

*MODIFICATION OF PERSEVERATIVE RESPONDING THAT
INCREASED EARNINGS BUT IMPEDED SKILL ACQUISITION IN A
JOB-SKILLS TRAINING PROGRAM*

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Adults in a therapeutic workplace working on a computerized keyboarding training program earned vouchers for typing correct characters. Typing technique was evaluated on review steps. Participants could pass the review and earn a bonus, or skip the review and proceed with no bonus. Alternatively, participants could continue practicing on the same step. Participants persistently repeated the same step, which halted progress through the program but allowed them to increase their rate of responding and, as a result, their earnings. Blocking the initiation of practice on review steps and removing payment for practice initiated after prompts (extinction) both produced rapid progress through the program. These results underscore the importance of careful arrangement of the contingencies in adult education programs.

DESCRIPTORS: addiction, extinction, job skills training, response blocking, voucher reinforcement

Poverty is a serious problem in the United States and is related to unemployment and low levels of education. Approximately 20 million adults living in the United States aged 25 or older (10.2% of the adult population) live below the poverty level (U.S. Census Bureau, 2006). Individuals who did not graduate from high school or earn an equivalent certification accounted for 35.9% of the total number of adults living in poverty, and were more than twice as likely to be below the poverty level compared with individuals whose highest level of education was a high school diploma or equivalent. Unemployment is also clearly related to poverty. Among individuals living below

the poverty level in the United States aged 16 or older, 54.2% did not work at all during the previous year, and unemployed individuals were over eight times as likely to be below the poverty level compared to individuals who worked full time in the previous 12 months. These statistics suggest that education and employment are appropriate targets for addressing the problem of poverty.

Employment interventions for poor and chronically unemployed adults can generally be characterized as either “quick entry” or “intensive education and training.” Quick-entry programs emphasize job-search and job-interview skills and seek to place individuals into jobs as quickly as possible. Quick-entry programs have had some success, but many individuals do not benefit from these interventions, and the long-term benefits of this approach are unclear (Hamilton et al., 2001). Intensive education and training programs typically include some combination of basic academic skills training, General Education Development (GED) test preparation, and vocational training. These programs seek to place individuals in jobs only after education and training are completed.

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Although intensive education and training programs are promising, these programs have had one critical shortcoming: They have failed to reliably engage participants in the education and training programs and to establish the targeted skills. Data from the National Evaluation of Welfare-to-Work Strategies (NEWS), for example, indicate that welfare recipients who participated in educational and job skills training programs and increased their skills or earned GED certificates increased their earnings more than individuals who participated but did not achieve such milestones (Bos, Scrivener, Snipes, & Hamilton, 2002; Hamilton, 2002). However, Hamilton noted that lack of retention and motivation severely limited the beneficial effects of education and training in welfare recipients. These data suggest that specialized interventions may be needed to increase attendance in job-skills training programs and acquisition of job skills.

Over the past several years, Silverman and colleagues have been conducting a systematic program of research to develop the therapeutic workplace, an operant intervention for chronically unemployed adults that could address the key shortcomings of traditional intensive education and training programs. Specifically, this intervention arranges explicit and high-magnitude reinforcement to promote engagement in training and skill acquisition for chronically unemployed adults with long histories of drug addiction. The therapeutic workplace is part of a larger family of voucher-based reinforcement interventions that have been used with considerable effectiveness in the treatment of drug addiction (Higgins & Silverman, 2008).

Voucher interventions are essentially token economies (see Kazdin & Bootzin, 1972, for a review of the early literature) in which participants receive tokens or vouchers contingent on a desired target behavior. The vouchers have monetary values and are exchangeable for a wide range of goods and services (e.g., groceries, clothing, transportation, and rent payments).

Voucher reinforcement was originally developed to promote cocaine abstinence in cocaine-dependent adults enrolled in an outpatient treatment program (Higgins *et al.*, 1991). Under that intervention, vouchers were made contingent on provision of cocaine-free urine samples. It is important to note that the magnitude of voucher reinforcement progressively increased across consecutive cocaine-free urine samples, and failure to provide a cocaine-free urine resulted in a temporary reset in the magnitude of the voucher. The therapeutic workplace uses a similar arrangement of contingencies, but uses access to paid training or employment rather than direct payment to reinforce drug abstinence (Donlin, Knealing, & Silverman, 2008).

In addition to the contingencies designed to increase and maintain drug abstinence, the therapeutic workplace uses voucher reinforcement contingencies to promote workplace attendance and productivity (Wong & Silverman, 2007). The first study in this line of research showed that specific and relatively high-magnitude reinforcement may be needed to promote attendance by unemployed adults in a job-skills training program. Silverman, Chutuape, Bigelow, and Stitzer (1996) showed that supported job-skills training, in which trainees receive training stipends for attending the training program, can be effective in maintaining reliable program attendance. Unemployed adults in methadone treatment for heroin addiction attended a data-entry training program consistently when they received high-magnitude training stipends in the form of vouchers exchangeable for goods and services for attending the workplace, but stopped attending when the rate of voucher pay was decreased below minimum wage. Although the trainees attended the workplace reliably when they received training stipends, they varied considerably in how much they practiced the typing skills and in how much progress they made on the training programs. To increase the

speed with which all participants progress through job skills training programs, Silverman et al. suggested that future research should investigate the effectiveness of arranging “explicit reinforcement of practice amount, of step mastery, of correct responses rate, or of some other performance parameter” (p. 206).

In a subsequent study, Dillon, Wong, Sylvest, Crone-Todd, and Silverman (2004) described a computer-based program for teaching keyboarding, keypad, and data-entry skills to individuals in a therapeutic workplace in which participants earned training stipends in vouchers both for attendance and for performance. The program began by introducing the use of a single character to be typed and added new characters across a series of steps of increasing complexity. The introduction of a new step was contingent on meeting fluency criteria for the previous step. Trainees earned productivity pay for correct characters typed and were penalized for incorrect characters typed during 1-min timings. The program was largely computerized, which facilitated self-pacing of the training and minimized staff burden. However, a key feature of this program was the inclusion of technique reviews in which staff directly observed trainees as they typed to ensure the development of specific response topographies associated with fluent keyboarding performance (e.g., anchoring fingers on the home row of the keyboard). After the participant had achieved criterion fluency at several predetermined steps, the computer screen displayed a stop sign and an instruction to get staff for a technique review. If staff were not immediately available (e.g., because they were engaged in training another individual, conducting a technique review for another trainee, or addressing inappropriate conduct in the workplace), trainees were allowed to continue practicing on the current training step in order to prevent staff delays from affecting trainees’ performance pay.

Therapeutic workplace staff subsequently noticed that some trainees practiced on tech-

nique review steps of the training program for days without notifying staff that they required a technique review. During this time these trainees consistently met or exceeded fluency criteria and produced the prompt screen that included instructions to get a staff member. Staff informally reminded trainees of the necessity of technique reviews, but these reminders did not produce behavior change. After this pattern of behavior persisted for several weeks, staff requested assistance in developing an intervention to address the problem. Direct observation of these trainees revealed that they were not using appropriate typing technique. Instead, these trainees developed specialized response topographies (e.g., leaving fingers on non-home-row keys) that allowed them to maximize the rate of characters typed on individual training steps and maximize their earnings but were counterproductive with respect to the development of keyboarding skills. The present study was designed to identify interventions that promote progress through a job-skills training program for individuals in a therapeutic workplace substance abuse treatment program.

METHOD

Participants and Setting

Five adults enrolled in a therapeutic workplace for the treatment of drug addiction and unemployment participated in the study. Participants in this study were enrolled in one of two larger randomized controlled clinical trials designed to determine if contingent access to the therapeutic workplace could reinforce and promote the use of naltrexone in opiate-dependent adults. Naltrexone is a non-addicting opiate antagonist that blocks the subjective and physiological reinforcing effects of opiates (Martin, Jasinski, & Mansky, 1973; Mello, Mendelson, Kuehnle, & Sellers, 1981; Schuh, Walsh, & Stitzer, 1999; Walsh, Sullivan, Preston, Garner, & Bigelow, 1996). However, most heroin addicts will not adhere to a

Table 1
Participant Characteristics at Intake

Variable	Danny	Alberta	Tim	Chris	Anita
Age	47	38	41	46	41
Sex	M	F	M	M	F
Race	W	B	B	B	B
Highest grade completed	8	11	12	10	12
Usual employment pattern, past 3 years	Irregular	Unemployed	Full time	Unemployed	Unemployed
Income, past 30 days					
Unemployment	0	0	0	0	0
Welfare (DSS)	0	0	158	0	0
Pension, benefits, or social security	700	0	0	0	0
Mate, family, friends	0	0	200	0	400
Illegal	0	4,000	0	0	0
\$ spent on drugs, past 30 days	2,000	1,500	600	1,000	300
Number of dependents	0	8	0	0	0
Currently on parole or probation	No	Yes	Yes	No	Yes
Felony convictions in life	16	12	3	3	6
Opiate dependence	Yes	Yes	Yes	Yes	Yes
Cocaine dependence	Yes	No	Yes	Yes	Yes
Opiate urinalysis	Positive	Positive	Positive	Positive	Positive
Cocaine urinalysis	Positive	Negative	Positive	Positive	Negative

regimen of naltrexone pharmacotherapy. All participants in both of the randomized trials were randomly assigned to one of two conditions. Specifically, some participants were granted access to the workplace contingent on taking prescribed naltrexone doses, and others were allowed to work in the therapeutic workplace independent of whether they took the prescribed doses. Because of their group assignment in the randomized trial, Danny, Alberta, and Anita were required to adhere to their naltrexone prescription to enter the therapeutic workplace. Tim and Chris could enter the therapeutic workplace independent of adherence to their naltrexone prescriptions. Participant characteristics are shown in Table 1. Note that although Tim's usual employment pattern over the previous 3 years had been full-time employment, he was unemployed for at least 30 days prior to admission to the workplace.

The therapeutic workplace was located at the Center for Learning and Health in Baltimore, Maryland, and is described in detail elsewhere (Silverman *et al.*, 2007). Each participant was assigned to a cubicle workstation containing a personal computer, monitor, keyboard and

mouse. All participants earned \$8.00 in vouchers per hour in base pay as long as they were in their assigned workrooms, regardless of their productivity. Participants were instructed that they could earn an additional \$2.00 in vouchers per hour in productivity pay if they worked consistently on the computer-based job-skills training. Keyboard training was available from 10:00 a.m. to 12:00 p.m. Monday through Friday. Vouchers were typically delivered as gift cards to grocery stores or retail outlets. Requests for specific payments, such as rent, were typically fulfilled by mailing a check directly to the payee (e.g., landlord).

The 5 participants were nominated by staff from a total of 17 unemployed opiate-dependent adults who were participating in the randomized controlled trials and attended the therapeutic workplace between June and August, 2007, and who had at least 4 months remaining in their participation in the randomized controlled trials. These individuals were included in the study if records indicated that they remained on a single keyboard training step for at least 5 days in which they attended the workplace, and they did not alert a staff member to conduct any prompted technique

reviews during that time. Six individuals met this requirement, but one was excluded due to inconsistencies in his technique review records. Technique review records were collected by staff (see below) and kept in individual binders in a locked cabinet in the therapeutic workplace. Records of the keyboard training steps, and all data used in this study, were collected automatically by Web-based software designed for use in the therapeutic workplace (Silverman et al., 2005).

Procedure

General procedure. Participants worked on a computer-based, self-paced keyboard training program. The program was divided into a series of small steps consisting of two three-character strings. These strings were presented as sample lines of text on the computer screen, and participants copied the sample lines into entry lines located just below the sample line. Participants earned \$0.02 for every 20 correct characters typed and lost \$0.01 for every two incorrect characters typed during 1-min trials. To complete a step, participants were required to type more than a minimum number (ranging from 60 to 150) of correct characters and less than three incorrect characters. Additional productivity pay was awarded for completing steps (see details below).

Across a series of fluency-building steps a single set of characters was used, and the number of correct responses required to pass the step was increased by five characters per minute on each step until reaching a maximum of either 90 (on earlier parts of the training) or 150 (on later parts of the training) characters per minute. When a trainee passed a step containing the maximum criterion, a technique review step was presented. When speed and accuracy criteria for passing a technique review step were met, a red stop sign appeared in the center of the screen with the following instruction below the stop sign: "You've met the mastery criterion for this step, but you need

to have a workplace supervisor observe your technique before you can move on. Please ask a workplace supervisor to evaluate your technique." As an alternative to getting a staff member to conduct a technique review, a participant could press ENTER and continue performing 1-min trials on that step. If the participant requested a technique review, the staff member came to the participant's workstation and observed the participant using a checklist to determine whether he or she used appropriate keyboarding technique (see Figure 1 for an example). If participants used appropriate keyboarding technique and met 80% of the mastery criterion for correct characters on that step, they earned a step completion bonus (\$0.25) and advanced to the next step the next time they achieved mastery criteria on that step. Participants were encouraged to take their technique reviews as soon as they qualified to do so, but staff allowed participants to skip technique reviews and progress through the training program if they were having difficulty passing a step or refused to take the technique review. These exceptions were made because in considering the difficulty of treating heroin addiction and the typical life and work histories of our participants, we valued consistency of work over quality of work. Overlaying any potentially aversive contingency on the existing differential reinforcement contingency (i.e., the productivity pay) for typing proficiency may have had counterproductive effects with respect to drug taking.

Preintervention. No intervention was conducted, and no additional formal instructions were given to the participants. However, prior to beginning work on the keyboard training program, participants were given a detailed set of written instructions that introduced them to the therapeutic workplace and to the keyboard training program. A staff member read the instructions aloud while the participant read his or her own copy. Those instructions described

**THERAPEUTIC WORKPLACE
TYPING TECHNIQUE EVALUATION FORM
TYPING 10.0
Step 32.7 – Review**

The workroom teacher will perform the technique review by observing a one-minute timing and completing the relevant Typing Technique Evaluation form. This form lists all of the suggested techniques. The workroom teacher must complete the form by circling Y or N to indicate whether the trainee did or did not use each technique. Mastering steps is not contingent upon passing technique reviews. These reviews are only to be used as a guideline for staff to give the trainee feedback on their performance.

TYPING					
Date/Staff					
Presses Backspace with pinky	Yes/ No/ NA	Yes/ No/ NA	Yes/ No/ NA	Yes/ No/ NA	
Presses Enter with pinky	Yes/ No/ NA	Yes/ No/ NA	Yes/ No/ NA	Yes/ No/ NA	
Does not look at fingers or keyboard to type	Yes/ No/ NA	Yes/ No/ NA	Yes/ No/ NA	Yes/ No/ NA	
Uses correct finger placement for letter ‘j’	Yes/ No/ NA	Yes/ No/ NA	Yes/ No/ NA	Yes/ No/ NA	
Uses correct finger placement for letter ‘f’	Yes/ No/ NA	Yes/ No/ NA	Yes/ No/ NA	Yes/ No/ NA	
Uses correct finger placement for letter ‘d’	Yes/ No/ NA	Yes/ No/ NA	Yes/ No/ NA	Yes/ No/ NA	
Uses correct finger placement for letter ‘k’	Yes/ No/ NA	Yes/ No/ NA	Yes/ No/ NA	Yes/ No/ NA	
Uses correct finger placement for space bar	Yes/ No/ NA	Yes/ No/ NA	Yes/ No/ NA	Yes/ No/ NA	
Comments/Feedback: (write any feedback that was given to the participant)					
Met Fluency Requirement Correct: 72 Incorrect: 3	Yes/ No	Yes/ No	Yes/ No	Yes/ No	
Characters Correct/ Incorrect					

Figure 1. Sample evaluation form.

all aspects of the therapeutic workplace rules and procedures and included the following instructions related to the technique evaluations:

It is important to use correct finger placement while typing to increase speed and accuracy. To pass some steps, a technique evaluation is required. After you

meet the criterion for certain steps, you will see a screen that looks like a stop sign. When you see this screen you will need to find a workplace supervisor and have them observe your typing technique. You will need to use proper finger placement during these evaluations.

Instructions only. At the beginning of this condition, a staff member read the following

instructions aloud while the participant read his or her own copy:

As you know, when you see a stop sign while working on your typing program, you should inform a classroom staff member that you need to have your typing technique reviewed. Once you have passed the typing technique evaluation, you will be able to earn a bonus for completing the step and will then move on to the next step. Although you are not required to notify staff and complete the technique review, we recommend that you inform a staff member and attempt to pass the technique evaluation the first time you see the stop sign on your computer screen. We feel that the technique review is an important part of your success in the typing program. If you do not wish to try the technique review and would like to move to the next step in the program, you can inform staff that you would like to do so, and they will move you to the next step in the program. However, if you decide to move to the next step without completing the technique review you will not earn a bonus for completing that step.

This condition served as the experimental baseline. Instructions-only conditions terminated when a minimum of five sessions had been completed and a judgment of stability was made on the basis of visual inspection of data showing cumulative steps advanced as a function of technique review opportunities. At the beginning of the first replication of this condition, Danny, Alberta, Tim, and Chris all began a keyboarding program identical to the first program except that the mastery criterion for correct responses was increased from 90 per minute to 150 per minute. This change was part of the progression of keyboard training experienced by all trainees in the therapeutic workplace independent of their involvement in the present experiment.

Blocking. In this condition, the keyboard training program was modified such that participants were unable to obtain additional practice on technique review steps. When a technique review opportunity occurred (i.e., the prompt appeared), pressing the ENTER key produced the following on-screen instruction: "You need to receive finger placement training before beginning this step. Please notify the workplace supervisor. Please click the button

below after you have received finger placement training for this step." To activate the button, to continue working on the keyboard training, and to continue to earn productivity pay, participants were required to get staff assistance and either attempt a technique review or skip the technique review without earning the step-completion bonus and move on to new training steps. If the participant failed to pass the technique review after three attempts, he or she was moved to the next step without earning the step-completion bonus. Thus, participants could choose to stop working on the training program and collect base pay only or move forward in the training program and earn both base pay and productivity pay. This condition ended after the completion of a technique review step that immediately preceded the change in the mastery criterion for correct characters typed per minute. At the beginning of this condition, participants were given instructions regarding the change in the contingencies.

No paid practice. To isolate pay for practice in 1-min timings as the variable controlling the participants' behavior of persistently repeating practice on individual training steps in the instructions-only condition, a second intervention was conducted in which participants' choices were expanded. This condition was similar to the instructions-only condition in that participants could obtain additional practice after achieving mastery of a technique review step, but differed in that the additional practice did not produce productivity pay. If vouchers were the relevant reinforcer for the target pattern of behavior, then this would function as an extinction procedure. This condition ended after a technique review step.

No paid practice plus relaxed criterion. During the no-paid-practice condition, Danny developed a novel method for preventing the progress of training steps, which had the effect of avoiding technique review steps. He pressed an incorrect key a sufficient number of times to

Table 2
Workplace Attendance and Performance on Keyboard Training Programs

Name	Condition ^a	Mean timings per hour (SD)	Mean minutes worked per day (SD)	Technique review results (pass/fail/skip)
Danny	PI	44.5 (1.7)	108.5 (16.1)	0/0/0
	IO	44.8 (1.3)	108.8 (10.6)	0/0/0
	LK	41.5 (4.0)	102.3 (11.8)	0/0/9
	IO	46.9 (7.1)	113.5 (1.9)	0/0/0
	NP	43.5 (4.9)	109.8 (11.5)	0/0/3
	NP+RC	50.4 (6.3)	110.4 (17.3)	0/0/49
	IO	45.8 (0.8)	115.9 (4.8)	0/0/0
Alberta	PI	35.9 (1.1)	108.9 (27.1)	0/0/0
	IO	30.5 (4.9)	112.8 (13.9)	0/0/0
	LK	34.3 (6.7)	104.9 (17.0)	1/1/15
	IO	34.5 (4.2)	120.0 (0.9)	0/0/0
	NP	42.2 (7.6)	111.2 (23.6)	0/0/32
	IO	46.5 (0.0)	120.0 (0.0)	0/0/0
Tim	PI	24.2 (15.3)	103.1 (31.1)	0/0/0
	IO	34.3 (17.3)	84.5 (37.5)	0/0/0
	LK	32.9 (10.2)	106.2 (15.9)	0/0/5
	IO	25.5 (9.3)	85.3 (24.8)	0/0/0
Chris	PI	34.4 (6.9)	106.5 (10.6)	0/0/0
	IO	36.1 (4.1)	96.8 (15.8)	0/0/0
	LK	34.5 (8.6)	105.0 (18.5)	0/1/20
	IO	30.6 (9.3)	98.3 (24.6)	0/0/0
Anita	PI	38.2 (7.9)	86.6 (23.9)	3/0/0
	IO	31.3 (12.6)	76.7 (21.1)	4/0/0
	NP	35.9 (13.0)	84.4 (36.1)	10/1/0
	IO	48.8 (6.1)	101.5 (18.6)	0/0/0

^a PI: preintervention, IO: instructions only, LK: blocking, NP: no paid practice, RC: relaxed criterion.

insure that the criterion for maximum number of incorrect characters typed would be exceeded. To reduce the effectiveness of this strategy with respect to maximization of pay, we relaxed the criterion for maximum number of incorrect characters typed from three (which carried a penalty of \$0.01) to 12 (which carried a penalty of \$0.05). Thus, relaxing the contingency reduced the overall rate of reinforcement for this pattern of responding.

Return to instructions only. Participants were exposed to the instructions-only condition after being exposed to the experimental conditions. The return to the instructions-only condition was identical to the procedures described above for the original instructions-only condition, except that the instructions were modified to refer to previous conditions.

Experimental design. A within-subject reversal design was used. Not all participants received all

treatment conditions due to time constraints. The order of conditions, productivity data, and technique review data are shown in Table 2.

RESULTS

Figure 2 shows the cumulative number of steps advanced on the keyboarding program as a function of technique review opportunities. In general, these data indicate that participants advanced through the typing program only during intervention conditions and that both interventions were successful in promoting progress through keyboard training. Anita advanced one step in the keyboarding program during the preintervention condition. No other participant advanced through the program during preintervention. During the first instructions-only condition, Anita progressed through several steps before progress through

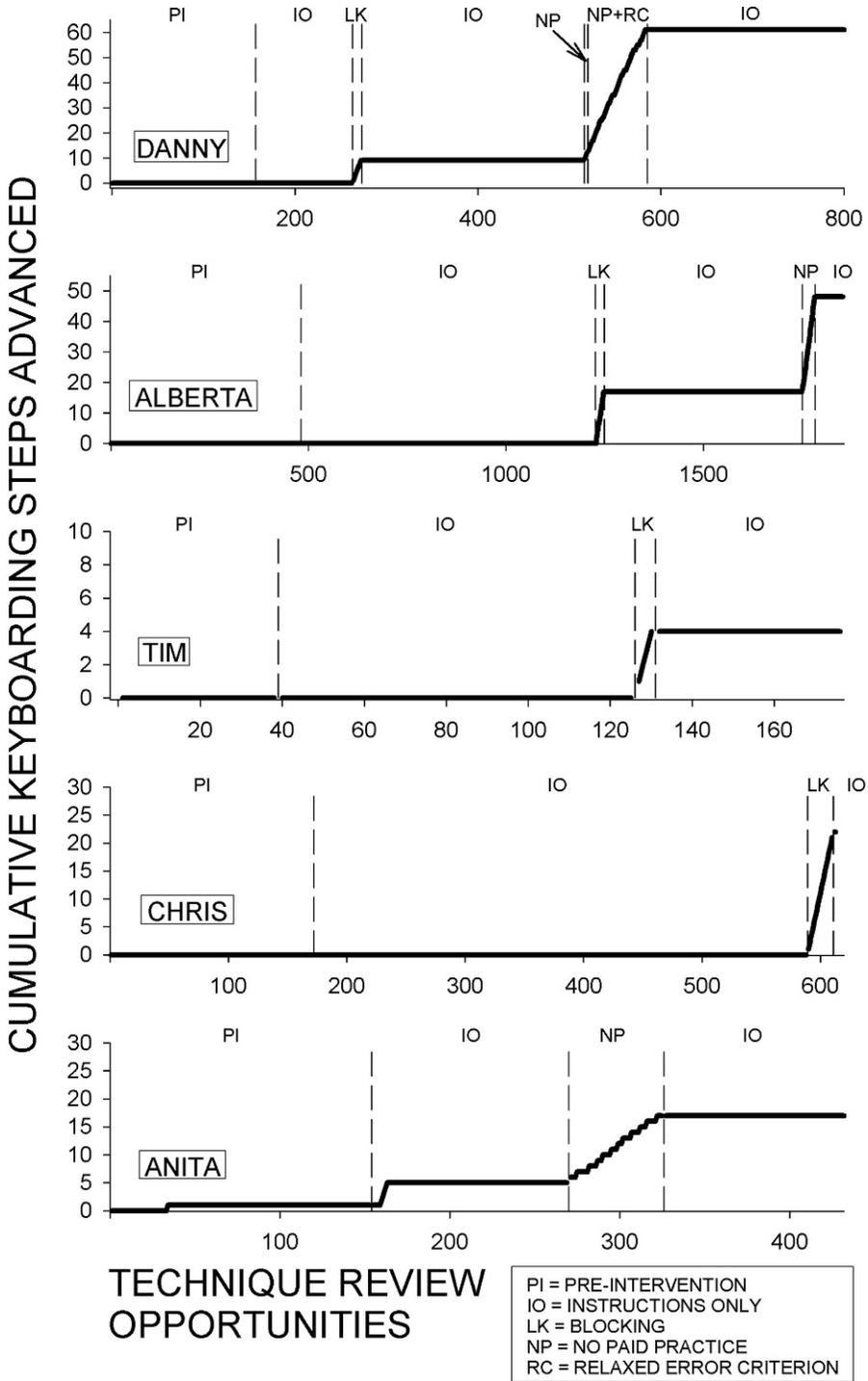


Figure 2. Cumulative typing steps advanced as a function of technique review opportunities. A technique review opportunity is any completed timing in which the participant met the mastery criteria for a step and produced a stop sign and an instruction to get staff for a technique review. Note different x-axis and y-axis scales for each participant.

the training program stopped for the remainder of the condition. No other participants advanced through the program during any instructions-only condition. This indicates that instructions were insufficient for promoting progress through the keyboard training program.

All participants progressed through typing steps during blocking and no-paid-practice conditions. All participants who experienced the blocking condition moved through the training program each time they satisfied mastery criteria on a step. Tim did not meet mastery criteria as frequently as the other participants and thus advanced through fewer steps than the others. Danny occasionally engaged in additional practice after achieving mastery during the no-paid-practice condition, and Alberta never engaged in unpaid practice. The step-like pattern visible in Anita's no-paid-practice condition indicates that she consistently practiced for brief periods after achieving mastery on a keyboarding step.

Figure 3 shows correct characters typed for each 1-min trial. During the preintervention and instructions-only conditions, each participant's rate of correct responding increased progressively to rates that substantially exceeded the criterion for correct responses. Participants began the preintervention condition with rates of correct responding well above the criterion level because the undesirable pattern of responses that halted their progress through the training program began prior to the beginning of the study; thus, they had already experienced extended practice on their respective starting steps. During the blocking and no-paid-practice conditions, participants generally did not reach high levels (i.e., levels substantially above the criterion) of correct responding. This indicates that extended practice on a single step was required for participants to achieve response rates that far exceeded the criterion for correct responses.

Figure 4 shows productivity pay per hour across sessions (days). These data correspond

well with those shown in Figure 3, indicating that number of correct characters typed per trial was the primary determinant of productivity pay for all participants. This is in part because of the relative consistency of the number of trials initiated per hour, a measure of work output (Table 2). Table 2 also shows that the blocking and extinction manipulations did not appreciably affect the number of minutes worked per day. Percentage of days attended showed no systematic relation to changes in experimental conditions (data not shown). Four of the 5 participants (Danny, Alberta, Tim, and Chris) almost exclusively opted to skip technique reviews throughout the entire experiment. Anita typically chose to take technique reviews and passed 17 of 18 attempts.

Taken together, Figures 2, 3, and 4 indicate that for these participants, repeated practice on single steps using specialized response topographies maximized the number of correct characters typed per trial and thus produced high levels of productivity pay, and Table 2 indicates that the lower levels of pay obtained during the blocking and extinction conditions were sufficient to maintain acceptable levels of work output and attendance.

DISCUSSION

This study shows that productivity payments can have powerful reinforcing effects on the behavior of unemployed adults with substance abuse problems. Participants in the present study appeared to engage in patterns of responding that were counterproductive to the development of keyboarding skills because these patterns increased their earnings in the therapeutic workplace. The key element of these patterns was engaging in repeated practice on a step in the presence of an instruction to get staff for a technique review. In all conditions in which the counterproductive pattern of responding could produce high rates of reinforcement, participants responded rapidly and

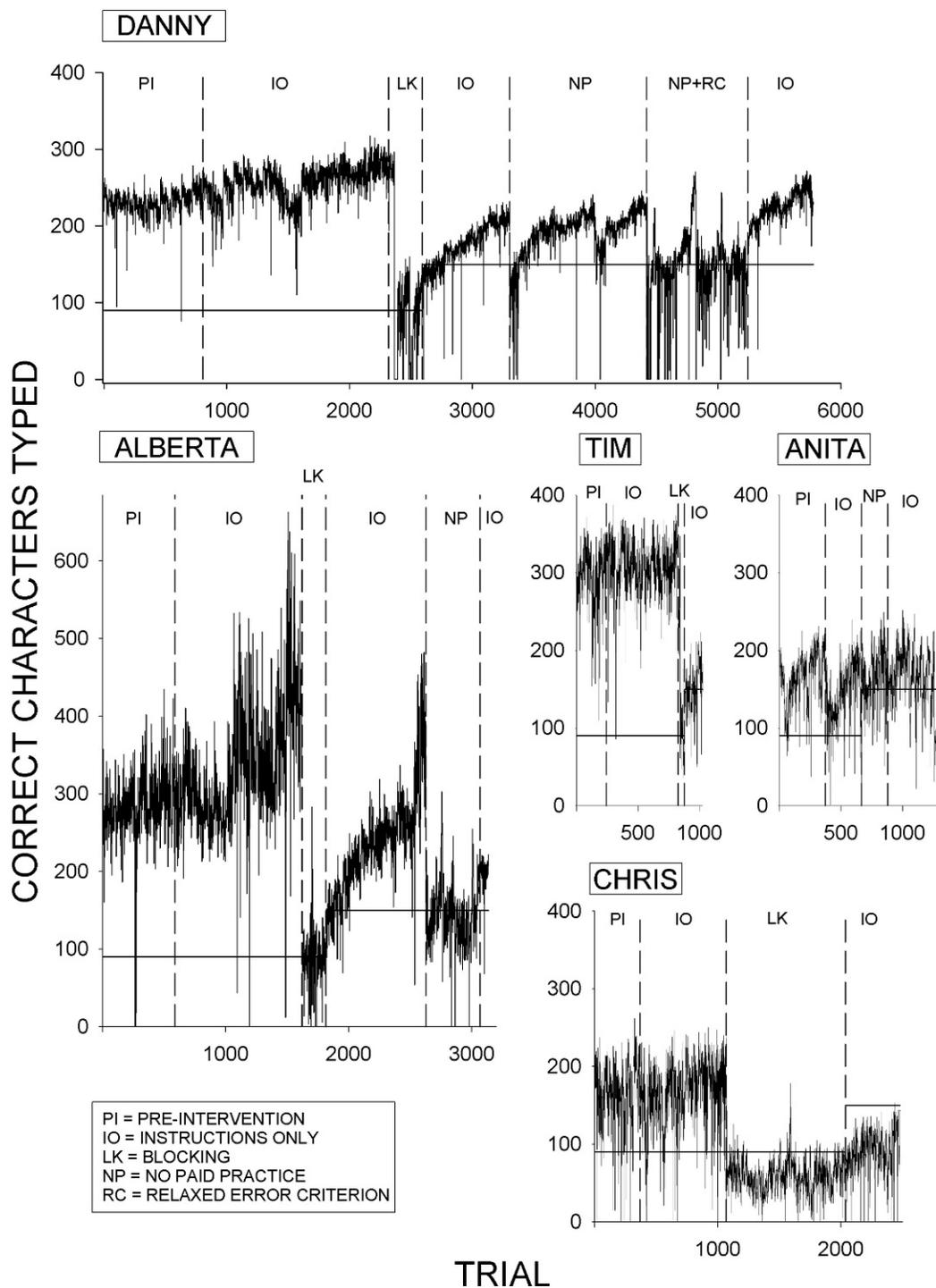


Figure 3. Number of correct characters typed for all 1-min keyboard training trials. The horizontal line on each graph shows mastery criteria for correct characters typed (maximum for each character set). Axis lengths are proportionally scaled.

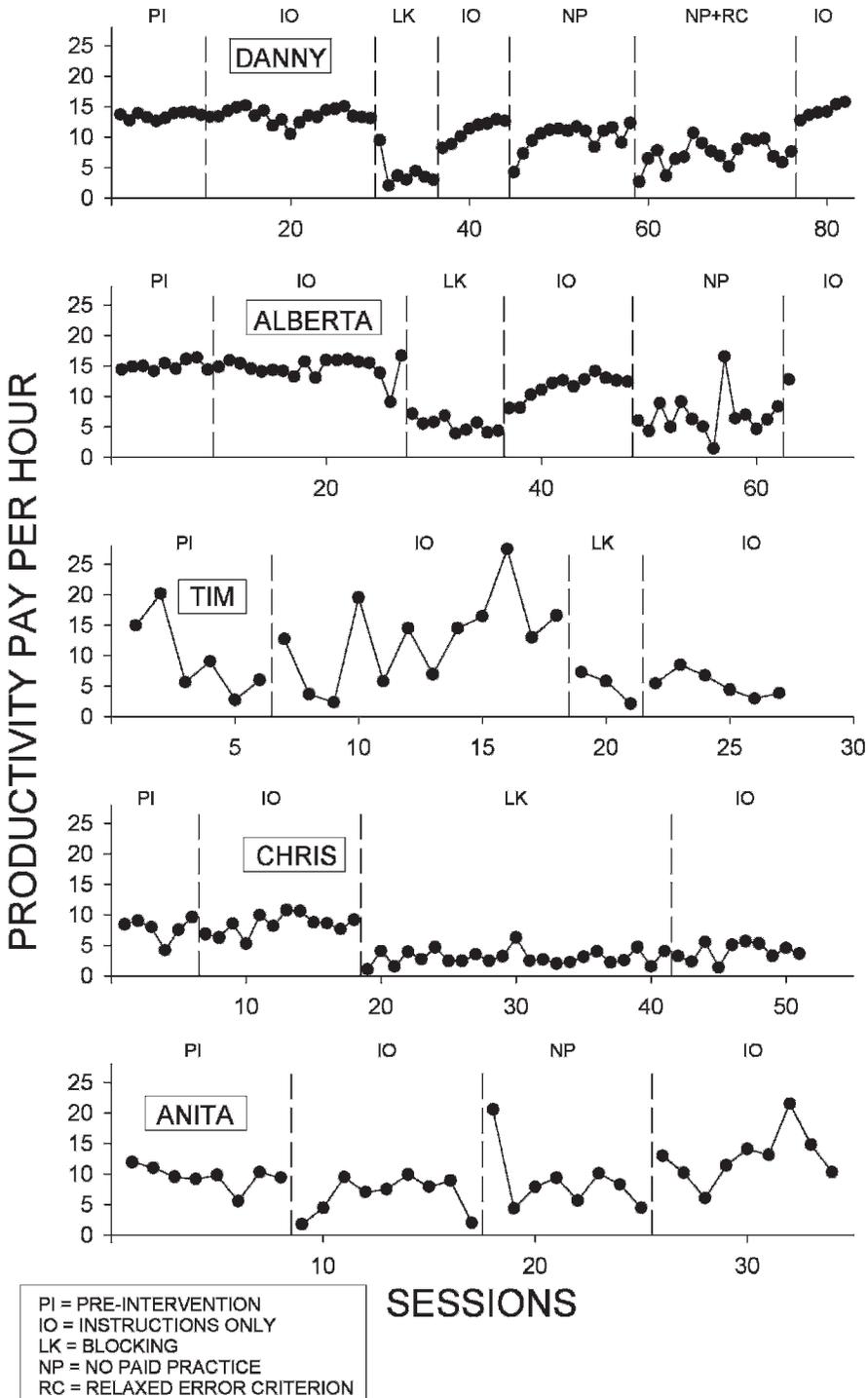


Figure 4. Productivity pay per hour in U.S. dollars earned on the typing training program for each participant. Productivity pay includes all vouchers earned for typing correct characters and typing step-completion bonuses, but does not include hourly wages.

ultimately (in most cases) far exceeded the criterion for correct responses on a step without advancing across steps. By contrast, in conditions in which counterproductive responding was either blocked or extinguished, participants progressed through the training program and exhibited substantially lower rates of correct responding. These results show that voucher earnings were essential for the maintenance of persistent practice on a step.

The contingencies operating during preintervention and instructions-only conditions, in which the behaviors that maximized earnings were not the same as behaviors that facilitated skill acquisition, are analogous to concurrent-operants arrangements commonly used to study response allocation across alternatives (e.g., Harding et al., 1999). The two alternative responses in this situation can be loosely described as “getting staff in the presence of the stop sign” and “pressing enter in the presence of the stop sign.” Potential reinforcers include voucher payments, improved keyboarding skills, and social praise delivered by staff.

In concurrent-operants arrangements, the schedule of reinforcement and quality of reinforcers play a critical role (Neef & Lutz, 2001). In the present case, it seems plausible to suggest that improved keyboarding skills and social praise delivered by staff were not reinforcers for the keyboarding behavior of our participants. If this is true, then vouchers are the only relevant reinforcer for the present analysis, and we are left with a symmetrical arrangement in which schedule of reinforcement (i.e., voucher delivery) and quality of reinforcers (vouchers in all cases) are the same across alternatives, and total obtained reinforcement is the critical determinant of choice (Fisher & Mazur, 1997). Because persistent repetition of a step allowed a higher rate of correct responses during timings, total obtained reinforcement was greater for persistently practicing a single step than for getting staff and progressing through the training program (Figure 4). Given the choice between

making more money by staying on a step or moving to the next step and making less money, they chose to stay on the more lucrative step. The \$0.25 bonuses available for passing technique review steps, although reasonable in light of the program’s targets for participants’ total hourly wages, were too small to overcome the large increases in rate of pay obtained by these participants while staying on a step. Thus, it may have been possible, but not necessarily practical, to increase participants’ rate of taking technique reviews by increasing the value of the bonuses or by decreasing the value of typing correct characters. It is interesting to note that of the 17 individuals who could have participated in the present study, 11 engaged in the target behavior at least occasionally. After the completion of the present study, the contingencies used in the no-paid-practice condition were put into place for all therapeutic workplace participants, independent of whether they had ever engaged in persistent practice of a step. This prevented any further occurrence of the problem.

Although it is preferable to avoid unwanted concurrent-operants situations by reconciling the economic interests of the trainees with the goals of training before the program begins, it may be difficult to predict the effects of all of the arranged contingencies on the behavior of all individuals in a workplace or classroom. Ongoing data monitoring and regular communication between staff and program designers (especially behavior analysts) increase the probability that undesirable behavior can be detected and addressed. As demonstrated by the present study, simple adjustments to a training program can have powerful effects on the behavior of trainees.

This study shows that voucher reinforcement, when properly arranged, can promote participation in and progress through training programs, even in reluctant learners. Contingency management programs such as the therapeutic workplace offer a way to improve traditional intensive education and training programs designed to treat unemployment and poverty.

Assessments of welfare-to-work programs suggest that outcomes are best for unemployed individuals in training programs when they earn formal certification such as a GED, but that formal certification is uncommon due to poor attendance and lack of progress in the programs (Bos et al., 2002; Hamilton, 2002; Hamilton et al., 2001). Furthermore, as demonstrated in the present study and elsewhere (e.g., Herman & Tramontana, 1971), instructions alone are often insufficient to produce behavior change. Careful application of contingency management techniques targeted at improving attendance and productivity could increase the rate of formal certification and produce better outcomes in intensive education programs.

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