participants was 96.8%.

**Independent variable.** The agreement on the delivery of the independent variables (praise, guidance, and correction statements) also was determined using point-by-point agreement. For an agreement to be scored, the two observers had to record the same code. Agreement percentages were determined using the same formula used for the dependent variables. Agreement across all independent variable codes and participants was 97.2%. Table 4 contains a summary of the agreement data for the dependent and independent variables.

### Procedures

Prior to baseline, the first author was present at the employees' worksites for three to four sessions to mitigate potential reactivity among the participants. Once the study began, the

job coaches were asked not to interact with the participants on the experimental tasks for the remainder of the study; job coaches were not present during any phase of the study. During baseline, participants were observed performing the selected skills and did not receive any coaching. During one or two baseline probe sessions, however, the participants wore the CAC equipment (two-way radio and headset) to determine any influence the equipment (without the audio prompts) might have exerted. During these probes, no feedback statements were delivered. These probes consisted of a single session to perform the job tasks. Criteria for moving from baseline to the CAC intervention included either a low percentage of accuracy (for Paul and Andy) or inconsistency of work performance (for Daniel; improperly stacked crates presented danger to people passing by).

Prior to implementing the CAC intervention, the first author conducted a 30- to 45-min training session for each participant on the use of the radio equipment. The equipment included two-way radios (Midland, Model LXT276VP; and Midland X-tra Talk Adventure Headsets, Model AVP-H4). The participants received instruction on the types of statements that would be made and listened to examples of the statements delivered via the radio equipment. The volume was determined for each participant, and this was checked before each CAC session. CAC began once the training on the use of the equipment was completed.

CAC consisted of delivering praise, guidance, and correction statements. No vocalizations other than these three types of statements were provided. To deliver the feedback, the first author stood behind or beside each employee far

enough (at least 15 feet away) so that messages could be heard only through the ear bud speaker.

The CAC intervention was withdrawn to test the durability of CAC. The decision criterion for the withdrawal was determined individually. For Paul, Andy's windows, and Daniel, 8 to 11 days of stability (90%–100%) suggested accurate and durable performance. For Andy's trash collecting, the intervention was withdrawn after 6 days of performance that matched or exceeded the mean accuracy of the normative sample (52%). Initial withdrawal observations were conducted over five consecutive work sessions. Following these observations, maintenance probes were conducted weekly for 4 to 5 weeks to further examine the durability of the intervention.

### Experimental Design

A multiple-baseline design across participants and work tasks was used to examine the effectiveness of the CAC intervention on supported employees' work behaviors. The design consisted of three conditions including baseline, intervention (CAC), and follow-up (five consecutive data collection sessions followed by weekly probes).

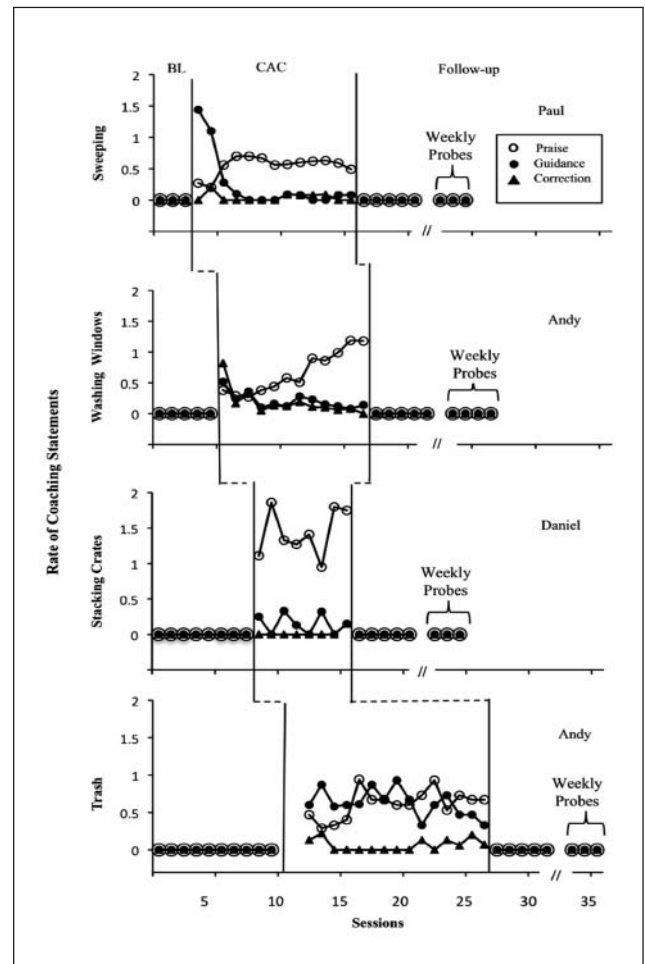
## Results

### Intervention Fidelity

Fidelity of the experimental conditions, a tactic that strengthens evidenced-based practices (Smith, Daunic, & Taylor, 2007), is illustrated in Figure 1. This figure demonstrates that the independent variable was delivered only during the intervention condition and that no performance feedback was administered during either the baseline or follow-up condition.

The first graph in Figure 1 displays the rate of praise, guidance, and correction statements for Paul while he swept the floor. During baseline, no coaching statements were made. When the CAC intervention began on Session 4, there were high rates of guidance, with few corrections or praise. Within three sessions, guidance reduced to near zero; praise increased and remained stable throughout the intervention. When the CAC was withdrawn on Session 17; coaching statements immediately ceased.

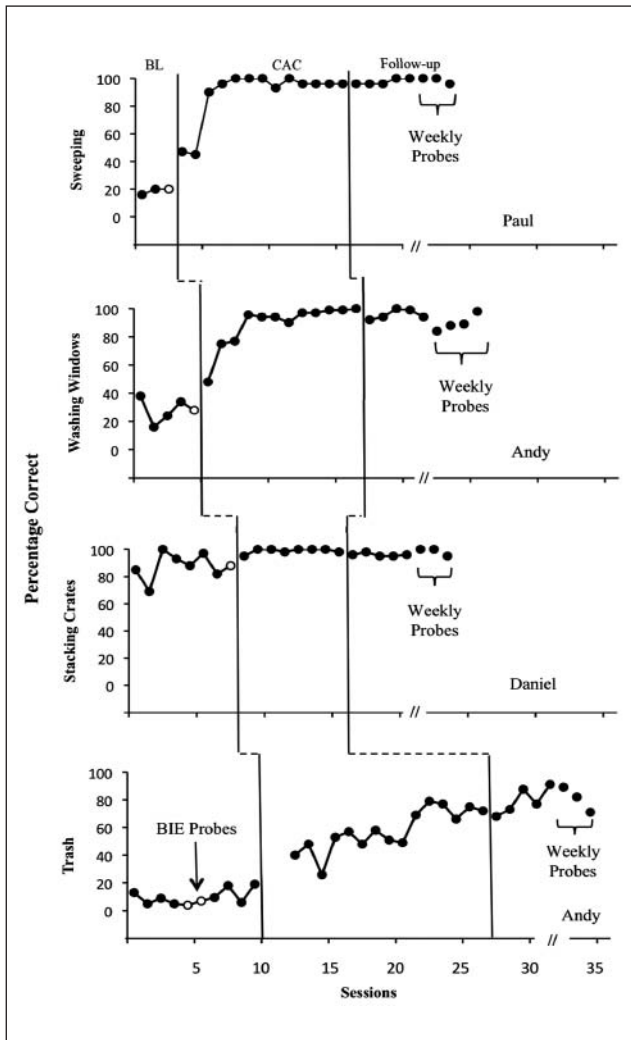
The second graph of Figure 1 shows the praise, guidance, and corrections delivered to Andy while he washed windows. Coaching statements were not delivered during baseline. When the intervention started on Session 6, the coach's guidance and corrections were slightly higher than the praise, which eventually increased to 1.2 statements per minute. As Andy's work skills improved, the coach's guidance and corrections decreased to low, steady levels, then reduced to 0 once the intervention was removed.



**Figure 1.** Rate of praise, guidance, and correction statements delivered per minute

The third and fourth graphs of Figure 1 present the coaching statements to Daniel (stacking crates) and Andy (collecting trash). During their baselines, the coach did not deliver praise, guidance, or corrections. The CAC intervention began on Session 9 for Daniel and Session 13 for Andy. Praise immediately increased for both participants, as did guidance for Andy. Corrections for Daniel and Andy were infrequent, although there was a slight increasing trend during Andy's last 6 sessions. When the CAC was withdrawn (Session 17 for Daniel, Session 28 for Andy), all of the coaching statements ceased.

Caution is needed when interpreting the rate of praise during the intervention condition shown in Figure 1. For each employee, praise was delivered on a FR 4 schedule. Although the schedule of the praise was administered consistently, the rate of praise is affected by the speed with which the employees performed their skills. For example, although the praise delivered to Daniel was on a consistent schedule, Figure 1 shows variability in the rate of this praise



**Figure 2.** Percentage of task steps completed and pieces collected (Andy) independently

because of daily fluctuations in his speed of stacking crates. (His performance will be seen subsequently in Figure 2.)

### Impact of CAC on Accuracy

Figure 2 shows the effectiveness of the intervention on the employees' work performance. Paul's sweeping (first graph) was stable and at or below 20% accuracy. The baseline probe in which Paul wore the earpiece (Session 3) revealed that he was not reactive to the radio equipment. When the CAC intervention was introduced, Paul increased his accuracy almost immediately. His performance remained high and stable during the intervention, with 11 of the 13 days yielding at least 90% correct.

Andy's window washing (second graph of Figure 2) never exceeded 38% correct during baseline, with no

reactivity to the radio equipment during the baseline probe (Session 5). When the CAC was introduced on Session 6, Andy quickly improved his performance, then stabilized between 97% and 100% accuracy during the final intervention sessions.

During baseline, Daniel's crate stacking (third graph of Figure 2) was relatively high but inconsistent. Daniel did not react to wearing the radio equipment during the baseline probe (Session 8). When the intervention was introduced, Daniel's accuracy immediately stabilized at 95% or above.

The fourth graph of Figure 2 summarizes the percentage of trash collected by Andy. The baseline data were stable but low, indicating that Andy skipped most of the trash. He showed no reactivity to the radio equipment during baseline probes (Sessions 5 and 6). Once Andy received the CAC, his accuracy steadily improved; during the final intervention sessions, Andy's data ranged between 66% and 79%. Although he missed more than 21% of the trash during these sessions, he showed marked improvement over both his baseline and the normative sample.

### Impact of CAC on Durability

Figure 2 also displays the durability of the employees' work when the CAC intervention was removed. During the withdrawal, Paul continued to work at high and stable levels (first graph of Figure 2). This continued during the weekly probes, ranging from 96% to 100% accuracy. Andy's window washing (second graph) showed a slight (8%) reduction in accuracy when the intervention was removed, although his performance remained high (92%–100% accuracy), with an ascending trend during the weekly maintenance probes.

The third graph of Figure 2 shows that Daniel's work maintained above 95% accuracy when the intervention was withdrawn and during the weekly probes. Andy's trash collecting (fourth graph) continued to ascend, with 91% of trash collected during the last daily observation. During the weekly probes, however, Andy's performance descended, with only 71% of the trash collected during the final session. Despite this decrease, Andy's accuracy surpassed the average of his final six intervention sessions (means of 81% and 73%, respectively).

### Impact of CAC on Fluency

In addition to evaluating task accuracy, an additional means of evaluating the results was to analyze task fluency, measured by the rate of steps completed correctly for the sweeping, windows, and crates task analyses and the rate of pieces of trash collected. These data are summarized in Table 5.

From baseline to the CAC conditions, each participant increased his rate of performance. Paul's rate showed the



**Table 5.** Rate of Correct Responses per Minute

Employee	Task	Baseline	Covert audio coaching	Follow-up	
Paul	Sweeping	<i>M</i>	0.27	2.41	2.77
		<i>SD</i>	0.12	0.60	0.24
		Range	0.2–0.41	1.1–3.1	2.3–3.1
Andy	Windows	<i>M</i>	2.46	2.73	4.97
		<i>SD</i>	1.60	1.51	0.50
		Range	1.5–5.3	0.91–5.5	4.32–5.8
Daniel	Crates	<i>M</i>	3.33	5.94	6.53
		<i>SD</i>	1.36	0.96	0.69
		Range	1.8–6.2	4.7–7.2	5.5–7.7
Andy	Trash	<i>M</i>	2.47	2.90	2.46
		<i>SD</i>	1.27	1.01	0.81
		Range	1.25–5.6	1.4–5.3	1.4–3.6

highest percentage increase at 792.5%. Daniel's rate increased 78.3%. Andy's rate of window washing and trash collecting showed the smallest increases in rates (10.9% and 17.4%, respectively).

From the CAC to the follow-up conditions, performance rates maintained, and in three of four instances continued to increase. Paul's rate of sweeping increased by 14.9% during the follow-up observations. Andy's window washing rate increased by 82.0% during the withdrawal, and Daniel's rate of stacking crates increased by 9.9%. The only skill that showed a decrease in the performance rate was Andy's trash collecting, which decreased by 15.1%. It is important to note that although the rate of pieces of trash collected decreased during the follow-up sessions, the overall accuracy was higher than during the intervention.

## Discussion

The results of this study can be interpreted to conclude that the CAC intervention was effective in increasing the work performance of supported employees and that the changes were durable several weeks following removal of the intervention. Furthermore, the intervention was effective across different participants and work tasks. For each participant, baseline conditions revealed that some aspects of the tasks were previously acquired, an important finding because the purpose was to *improve* existing work skills rather than *develop* new skills. However, each employee had difficulties with the work tasks. Sweeping the hallways for Paul and both of Andy's skills occurred below normative levels. And although Daniel's crate

stacking was only slightly below the normative sample on some occasions, his baseline performance was inconsistent, and poorly stacked crates posed a falling hazard. When the coaching intervention was implemented, each employee showed improvements. Paul's sweeping accuracy and Andy's window washing improved immediately and remained high and stable. Daniel's crate stacking and Andy's trash collecting also showed improvements, although Andy's improvements were more gradual. When the intervention was withdrawn, each employee maintained his accuracy during the initial observations as well as during subsequent probes 4 to 5 weeks later.

One reason for the strength and durability of the results might be that the employees increased the fluency as well as the accuracy of their performance. Response fluency is a parameter frequently associated with strengthened performance (Binder, 1996; White, 1986). In this study, Paul showed a 792.5% increase in his rate of sweeping and Daniel showed a 78.3% increase in his performance rate. Andy also showed increases in his performance rate, although his improvements were more modest. Also, much of the improvement in fluency occurred once the coaching was withdrawn; only Andy's trash collecting did not show an increase in fluency when the intervention was removed. Without a controlled investigation of the maintenance conditions, explanations for the postintervention increases are subject to speculation and anecdotal observation. Our current hypothesis is that at some point during the intervention, continued coaching may have become suppressive. This phenomenon has been observed following a number of other behavioral interventions (see Brady, Shores, McEvoy, Ellis, & Fox, 1987; Davis, Brady, Hamilton, McEvoy, & Williams, 1994; Lasater & Brady, 1995). Typically these improvements have been observed following fairly intensive interventions, spanning multiple sessions, and resulting in significant behavioral improvement. Those conditions were present in this study as well. Although not intrusive, the CAC was direct and performance based. Each employee showed marked increases when the intervention was provided.

Although these improvements are encouraging, it is important to consider the supported employees' performance vis-à-vis the normative samples gathered prior to baseline. The employees' accuracy improved for each of the targeted skills, and these matched or exceeded the normative sample. The rate of performance also increased for three of the four tasks. However, these rates remained considerably lower than the rates for the normative sample. These comparisons to the normative samples bode well when the critical performance dimension of a task was accuracy alone. On the other hand, when the performance required fluency (a dimension that factors both accuracy and speed), the supported employees underperformed the employees without disabilities. When community employment requires that supported employees match normative

accuracy *and* fluency standards, an intervention that facilitates normative fluency appears to be important. This presents a need for CAC research to examine normative fluency standards.

### *Extending the Empirical Literature on CAC*

These findings extend the empirical CAC literature in several ways. Most of the studies to date have reported positive results, although Giebelhaus (1994) and Lindell (2001) found mixed results with preservice teachers. Those investigators cited various methodological reasons for the discrepancies, including too many teaching behaviors targeted for change, questions about sample size, and data analysis procedures. Our own explorations with this technology suggest another reason: The communications delivered by coaches in previous studies may have been too cumbersome. Several recent investigations with in-service teachers and parents of children with disabilities (Goodman et al., 2008; Oliver & Brady, 2010; Scheeler et al., 2008; Scheeler & Lee, 2002) refined the coaching procedures by *limiting* the spoken feedback to recipients. The coaching statements in these studies were brief and explicit, unlike the continuous dialogues or “think-alouds” delivered in other investigations. In the current study, the job coaching statements were succinct and direct. We believe this coaching brevity might be an important piece of the CAC intervention package and anticipate that future studies will identify it as a critical component.

The application of CAC with people with disabilities is another contribution of the current study. Previous investigations included varying populations (e.g., clinical psychology students, medical students, parents, and teachers). In the one study that provided covert coaching to a person with a disability, Price et al. (2002) targeted a behavior management outcome for a student with ADHD. The current study extends the intervention as an employability strategy for adults with moderate to severe disabilities, including intellectual disabilities and autism (i.e., a population with diverse social and cognitive abilities). Clearly, this form of coaching might not be effective for many individuals with significant disabilities. Each employee in this study had a sufficient receptive language repertoire to understand the feedback statements, with work behaviors amenable to verbal prompting and feedback. Future applications of CAC are needed to establish more specific parameters for the use of this intervention with people who experience cognitive, communication, and behavioral challenges.

The durability of the intervention found in this study also adds to the literature. To date, support for maintenance or generalization with this intervention has been limited. Scheeler et al. (2008) reported that participants’ teaching skills in their first experiment declined once the CAC

intervention and the radio equipment were removed, and an additional intervention was needed to promote maintenance while introducing a novel setting. However, the findings from the current investigation showed the opposite. Once the CAC intervention was withdrawn, maintenance, and in some instances performance improvements, was observed. In a similar vein, Oliver and Brady (2010) also reported that the CAC intervention produced maintenance of behavior change among parents of children with autism. Following the withdrawal of the CAC intervention, parents continued to use their new teaching strategies, and their children continued to perform their new routines for at least a month. Furthermore, generalization to novel tasks and settings was reported by Oliver and Brady. Although the effects of the coaching on the generalized responding of supported employees were not examined in the current study, the observed maintenance of the work skills combines with the Oliver and Brady findings to demonstrate the durability of CAC.

### *Limitations and Implications for Future Research*

There are several limitations to this study. To begin, only four experimental work tasks were used during this study, and the focus was on improving work accuracy and performance. It is not known if the CAC intervention would be equally effective in improving other employability skills (e.g., workplace social behavior). It is clear that some work tasks might be incompatible with this technology (e.g., tasks requiring auditory attention and discrimination). Second, the efficacy of the coaching is likely affected by employees’ language and hearing status. In this study, all coaching statements were delivered in English, a potential problem for second language speakers (e.g., Andy). In addition, the participants’ hearing was not screened. This also could lead to difficulty with understanding coaching statements, and future investigators would benefit from determining the hearing acuity of the participants. Furthermore, guidance statements were made both preventively and as a consequence, and the same code was recorded for both. Thus, it is not entirely clear how guidance statements worked. That is, they may have functioned as pre-corrections, corrections, or both, depending on the participant and task. Finally, future investigators should more thoroughly explore the durability and generalization potential of the intervention, questions central to the practical use of CAC in natural environments.

As an intervention to increase the job performance of individuals with disabilities, CAC seems to have merit as a promising practice. As early as 1992, Wehman, Sale, and Parent highlighted essential features of interventions for supported employees (i.e., interventions should be

minimally intrusive, efficient, reinforcement based, and systematic). The CAC intervention is consistent with these recommendations. Improvements occurred quickly (within 8–15 sessions), and the duration of the coaching was quite brief. For example, coaching sessions ranged from 6.5 min to just more than 27 min. This is significant given job coaches' heavy caseloads and limited time to coach each supported employee. In addition, employees' improvements were achieved with little coaching effort. Fewer than one praise statement was made each minute across all participants and tasks during the coaching; guidance statements averaged one per 3 min 20 s, and corrections averaged one per 14 min. Thus, the CAC intervention was implemented with little task loading on the part of the coach.

These implications are significant when considering recent concerns involving the difficulties that job coaches face in delivering practical supports to employees. For example, Cimera et al. (1998) found that job coaches typically struggle to fade their assistance to supported employees, and in 2001 Parsons et al. reported that when job coaches have difficulty fading support, some begin to assume the job duties of the supported employee. Such practices certainly have detrimental effects on the success of supported employees, including long-term employment once the funding for services has been exhausted. The findings from the current study can be analyzed to suggest that CAC can be used to improve the performance of employees with disabilities, which certainly makes CAC a viable tool for job coaches, coworkers, and supervisors.

### Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interests with respect to the authorship and/or publication of this article.

### Financial Disclosure/Funding

The author(s) received no financial support for the research and/or authorship of this article.

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