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A Reinforcement-Based Therapeutic Workplace for the Treatment of Drug Abuse: Three-Year Abstinence Outcomes

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Long-term Therapeutic Workplace effects were evaluated in heroin- and cocaine-dependent, unemployed, treatment-resistant young mothers. Participants were paid to work or to train in the Therapeutic Workplace but had to provide drug-free urine samples to gain daily access. Participants ($N = 40$) were randomly assigned to a Therapeutic Workplace or usual care control group. Therapeutic Workplace participants could work for 3 years. Relative to controls, Therapeutic Workplace participants increased cocaine (28% vs. 54% negative; $p = .04$) and opiate (37% vs. 60% negative; $p = .05$) abstinence on the basis of monthly urine samples collected until 3 years after intake. The Therapeutic Workplace can be an effective long-term treatment of cocaine and heroin addiction in poor and chronically unemployed young mothers.

Drug abuse is often described as a chronic relapsing disorder (McLellan, Lewis, O'Brien, & Kleber, 2000). This conception derives from the observation that patterns of excessive drug use often recur despite interruption by periods of abstinence (Hser, Hoffman, Grella, & Anglin, 2001; Vaillant, 1966, 1973). Indeed, drug abuse persists in many individuals for years, sometimes for decades, and often until death. Through extraordinary studies tracking individual life histories of alcohol- (Vaillant, 1996) and heroin-dependent (Hser et al., 2001; Vaillant, 1966, 1973) individuals, investigators have documented that these patterns of use, abstinence, and relapse repeat over periods as long as 30 to 50 years. Detailed analyses of these addiction histories suggest that relapse to drug use is likely unless a person sustains very long periods of abstinence, perhaps as long as 5 years (Vaillant, 1996) and possibly much longer (Hser et al., 2001). In the case of heroin addiction, even a period of abstinence as long as 15 years does not reliably mark the end of an addiction career (Hser et al., 2001).

The common need for multiple treatment episodes in many drug-addicted individuals also reveals the persistent nature of drug addiction. Large-scale national studies of drug abuse treatment programs in the United States suggest that more than half of the patients in drug abuse treatment have received at least one prior drug abuse treatment episode, and many patients have had multiple prior episodes (Simpson, Joe, Fletcher, Hubbard, & Anglin, 1999). In the case of methadone treatment, rates of prior treatment may be more than 70%. Furthermore, these studies report that between 40% and 60% of drug abuse treatment patients relapse to drug use within a year following treatment discharge (Simpson et al., 1999). Other studies have reported that relapse rates may be even higher (Hunt, Barnett, & Branch, 1971).

Despite the chronic nature of drug addiction, most treatments seem designed to treat an acute problem and are brief by design; planned durations of different treatment modalities range, on average, from a few weeks to a year (Etheridge, Hubbard, Anderson, Craddock, & Flynn, 1997). However, the persistence of drug addiction and the propensity to relapse suggest that treatments should seek not only to initiate abstinence but also to sustain that abstinence over spans of time that are greater than those typically within the sights of the treatment or research community.

The present report describes continuing research into the development and evaluation of a novel treatment designed specifically to address the chronic, persistent nature of drug addiction. This treatment, called the Therapeutic Workplace, is an employment-based intervention that is rooted in an extensive body of research in operant conditioning and behavioral pharmacology (Bigelow & Silverman, 1999) and integrates abstinence reinforcement contingencies of proven efficacy (Higgins et al., 1991, 1994; Higgins, Wong, Badger, Ogden, & Dantona, 2000; Silverman, Chutuape, Bigelow, & Stitzer, 1999; Silverman et al., 1996, 1998) into an

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employment setting (Silverman, Svikis, Robles, Stitzer, & Bigelow, 2001a, 2001b). The critical features of this intervention are fairly simple: Drug abuse patients are hired and paid to work in the Therapeutic Workplace. To promote drug abstinence, participants routinely are required to provide drug-free urine samples to gain and maintain access to the workplace. In this way, participants can work and earn a salary but only as long as they remain drug abstinent. In essence, the intervention uses salary for work to reinforce drug abstinence. The intervention has two phases. In Phase 1, participants who lack job skills receive needed training. Skilled participants progress to Phase 2, during which they are hired to perform real jobs in an income-producing Therapeutic Workplace business. Throughout both phases of the treatment, the salary-based abstinence reinforcement is maintained. To the extent that the Therapeutic Workplace business is financially successful, employment and the associated salary-based abstinence reinforcement can be maintained indefinitely at little or no cost. A self-sustaining Therapeutic Workplace business potentially could serve not only to initiate drug abstinence but also to maintain abstinence over extended periods of time.

A prior study showed that the Therapeutic Workplace could initiate abstinence from heroin and cocaine in a population of pregnant or recently postpartum methadone patients who had failed to achieve sustained abstinence when exposed to a state-of-the-art drug abuse treatment for pregnant and postpartum women (Silverman et al., 2001a). However, that study did not examine whether long-term exposure to the Therapeutic Workplace could maintain abstinence over extended periods of time. Indeed, although a considerable body of research has shown that short-term exposure to abstinence reinforcement contingencies can initiate drug abstinence (Griffith, Rowan-Szal, Roark, & Simpson, 2000; Higgins & Silverman, 1999; Robles, Silverman, & Stitzer, 1999), virtually no studies have examined the effects of long-term, extended exposure to abstinence reinforcement contingencies. Some studies have shown that abstinence reinforcement contingencies can have lasting effects (Higgins et al., 2000). However, as with other drug abuse treatments (McLellan et al., 2000), relapse is common when short-term abstinence reinforcement contingencies lasting several weeks to several months are discontinued.

The present study sought to determine whether long-term exposure to the Therapeutic Workplace intervention could sustain drug abstinence over an extended period. This study was a continuation of the randomized controlled study described earlier that evaluated the effectiveness of the Therapeutic Workplace in initiating abstinence from heroin and cocaine in pregnant and postpartum methadone patients (Silverman et al., 2001a). In that study, methadone patients who continued to use heroin or cocaine during treatment in a comprehensive, interdisciplinary program specifically for pregnant and postpartum drug-addicted women were randomly assigned to a Therapeutic Workplace or usual care control group. Participants in the Therapeutic Workplace group were repeatedly re-enrolled in the Therapeutic Workplace in 6-month blocks. The prior study (Silverman et al., 2001a) reported the effects of the Therapeutic Workplace intervention during the first 6 months of treatment. The present study reports the effects of the intervention up to 3 years after treatment initiation.

Method

The method for the first 6 months of this study was described in a prior report (Silverman et al., 2001a). This method is summarized here briefly; additional details are available in the earlier report.

General Procedures

Screening and Intake Process

Study participants were enrolled from October 30, 1996 to January 21, 1998. Participants were patients receiving treatment at the Center for Addiction and Pregnancy (CAP; Jansson et al., 1996; Svikis et al., 1997), a comprehensive specialty treatment program for pregnant substance abusing women located at the Johns Hopkins Bayview Medical Center, Baltimore, Maryland. Interested patients signed an initial research screening consent form and participated in the screening process.

Inclusion–Exclusion Criteria and Study Consent

CAP patients were eligible for this study if they were between the ages of 18 and 50 years, were unemployed, were currently receiving methadone maintenance treatment, and provided at least one urine sample positive for opiates or cocaine during the 6 weeks prior to being reviewed for screening. Patients were excluded if they were considered at risk for suicide or had a psychiatric disorder that might disrupt their workplace functioning or limit their ability to provide informed consent (e.g., schizophrenia). Eligible patients were invited to provide written informed consent to participate in the main portion of the study for 6 months. All enrollees were then repeatedly offered re-enrollment in the study in 6-month blocks to examine the long-term effects of the Therapeutic Workplace intervention. Johns Hopkins Bayview Medical Center Institutional Review Board approved the protocol.

Experimental Design and Groups

Forty women who provided informed consent were randomly assigned to one of two groups, a Therapeutic Workplace group ($n = 20$) or a usual care control group ($n = 20$). There were no significant differences between the two groups on any measure assessed at intake to the study.

Outcome Assessments

The primary long-term outcome measures for this study were derived from assessments conducted once every 30 days (30-day assessments) for all participants in both groups beginning 18 months after treatment entry. To schedule those assessments, participants were contacted by phone, mail, or in person by outreach staff. To facilitate data collection, participants were provided cab transportation to and from the research unit. In addition, they were paid $30 in vouchers for each assessment. As in the voucher system described later, vouchers were exchangeable for goods and services purchased for the participants by staff. Whenever possible, in advance of the assessment, staff asked each participant what goods or services they would like to purchase with their voucher

earnings; the staff person would then purchase the item and have it immediately available for the participant on completion of the assessment. At each assessment a urine sample was collected along with several interviews and questionnaires as described later.

Urine collection and toxicology. The primary outcome measures for this study were derived from urine samples collected at the 30-day assessments and tested for opiates and cocaine. During the early months of the study, urine samples were collected three times per week. Results from analyses of those urine samples for the first 6 months of the study are reported in Silverman et al. (2001a). Three-time-per-week urine collection continued after the first 6 months; however, the high rates of dropout preclude the use of those urine samples for study purposes.

The long-term outcomes were assessed by collecting and testing urine samples at the 30-day assessments that began for all participants 18 months after treatment entry. The present study reports the results of those 30-day assessments for Months 18 through 36. Missing data were relatively rare for both groups of participants. On average, 89% of the scheduled urine samples were collected from participants in the usual care control group, and 81% were collected from participants in the Therapeutic Workplace group.

Urine samples were collected under procedures designed to ensure their validity. Staff directly observed the collection of all urine samples. Samples were provided directly into Commode Specimen Containers (Catalog #00077, Sage Products, Inc., Crystal Lake, IL) that were placed directly on the toilet. Samples were immediately temperature tested. Only samples between 94.0°F and 99.0°F were accepted as valid. All samples were tested for metabolites of cocaine (benzoylecgonine) and opiates (morphine) using OnTrak Abuscreen (Roche Diagnostic Systems, Montclair, NJ). The OnTrak identifies samples as positive for cocaine and opiates if metabolite concentrations are at or above 300 ng/ml. Samples collected every 6 months were tested by an outside laboratory for cocaine, opiates, codeine, methadone, meperidine, quinine, amphetamine, methamphetamine, hydromorphone, phenothiazines, phenmetrazine, pentazocine, amitriptyline–nortriptyline, hyroxyzine, doxepin, hydrocodone, phenobarbital, barbiturates, imipramine, desipramine, meprobamate, glutethimide, ethchlorvynol, phencylciline, propoxyphene, and benzodiazepines.

Questionnaires and interviews. At each 30-day assessment, three interviews covering the past 30 days were administered including the employment, alcohol and drug, and legal sections of the Addiction Severity Index follow-up (ASI; McLellan et al., 1985); an AIDS risk questionnaire (adapted from the Centers for Disease Control, 1992); and a 30-day employment history. The AIDS risk questionnaire asked 9 questions (yes–no) related to HIV risk in the past 30 days, including whether they had "shot up drugs," "shared needles," "taken drugs for sexual activities," "taken money for sexual activities," "had a sexual partner who shot-up drugs," "had a sexual partner who was bisexual," "had a sexual partner who had a blood disorder requiring frequent transfusions," "had a sexual partner who had AIDS or tested positive for the virus that causes AIDS," or "had a sexual partner who had sex with same sex partners." This questionnaire also asked whether they felt "at risk for contracting the virus that causes AIDS" and whether they had been tested for AIDS in the past 30 days. In addition, every 6 months, additional assessments were administered including the full ASI; a battery of computer questionnaires assessing drug, employment, and psychological factors; a questionnaire assessing the number of children of whom they have custody; a questionnaire asking about concomitant medication; and the SF 36 Health Survey (Ware, 1993). Participants earned $50 in vouchers for the 6-month assessments.

Therapeutic Workplace Intervention

Participants assigned to the Therapeutic Workplace group were invited to attend the Therapeutic Workplace 3 hr per day, Monday through Friday. Each day when a participant reported to the workplace, she was required to provide a urine sample (see collection and testing procedures previously mentioned). If the sample tested negative for opiates and cocaine, she was allowed to work that day. Participants who gained entrance to the workplace participated in basic skills education and job skills training throughout each 3-hr work shift. After completing the 3-hr work shift, patients received a base pay voucher. Patients could also earn vouchers for appropriate professional demeanor, for meeting daily learning aims, and for typing and data entry accuracy and productivity.

Education and Training

Participants were taught the skills that they would need to perform office data entry jobs. The focus on office data entry jobs and the inclusion of basic academic and job skills training was adopted on the basis of previous research on the occupational interests and academic skills of patients from the Center for Addiction and Pregnancy (Silverman, Chutuape, Svikis, Bigelow, & Stitzer, 1995). That research showed that most of this population were interested in obtaining a variety of office jobs but lacked many of the academic and job skills required to obtain and sustain those jobs. Participants received training in the Therapeutic Workplace in reading, arithmetic, writing, spelling, typing, number entry, and data entry.

The Therapeutic Workplace used two types of teaching procedures, Direct Instruction (Engelmann & Carnine, 1982) and fluency training (Johnson & Layng, 1992). Typing and numeric keypad entry were taught with an in-house computerized typing program. Finally, data entry training was provided in which participants were taught to enter printed alphanumeric data into computer spreadsheets. Training in the different areas was provided on the basis of the need of each participant and availability of staff to provide the needed training. One full-time bachelors-level staff person served as the teacher and was assisted when possible by part-time college students. Training was provided to a maximum of 13 participants at one time, although class size was typically fewer.

The Voucher Reinforcement System

Voucher reinforcement contingencies were arranged primarily to promote abstinence and to maintain workplace attendance. Additional modest voucher reinforcement was arranged to promote professional demeanor, learning, and productivity. Under the voucher system, patients earned monetary vouchers exchangeable for goods and services for a variety of defined behaviors as described later. The voucher system in this study was based on the procedures developed by Higgins and his colleagues (Higgins et al., 1991) and was adapted in previous studies with methadone patients (e.g., Silverman et al., 1999). Patients received paper vouchers showing the amount of voucher dollars earned. The paper itself was not negotiable but only served to inform the patient of the earnings. The amount printed on the voucher was electronically entered by staff into the patient's voucher account; patients could not directly access the account. When a patient wanted to make a purchase, they completed a paper purchase order and submitted it to the research staff. If there were sufficient voucher dollars in the patient's account, the staff went into the community to make the

requested purchase and deducted the amount of the purchase from the patient's voucher account. Patients could use earnings to order goods and services; restrictions were kept to a minimum. Purchases were made only if the item requested was for the patient or for a person in the patient's immediate family and if a verifiable receipt could be obtained. Earnings could not be used to purchase weapons, alcohol, or to pay for recently obtained traffic tickets or legal fines. To ensure consistent and relatively quick processing of purchase orders, the program policy required that if a participant submitted a purchase order to staff by Monday or Wednesday at 5:00 p.m., the item or service would be available for pickup by the participant by Wednesday or Friday at 1:00 p.m., respectively.

Reinforcement for abstinence and attendance. The majority of available voucher earnings were in base pay vouchers that were contingent on abstinence and workplace attendance. Patients earned base pay vouchers according to a schedule of escalating reinforcement for sustained behavior (cf. Higgins et al., 1991). Under the escalating reinforcement schedule, a patient received a voucher worth $7 on the 1st day they provided a drug-free (negative for opiates and cocaine) urine sample and completed a 3-hr work shift. An important feature of this schedule is that the value of the vouchers increased by $.50 for each consecutive successful day, to a maximum of $27 per day. If a patient either provided a drug-positive urine sample or no sample, or failed to attend the workplace on a scheduled workday, the value of the next day's voucher was reset to $7. After a patient's voucher value had been reset, the base pay voucher value increased to the highest level previously achieved after 9 consecutive days of sustained abstinence and workplace attendance.

Each patient was allowed 1 personal vacation day every 4 weeks. Patients could cumulate these days over successive 4-week blocks. Although patients were not paid for these days, the significance of this policy is that they could miss days without resetting the value of base pay vouchers under the escalating reinforcement schedule. Patients were free to take these days whenever they chose; approval by a staff member was not required. In addition, to allow for unavoidable absences due to illness or other emergencies (e.g., death in the family), the escalating pay for sustained behavior was not reset if the patient provided documentation by a physician that an absence was due to their own illness or an illness of a child, or if the patient provided documentation of another emergency (e.g., documentation of funeral). However, patients were required to provide a urine sample every Monday, Wednesday, and Friday, whether or not they worked on those days. If a patient failed to provide a urine sample on one of those days, the patient did not receive a voucher that day, and the value of the next voucher was reset to $7 as though she had provided a drug-positive urine sample.

Reinforcement for punctuality. An explicit reinforcement contingency for punctuality was arranged. To be considered in attendance at the workplace on a given day, a patient had to arrive at the workplace within 15 min of the scheduled start of the workday. A time clock was used to document the time patients entered the workplace. If a patient arrived late, the patient did not receive the base pay voucher for that day, and the value of their next base pay voucher was reset to $7. To provide some flexibility for unavoidable problems in getting to work, patients were allowed to arrive late to the workplace 1 day every 4 weeks without resetting the value of base pay vouchers. Patients could cumulate these late, not-reset days across 4-week blocks. Although patients did not receive base pay vouchers on days that they reported late to the workplace, they were allowed to work and to earn pay for professional demeanor, learning, and work productivity.

Reinforcement for professional demeanor. To promote professional demeanor, a schedule of differential reinforcement of other behavior (DRO; Favell, 1977) was used in which each patient could earn a $1 voucher for every 30-min period that elapsed without having engaged in any one of a list of unprofessional behaviors (i.e., cursing, eating food in the workplace, arguing in an unprofessional manner with staff or other patients, criticizing or harassing other patients, or sleeping in class). An additional $1 was available for appropriate professional demeanor whenever the patient was in the research unit between classes (i.e., during nonwork hours).

Over the months of operating the Therapeutic Workplace, it became clear that trainees periodically became agitated and verbally or physically aggressive, typically toward other participants. To address these problems, procedures for handling severe behavior incidents evolved over time. The following procedures describe the full program for management of severe and disruptive behavior that was ultimately developed. To discourage these behaviors, participants generally were encouraged to take a personal break and leave the area if they felt upset or on the verge of arguing with a fellow trainee or a staff member. However, if a trainee displayed hostile or aggressive behavior, the workroom supervisor quietly and as privately as possible would suggest that the offender take a 5-min personal break. If the trainee was still arguing after 1 min, the staff member would tell the trainee to leave the workplace premises for 30 min. If the trainee had not left the premises within 1 min of being told to leave, the staff person would tell the trainee that she must leave the workplace for the day and that she would not receive the day's base pay. If the trainee had not left the workplace premises within 1 min of being told to leave for the day, the staff would the tell the trainee that she had to leave for the day and that the value of her base pay vouchers would be reset to $7 per day (similar to the reset for providing a drug-positive urine sample). If the trainee had not left the workplace premises within 1 min of receiving the instructions about the base pay voucher reset, the workplace supervisor would call security to escort the trainee off of the hospital grounds. If a trainee engaged in particularly severe behavior, the staff member could advance immediately to any step in this sequence (e.g., to call security) that seemed appropriate.

Furthermore, to prevent such instances, trainees were provided with headphones and music compact discs that they could listen to on their computers while working on computer-based typing or keypad training programs or while doing data entry work. In addition, in an effort to prevent the loud talking that could escalate into argument, a procedure was adopted in which trainees and staff members were required to maintain a library mode of talking at all times while in the workplace. *Library mode* was defined as speaking at a volume low enough so that someone standing 10 ft away from you could not hear you well enough to transcribe or imitate the words, sounds, or noises you are saying or making. To promote the use of the library mode of talking, the workplace supervisor implemented the following procedure in as private a manner as possible if a trainee spoke in a volume that exceeded the library mode threshold. The first time in each 30-min period that a trainee violated the library mode, the workplace supervisor prompted the trainee to stop talking (e.g., by saying "Shhh" or "You're too loud"). If a trainee violated the library mode a second time in a 30-min period, the trainee lost the professional demeanor dollar for that 30-min period and the workplace supervisor prompted the individual(s) to keep the volume down and suggested that the offender(s) take a 5-min personal break.

Reinforcement for learning and productivity. Patients received $0.25 in vouchers for each daily learning aim they met. The

curriculum was designed so that participants should be able to meet approximately four learning aims per hour, thus earning $1 per hour. To provide additional payment for work on the typing program during practice timings, participants earned additional voucher pay for all correct characters typed ($0.03 for every 100 correct characters); to promote typing accuracy, participants lost voucher pay for every incorrect character typed (–$0.01 for every 10 incorrect characters). To provide voucher payment for data entry work, patients earned $1 in vouchers for each batch of data completed. A batch of data included approximately 25 printed pages, containing about 3,500 characters that had to be entered into an Excel spreadsheet. To discourage errors, $0.02 was subtracted from that $1 for every incorrect character in the batch. For a batch completed with four errors, for example, the patient would earn $0.92. To provide further reinforcement for work productivity, patients earned 10 min of paid vacation for every batch completed, minus 12 s per error. The batch completion bonus was increased to $10 per batch for a period of about 1 month in a within-subject study design to examine the effects of increasing reinforcement magnitude on data entry productivity. The results of that study will be reported elsewhere.

Off-site employment. At various times during the first 3 years of the study, 3 participants obtained employment in the community that precluded attending the Therapeutic Workplace. To maintain abstinence in those participants, we continued to collect urine samples from them every Monday, Wednesday, and Friday and agreed to pay them base pay vouchers (as described earlier) if they continued to work 3 hr per day or 15 hr per week in their community job and continued to provide urine samples negative for opiates and cocaine. Urine samples were collected at the site of the Therapeutic Workplace on Monday, Wednesday, and Friday of each week using the urine collection procedures described earlier. Off-site workers were considered abstinent from opiates and cocaine on Tuesday if their urine samples on Monday and Wednesday were drug negative; they were considered abstinent on Thursday if their urine samples on Wednesday and Friday were drug negative. Because participants chose not to inform all employers of our voucher contingency, verification of off-site employment was difficult and had to be adapted for different individuals and for different jobs. The methods to verify off-site employment included requiring participants to bring paychecks or pay stubs that verified the hours worked and their total pay, arranging to call or visit the participant at the place of employment on a random schedule, or having the employer sign a form detailing the hours that the participant worked. Three participants had some off-sight employment: S33 had 42 weeks of off-site employment, S18 had 48 weeks, and S12 had 39 weeks.

Data entry business. In April 2000, a Phase 2 data entry business was opened and began employing successful Phase 1 Therapeutic Workplace participants. Some of the participants in this study had been in the Therapeutic Workplace for more than 3 years by that time, and so for those participants the procedures and details of the Phase 2 Therapeutic Workplace data entry business are not relevant to the present report, which focuses on the first 3 years of Therapeutic Workplace participation. Five participants (S16, S27, S33, S44, and S45) reached their 3-year anniversary after the Phase 2 data entry business was opened. As a result, those individuals spent between 2 and 21 weeks (2, 21, 6, 18, and 15 weeks, respectively) in the Phase 2 data entry business during their first 3 years in the study. Because of the minor relevance of the Phase 2 data entry business to this report, the procedures of that phase are described only briefly here; a more extensive description of the Phase 2 data entry business will be reported elsewhere.

The Phase 2 data entry business is a nonprofit business that provides data entry services for a fee to researchers. The Therapeutic Workplace participants were hired into this business to serve as data entry operators. The operators entered information, typically hand-written or printed on paper data forms or surveys, into a custom double-data entry software application. The data forms were divided into batches designed to require about 1 hr to enter for each operator. Two operators independently entered each batch of data. After both entries were completed, a staff person used the custom software to compare the data entered by the two operators. The software identified all discrepancies and the staff person referred to the original raw data forms to determine, for each discrepancy, which operator was correct and to create a final corrected data file. Participants in this business were hired as Johns Hopkins University temporary employees and paid through standard payroll checks every 2 weeks. Participants were invited to work 6 hr per day, 5 days per week and were paid $5.25 per hour for all hours worked. In addition, participants earned $5 per batch of data entered minus $0.08 for every character entered incorrectly in the batch.

Data Analyses

The two groups were compared on various measures collected at the monthly assessments conducted from 18 to 36 months after treatment entry. For continuous variables, the two groups were compared using *t* tests. For dichotomous variables, the two groups were compared using chi-square tests. Statistical tests were two-tailed and considered significant at $p < .05$. Effect sizes ($d = .80$, $\alpha = .05$) for the primary outcome measures were calculated (Cohen, 1988).

Although most urine samples were collected, some samples from both groups were not (11% for controls and 19% for Therapeutic Workplace participants). In the primary analysis, all missing urine samples were considered positive ("missing positive"). However, because the results for those missing samples cannot be known, a secondary analysis was conducted using another method for handling the missing data. In the secondary analysis, missing samples were considered positive for a given drug only if a sample provided immediately before or after the missing sample (or missing group of samples) was positive for that drug ("missing values interpolated"); other missing samples were considered negative.

Similar analyses were conducted for the self-reports of drug use on the ASI. For every 30-day assessment, a participant was considered positive for a given drug (opiates or cocaine) if the participant reported using that drug in the past 30 days. As with the urinalysis data, because participants did not complete all ASI interviews, two different methods were used to handle the missing self-report data. In one set of analyses, a participant was considered positive for opiates and for cocaine on months that the participant failed to provide a self-report of drug use ("missing positive"). In the second set of analyses ("missing values interpolated"), if a participant failed to complete an ASI interview on a given month, the participant was considered positive for a drug only if the participant reported using that drug in the ASI interview conducted in the month before or the month after the missing self-report (or missing group of self-reports); other missing self-reports were considered negative.

Results

Cocaine and Opiate Use

The top portion of Table 1 shows the mean percentage of urine samples that were negative for cocaine, opiates, and

Table 1
Mean (and Standard Error) Percentage of Months Abstinent From 18 to 36 Months

Measure	Control (n = 20)		Therapeutic Workplace (n = 20)		$t(38)$	p
	M	SE	M	SE		
Urinalysis						
Missing positive[a]						
Cocaine	28	8	54	9	2.08	.04
Opiate	37	8	60	8	2.04	.05
Both	26	8	50	9	1.97	.06
Missing interpolated[b]						
Cocaine	30	8	54	9	1.95	.06
Opiate	43	9	62	8	1.58	.12
Both	27	8	50	9	1.83	.07
Self-report						
Missing positive[a]						
Cocaine	30	8	55	9	1.99	.05
Opiate	38	8	60	8	2.01	.05
Both	27	8	49	9	1.83	.07
Missing interpolated[b]						
Cocaine	32	9	63	9	2.49	.02
Opiate	44	9	63	8	1.64	.11
Both	28	9	52	9	1.91	.06

Note. Results are based on the urine samples and Addiction Severity Index (ASI) interviews conducted once per month from 18 to 36 months after study entry. Abstinence for the urinalysis and self-report measures was determined independently. The control and Therapeutic Workplace groups were compared with t tests.
[a]Participants were not considered abstinent at a given time point if they failed to provide a scheduled urine sample or if they failed to complete a scheduled ASI interview. [b]Participants were considered abstinent at a given time point only if they were considered abstinent in the months before and after the month (or group of months) with the missing urine sample(s) or ASI interview(s).

both drugs for the two groups. The primary analyses, in which missing samples were considered positive, are shown in the top three rows of data in the table. These data show that patients in the Therapeutic Workplace group had significantly higher rates of urine samples negative for cocaine (t = 2.08, p = .04, d = .67) and for opiates (t = 2.04, p = .05, d = .64). The direction of the differences between groups was the same for the secondary "missing interpolated" analyses, although the differences were not significant. Of all of the urine samples scheduled in the study (380 per group), 89% and 81% were collected for the control and Therapeutic Workplace groups, respectively. The bottom portion of Table 2 shows that similar patterns of results were obtained from analyses of participants' self-report of cocaine and opiate use, a consistent superiority of the Therapeutic Workplace condition that only occasionally achieved statistical significance.

Significantly more Therapeutic Workplace participants provided cocaine-negative, $\chi^2(1, N = 40) = 4.33$, p = .04, and opiate-negative, $\chi^2(1, N = 40) = 4.33$, p = .04, urine samples at all time points than control participants (Table 2, "missing positive analysis"). As shown in Figure 1, only one (S32; 5% of participants) usual care control participant achieved complete cocaine abstinence (i.e., 100% cocaine-negative urine samples); in contrast, 6 Therapeutic Workplace participants (S33, S27, S20, S18, S16, and S15; 30% of participants) achieved this outcome. As shown in Table 2, the results for the "missing interpolated" analyses were in the same direction as the "missing positive" analyses, although the differences were not statistically significant. Analyses of the self-report data were consistent with the analyses of the urinalysis data, although the comparison for cocaine ("missing positive") reached the accepted significance level.

Twelve (60%; S8, S47, S31, S6, S10, S53, S34, S56, S54, S43, S30, and S22) of the usual care control group participants never provided cocaine-negative urine samples on more than one consecutive monthly assessment; in contrast, all but 4 (20%; S39, S38, S17, and S4) of the Therapeutic Workplace participants provided 2 or more months of consecutive cocaine-free urine samples. The rates of patients who provided no cocaine-negative urine samples were about the same for the usual care control and Therapeutic Workplace groups (5 and 4 participants, respectively). The right panels of Figure 1 show that the patterns of opiate abstinence for the two groups were similar to the patterns of cocaine abstinence.

Although both groups provided most of the scheduled urine samples, participants in the Therapeutic Workplace

Table 2
Percentage of Participants Abstinent at All Time Points

Measure	% participants		χ^{2c}	p
	Control (n = 20)	Therapeutic Workplace (n = 20)		
Urinalysis				
Missing positive[a]				
Cocaine	5	30	4.33	.04
Opiates	5	30	4.33	.04
Both	5	25	3.14	.08
Missing interpolated[b]				
Cocaine	15	30	1.29	.26
Opiates	10	30	2.50	.11
Both	10	25	1.56	.21
Self-report				
Missing positive[a]				
Cocaine	5	30	4.33	.04
Opiates	10	25	1.56	.21
Both	5	20	2.06	.15
Missing interpolated[b]				
Cocaine	10	35	3.58	.06
Opiates	15	35	2.13	.14
Both	5	25	3.14	.08

Note. Results are based on the urine samples and Addiction Severity Index (ASI) interviews conducted once per month from 18 to 36 months after study entry. Abstinence for the urinalysis and self-report measures was determined independently.
[a]Participants were not considered abstinent at a given time point if they failed to provide a scheduled urine sample or if they failed to complete a scheduled ASI interview. [b]Participants were considered abstinent at a given time point only if they were considered abstinent in the months before and after the month (or group of months) with the missing urine sample(s) or ASI interview(s). [c]df = 1, N = 40.

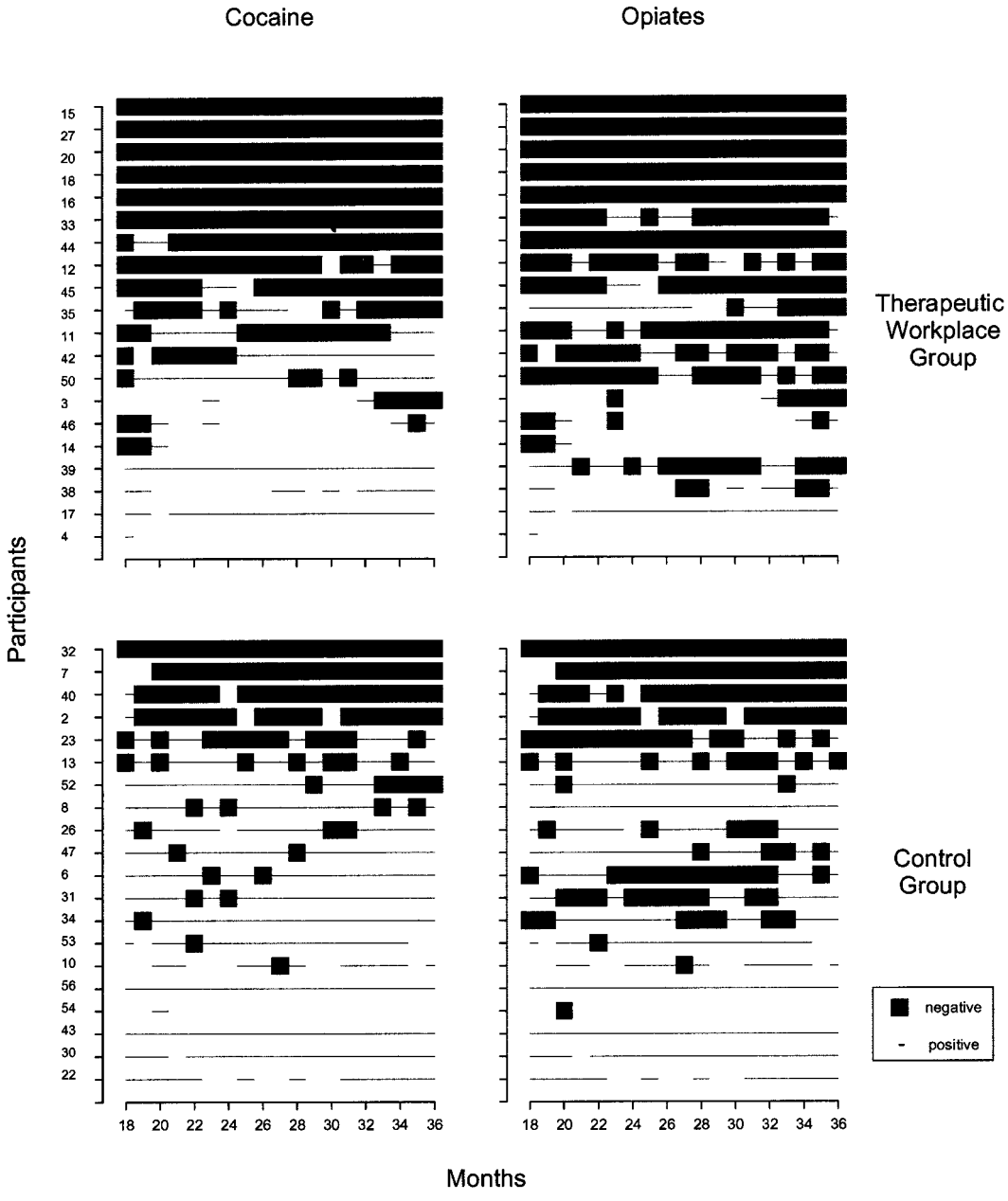

Figure 1. Urinalysis results for each of the monthly urine samples collected from 18 to 36 months after treatment entry. Cocaine and opiate urinalysis results are shown in the left and right panels, respectively. Results for the Therapeutic Workplace and usual care control groups are shown in the top and bottom panels, respectively. Each horizontal row of results represents the results for a different individual. The numerals on the left-most ordinates represent participant numbers. The participant numbers are the same ones used in Silverman et al. (2001a). Solid squares represent drug-negative urinalysis results, thin lines represent drug-positive results, and blank spaces represent instances in which the participant did not provide a urine sample (i.e., missing urine samples). Within the Therapeutic Workplace and control groups, participants are arranged from those with the most cocaine abstinence on the top to those with the least cocaine abstinence on the bottom.

group had more missing samples than control participants. As reflected in Figure 1, 4 of the Therapeutic Workplace participants (S3, S46, S14, and S4) could not be found or contacted for extended periods of time; one of those participants (S4) moved to another state and another (S3) temporarily asked not to be contacted for assessments. In contrast, only 1 control group participant (S54) could not be found or contacted for an extended period of time.

Table 3 shows secondary measures of HIV risk behaviors, employment and welfare participation, income, illegal activity, and other treatment services for participants in both groups collected in the monthly outcome assessments. For the most part, the Therapeutic Workplace contingencies did not directly target the measures in this table. As a result, differences between the two groups on these measures were possible, but they were not anticipated. The only measure on which the control and Therapeutic Workplace groups differed significantly was the percentage of participants who reported never injecting drugs or smoking crack/cocaine throughout all the monthly assessments. Only 10% of control participants reported never injecting drugs or smoking crack/cocaine, whereas 45% Therapeutic Workplace participants reported never doing so ($p = .01$).

The data in Table 3 also provide interesting information on important aspects of the lives of the study participants. One quarter of control participants reported trading sex for money or drugs at one or more of the monthly assessments. Employment was extremely rare in both the control and Therapeutic Workplace groups, and total income was well within the poverty range ($8,340 and $9,288 per year, respectively). The vast majority of participants in both groups received public assistance (i.e., welfare benefits). Control participants reported spending $228 per month on drugs, on average, an amount representing one third of their total reported monthly income. Both groups reported relatively high rates of involvement with the criminal justice system. For example, 35% and 25% of participants in the control and Therapeutic Workplace groups, respectively, reported being arrested at some point during the assessment months. A substantial proportion of participants in both groups received methadone during their participation in the study. On average, 60% and 75% of urine samples provided every 6 months by the control and Therapeutic Workplace groups, respectively, tested positive for methadone. On those 6-month assessments, urine samples were tested for other drugs (see list mentioned earlier), but no more than 5% of the samples tested positive for any of the other drugs except cocaine, opiates, and quinine.

Therapeutic Workplace Attendance

Figure 2 shows patterns of workplace attendance across the 3 years of the study for each of the 20 Ther-

Table 3
Secondary Measures From 18 to 36 Months

Secondary measure	Control ($n = 20$)	Therapeutic Workplace ($n = 20$)	$t(38)$	χ^{2d}	p
% of HIV/AIDS risk behaviors					
Injected drugs[a]	65	35		3.60	.06
Smoked crack	45	50		0.10	.75
Injected drugs or smoked crack[a]	90	55		6.14	.01
Shared needles or injection equipment[b]	10	10		0.00	1.00
Traded sex for drugs or money[b]	25	10		1.56	.21
Employment and welfare					
Mean % of months employed full-time (±*SE*)	4% (4)	11% (7)	0.89		.38
Mean no. of days employed per month (±*SE*)	0.86 (1.0)	4.39 (2)	1.53		.13
% received public assistance	85	95		1.11	.29
Mean monthly income (±*SE*)					
Employment income	$46 (93)	$161 (83)	0.92		.36
Public assistance income	$338 (71)	$496 (70)	1.58		.12
Illegal income	$97 (135)	$9 (22)	0.64		.52
Total income	$695 (182)	$774 (96)	0.39		.70
Illegal activity					
Mean amount of money spent on drugs/month (±*SE*)	$228 (113)	$104 (53)	0.98		.33
% engaged in illegal activities	20	10		0.78	.38
% detained or incarcerated	35	20		1.13	.29
% on parole or probation	25	40		1.03	.31
% arrested	35	25		0.48	.49
Mean (±*SE*) for other treatment					
Days in outpatient treatment	3 (2)	6 (3)	0.75		.46
Days of methadone use	16 (3)	23 (3)	1.52		.14
% methadone positive[c]	60 (11)	75 (10)	1.10		.28

Note. All measures collected from the Addiction Severity Index (ASI) unless otherwise noted. For continuous measures, the groups were compared using *t* tests. For dichotomous measures, the groups were compared using chi-square tests.
[a]Based on AIDS risk questionnaire and ASI. [b]From AIDS risk questionnaire only. [c]Based on urine samples collected and tested every 6 months. Missing samples were considered positive only if the sample before or after the missing sample or missing group of samples was positive. [d]$df = 1$, $N = 40$.

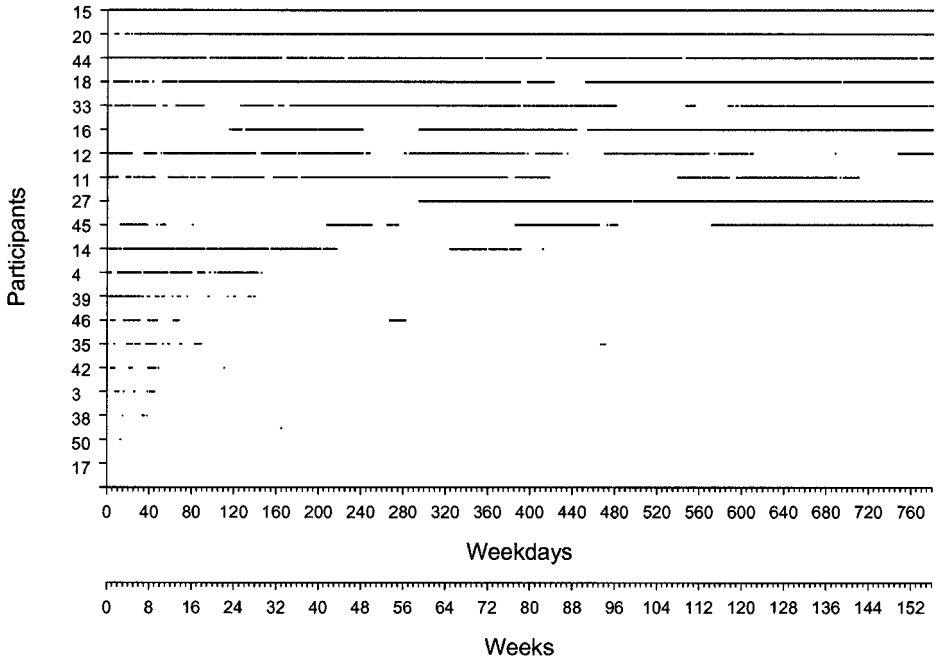

Figure 2. Days in attendance in the Therapeutic Workplace across consecutive weekdays for each of the 20 Therapeutic Workplace participants. Each horizontal line represents the attendance results for a different individual across consecutive weekdays during the study. The numerals on the ordinates represent participant numbers. The solid portions of lines indicate that the participant attended the workplace on that day. Participants are arranged from those with the most (on the top of the figure) to those with the least attendance (on the bottom of the figure). Patients were considered in attendance if they attended and completed a work shift or if they had an excused absence (e.g., standard program vacation day, personal day, or sick day with note from physician). Monday, Wednesday, or Friday absences were not considered excused unless a urine sample for that day was provided and was negative. Three participants (S33, S16, and S12) had off-site employment included in this figure. Because patients were required to provide drug-free urine samples to gain access to the workplace each day (and on Monday, Wednesday, and Friday of each week even if they took a personal or sick day), continuous solid lines also show consecutive days of abstinence. In addition to showing patterns of attendance and abstinence, a break in a line shows where the voucher value for a patient was reset.

apeutic Workplace participants. The figure shows that 12 (60%) of the participants (S15, S20, S44, S18, S33, S16, S12, S11, S27, S45, S14, and S4) maintained periods of sustained attendance (i.e., interrupted by no more than occasional brief absences) of 6 months or more. Three (15%) of the participants initiated their longest period of sustained workplace attendance many months after their initial invitation to attend the Therapeutic Workplace: S16 began attending the workplace for the first time almost 6 months after the start of her program; S27 began her participation more than 1 year after her program started; although S45 attended the workplace sporadically at various times throughout her 3-year program, she did not sustain extended attendance until more than 2 years after the start of her program. On average, the 20 Therapeutic Workplace participants attended the workplace on 43% of the 780 weekdays in the 3-year period. At the end of the 3-year period, 9 of the 20 participants (45% of participants; S15, S20, S44, S18, S33, S16, S12, S27, and S45) were attending the workplace consistently.

Correlation Between Attendance and Abstinence

A Pearson correlation coefficient was calculated for the 20 participants in the Therapeutic Workplace group between the percentage of days that each person attended the workplace and the percentage of urine samples collected during the 30-day assessments that were negative for both opiates and cocaine. As shown in Figure 3, attendance and drug abstinence were highly correlated ($r = .91$, $df = 18$, $p < .001$).

Voucher Earnings

On average, participants earned $53.67 per week in vouchers. Most of the earnings were derived from base pay ($42.89 per week, on average); the remainder was earned from professional demeanor ($7.96 per week, on average) and performance (meeting learning aims, data entry productivity pay, and typing; $2.81 per week, on average) pay. The proportions of pay earned from the different sources were similar across participants.

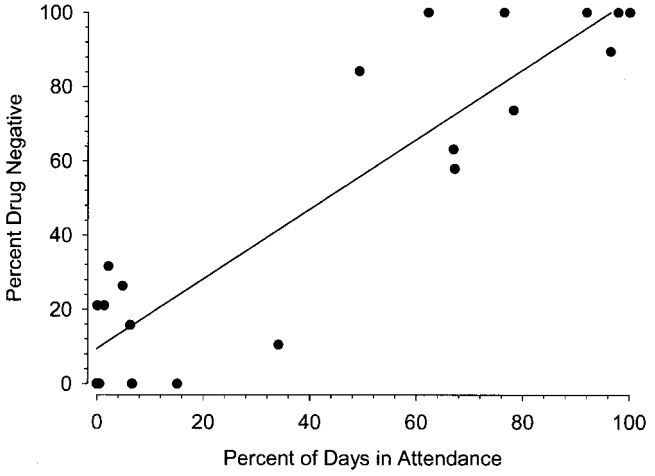

Figure 3. Relationship between percentage of days in attendance at the Therapeutic Workplace and percentage of urine samples that were negative for opiates and cocaine in 30-day assessments for each of the 20 Therapeutic Workplace participants. Patients were considered in attendance if they attended and completed a work shift or if they had an excused absence (e.g., standard program vacation day, personal day, or sick day with note from physician). Monday, Wednesday, or Friday absences were not considered excused unless a urine sample for that day was provided and was negative. Urinalysis results are from the monthly urine samples collected from 18 to 36 months after treatment entry. A sample was considered negative only if the sample tested negative for both opiates and cocaine. Missing samples were considered positive.

Discussion

This study provides a unique and extended view of the nature and persistence of heroin and cocaine addiction in a group of poor and chronically unemployed women over a 3-year period and of the potential of the Therapeutic Workplace intervention to produce a lasting change in their drug use. Participants in this study were originally identified and selected because they failed to stop their use of heroin and cocaine when exposed to a comprehensive and intensive state-of-the-art substance abuse treatment program for pregnant and postpartum women (Jannson et al., 1996). Without exposure to the Therapeutic Workplace, control participants continued high rates of heroin and cocaine use throughout the 3-year study period. Seventy-three percent of the urine samples collected in the last half of this 3-year study tested positive for opiates or cocaine (see Table 1 and Figure 1), essentially the same rate observed during the first 6 months of the study (Silverman et al., 2001a). Only one of the 20 control participants (5%) provided evidence of continuous abstinence from cocaine and opiates throughout the assessment period of this study (see Table 2 and Figure 1). Behaviors that increased participants' risk of acquiring HIV infection were alarmingly common: Ninety percent of participants in the control group reported injecting drugs or smoking crack/cocaine during the assessment period, and 25% reported trading sex for drugs or money (see Table 3). These data on the control group show that despite extended prior involvement in the drug abuse treatment system, including exposure to a state-of-the-art drug abuse treatment for pregnant and postpartum women, the cocaine and heroin addictions of the study population were highly persistent and refractory to standard treatment. In addition, these women had young children who were born at the start of this study and who were also at considerable risk as a result of their mothers' continued drug use. This population is clearly in need of a different and more effective drug abuse treatment approach than is currently being provided in their community.

Long-term exposure to the Therapeutic Workplace appeared to produce increases in cocaine and heroin abstinence that were maintained for 3 years. Therapeutic Workplace participants had almost twice the rate of cocaine-negative and opiate-negative urine samples during the monthly assessments (see Table 1; 54% and 60%, respectively) than control participants (28% and 37%, respectively). In addition, six times as many Therapeutic Workplace participants (see Table 2; 30% of participants) showed evidence of continuous abstinence from cocaine and opiates throughout the 19-month assessment period compared with control participants (5% of participants). In the final month of the 3-year period, only 25% of control participants were abstinent from cocaine, and only 25% were abstinent from opiates (see Figure 1). In contrast, in that month, 55% of Therapeutic Workplace participants were cocaine-abstinent, and 60% were opiate-abstinent (see Figure 1), abstinence rates that were more than double those of the control group. Consistent with these results, 4.5 times as many Therapeutic Workplace participants as controls reported never injecting drugs or smoking crack/cocaine during the assessment period (see Table 3; 45% vs. 10% of participants, respectively). Comparison of abstinence outcomes between the Therapeutic Workplace and control groups provides the primary basis for concluding that the Therapeutic Workplace intervention increased abstinence. However, additional support is provided by the data showing that only participants in the Therapeutic Workplace group who attended the workplace with some consistency achieved substantial periods of abstinence; participants in this group who never or very rarely attended the Therapeutic Workplace failed to achieve much abstinence at all (see Figure 3). Overall, the study provides good evidence that the Therapeutic Workplace intervention can serve as a long-term maintenance therapy that can sustain abstinence from cocaine and heroin over extended periods.

The effects of the Therapeutic Workplace intervention were evident despite the relatively small sample size used in this study ($N = 20$). The intervention had a medium effect size based on the primary outcome measures of cocaine and opiate use (Cohen, 1988). Although significant effects were not observed on all measures, consistency in the direction of the between-group differences based on primary (urinalyses with missing samples considered positive) and secondary (urinalyses with results of missing samples interpolated and self-reported use of cocaine and opiates) measures of drug use provide some additional support for the conclusions regarding the efficacy of the Therapeutic Workplace inter-

vention. However, the fact that statistically significant differences between groups were mainly restricted to the primary measures diminishes confidence in these conclusions to some extent.

Careful review of the patterns of attendance in the Therapeutic Workplace over the full 3-year period reveals important information as to how this treatment produced its effects. Over the 3 years of this evaluation, Therapeutic Workplace participants attended 43% of the possible workdays, an attendance rate virtually identical to the 45% of workdays attended during the first 6 months of treatment (Silverman et al., 2001a). Inspection of patterns of workplace attendance of all of the individual participants over the 3-year period (see Figure 2) shows that a little less than half of the participants maintained fairly consistent attendance throughout most of the 3-year period. However, this long-term view shows that treatment response is not a dichotomous outcome for individual patients. Although some participants (S15, S20, S44, and S18) appeared responsive to the treatment from the outset and attended the workplace and maintained abstinence from cocaine and opiates throughout the entire 3-year period, several participants showed delayed response to the intervention (S16, S27, S45). Participants S16 and S27 appeared completely unresponsive to the intervention during the first 6 and 12 months, respectively, and S45 appeared only partially responsive during the first 2 years. But these individuals later initiated long periods of sustained attendance and abstinence, lasting nearly 1 (S45) and 2 (S16 and S27) years. The results in these individuals suggest that offering participation in the Therapeutic Workplace over extended periods of time, even to persons who do not become engaged in treatment initially, may be therapeutically valuable and increase the proportion of patients that respond to the intervention.

Participants in the present study remained in the Phase 1 training phase of treatment for periods exceeding 2 and 3 years. These durations of Phase 1 participation were considerably longer than should be required to prepare individuals to serve as data entry operators in a Phase 2 data entry business. The durations of Phase 1 participation were exceedingly long in the present study for two reasons. First and foremost, the Phase 2 data entry business was not established until April 20, 2000. As a result, even highly trained participants could not advance beyond Phase 1 until that time. Second, Phase 1 training focused on a wide range of academic and job skills, including reading, spelling, writing, math, typing, and data entry. In recent new cohorts of Therapeutic Workplace participants, training has been highly focused to teach only those skills critical to performing data entry jobs. Most participants in the recent groups who have stayed engaged in treatment have become highly proficient data entry operators when only given training in typing, keypad number entry, and data entry. Although required training durations have not been fully determined, it appears that most chronically unemployed heroin- and cocaine-dependent adults can complete Phase 1 training within a 2- to 8-month period. In future cohorts, we will investigate methods to reduce the Phase 1 training duration even further.

Beyond their substance abuse problems, this population of women suffers from chronic unemployment and poverty. Nearly all participants had been engaged with the Department of Social Services as welfare recipients (see Table 3), with all the attendant services and pressures to obtain employment and leave the welfare rolls. Yet, unemployment remained a severe and chronic problem throughout the 3-year period of this study. None of the participants were employed full time at intake to the study, and only 1 of the 40 participants (2.5% of all participants) maintained full-time employment for even half of the months assessed (see Table 3). On average, participants in the Therapeutic Workplace and control groups reported working only 4.39 and 0.86 days per month, respectively. Their annual incomes, combining income from both legal and illegal sources, averaged $8,340 and $9,288, respectively—amounts that could not be considered sufficient by any standard to support them and their children. These data leave little question that the traditional available approaches to promote employment in these individuals have been grossly inadequate. Without effective employment interventions, it appears likely that these women and their young children will continue to live in poverty.

The extended and intensive experience of training the Therapeutic Workplace participants in this study has offered a unique and detailed characterization of the challenges of preparing many individuals in this population for gainful employment. Almost all participants lacked necessary job skills, many participants displayed highly unprofessional behavior that most certainly would have led to termination in most community workplaces, and productivity was poor in some participants. Special training programs and contingencies were used to establish skills, maintain acceptable professional demeanor, maintain productivity, and sustain punctuality and consistent workplace attendance. Informally, these special programs and contingencies appear necessary and somewhat effective in establishing and maintaining required behavior in many study participants. Studies examining the effectiveness of these contingencies and methods to improve their effectiveness are underway (e.g., Wong, Munjal, Dillon, Sylvest, & Silverman, 2001). On the basis of experience to date, these and other studies will be needed to optimize the effectiveness of the Therapeutic Workplace as a training and employment intervention to address the problems of chronic unemployment in this population.

The present study provides evidence that the Therapeutic Workplace was effective in a small group of women who were pregnant or recently postpartum and in methadone treatment at the start of the study. Clearly this intervention must be evaluated in more individuals and in other populations. This study is only an initial test of the Therapeutic Workplace intervention. Future studies will be required to establish the reliability and generality of these findings.

The present study shows in principle that the Therapeutic Workplace intervention can serve as an effective long-term

maintenance intervention for the treatment of cocaine and heroin addiction. A critical question of practicality remains to be answered: Can the Therapeutic Workplace procedures be applied and maintained in a cost-effective and practical manner? To a large extent, the answer to this question will depend on whether Therapeutic Workplace businesses can become financially successful. If so, the salary-based abstinence reinforcement and the employment offered in such businesses could be sustained indefinitely at little or no cost. Early experience in an ongoing Therapeutic Workplace data entry business provides some reason for optimism (Silverman, et al., in press), but additional research will be required to fully answer this question.

The model of establishing income-producing Therapeutic Workplace businesses to employ chronically unemployed drug abuse patients may be a desirable approach, particularly for individuals, like many of the participants in this study, who require very special and intensive contingencies to establish and maintain important job skills and professional demeanor. However, less intensive procedures may be useful for individuals who can function successfully under more normal workplace contingencies. For people already employed, it may be possible to integrate the salary-based abstinence reinforcement contingencies into community workplaces (McLellan, 2001). For people who are not employed but who have the personal and professional behaviors required to succeed in community workplaces, some features of the off-site employment procedures used in the present study might be adapted. For example, abstinence and job skills could be established in an initial phase of the Therapeutic Workplace intervention. In the second phase, participants could be placed in community jobs and Therapeutic Workplace treatment providers could assist community employers in maintaining the salary-based abstinence reinforcement contingencies (e.g., by conducting urinalysis testing and implementing the contingencies), much like supported employment programs for individuals with psychiatric illnesses (Crowther, Marshall, Bond, & Huxley, 2001) or developmental disabilities (Rusch & Hughes, 1989). Such applications seem feasible, but they would undoubtedly require extensive research and development efforts.

Regardless of the financial success of Therapeutic Workplace businesses, some public support for interventions such as the Therapeutic Workplace will probably be required. Considerable public funds currently support both welfare-to-work initiatives and substance abuse treatment programs for those who are poor and chronically unemployed. However, the long-term outcomes of usual care control participants in this study show just how inadequate those public programs have been for these women. Other public approaches to their problems are clearly needed. The data reported in this study provide additional support for a prior suggestion to establish "government-funded centers like the Therapeutic Workplace in our poorest communities to try to combat the dual problems of drug abuse and chronic unemployment" (Higgins, 2001, p. 28). Given the severity and persistence of the problems of addiction, unemployment, and poverty in the population of mothers in this study, and the lasting effects produced by the Therapeutic Workplace, investigations into the future financing and further development and evaluation of this intervention are clearly warranted.

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