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TGI Monday?: Drug-Dependent Outpatients Report Lower Stress and More Happiness at Work than Elsewhere

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Abstract

In the general population, experience-sampling studies show that work is the aspect of daily life most associated with momentary unhappiness and a desire to be elsewhere. We assessed whether this holds true for urban outpatients in treatment for heroin and cocaine dependence. In a 25-week natural-history study, 79 employed methadone-maintained misusers of heroin and cocaine carried electronic diaries on which mood and behavior were assessed up to five times per day. Being at work was associated with lower stress, greater happiness, and lower drug craving. Work accounted for 14% of the variance in stress, 30% of the variance in happiness, and 50% of the variance in cocaine craving. Participants with skilled jobs reported more positive and less negative mood states (and lower cocaine craving) at all times compared to participants with semi/unskilled jobs, although the latter reported greater mood improvement at work. In all participants, mood improvements occurred specifically in the presence of coworkers (not other companions). Our seemingly unusual findings might be specific to substance-disorder patients (for whom work may be a respite from drug-using companions), but might also hold for other urban dwellers of similar socioeconomic backgrounds (for whom work may be a respite from environmental stressors).

INTRODUCTION

The findings presented in this paper stem from an examination of patterns of daily-life stress in an outpatient sample of cocaine and heroin misusers. Laboratory studies have shown that stressors can increase drug craving¹ and that sensitivity to standardized stressors predicts drug self-administration in the laboratory,² relapse to drug misuse,^{1,3} and dropout from treatment.⁴ To extend these findings to daily life, we examined momentary ratings of stress in out-patients from whom we have reported other results.^{5–8} We were surprised to see that stress seemed to be lower when participants were at their workplaces than in most other locations. In the general population, experience-sampling studies show that work is the aspect of daily life most frequently associated with a desire to be doing something different⁹; happiness during working hours tends to be rated low relative to other times.¹⁰

Therefore, in the analyses reported here, we “drilled down” into our finding that work was associated with lower momentary ratings of stress. Our questions were: Do drug craving and other aspects of mood follow a similar pattern, reflecting more positive mental states at the workplace than elsewhere? If so, does this vary by the nature of the work, for example

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Declaration of Interest

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skilled versus unskilled? Experience-sampling data in the absence of a randomized intervention can address these questions only in terms of association, not causation, but can still generate and constrain hypotheses and thereby guide future interventional studies. (Readers will note that this Introduction is not grounded in a literature review. We made this choice for ethical reasons. Like many researchers who collect experience-sampling data or Ecological Momentary Assessment (EMA) data, we have been using a single large data set as the basis of multiple publications. To avoid both the appearance and the reality of “fishing” for statistically significant findings, we adhere to the following policy: (1) we limit the number of questions we ask of our data; that is, we do not perform analysis after analysis until we find something we can publish and (2) we maintain the greatest possible transparency about what analyses we performed, when we performed them, and why we performed them. An extensive literature review would imply that the analyses were driven by prior findings in the literature. The Introduction to this paper describes exactly how the current analyses came to be. We believe that this sort of transparency serves readers well, both with regard to understanding this paper and with regard to judging everything we publish from the overall data set.)

METHOD

Participants and Setting

Participants were methadone-maintained cocaine- and heroin-using outpatients at a treatment-research clinic in Baltimore, MD. The Institutional Review Board of the National Institute on Drug Abuse (NIDA) approved the study, and participants gave written informed consent before being enrolled. We have reported other results from the same study^{5–8}; methodological details are summarized briefly here.

Inclusion criteria were: (1) age between 18 and 65, (2) evidence of physical dependence on opioids (by self-report and physical examination), and (3) evidence of cocaine and opiate use (by self-report and urine screen). All participants met American Psychiatric Association *Diagnostic and Statistical Manual* (DSM-IV) criteria for dependence on both heroin and cocaine, though neither diagnosis was required. Exclusion criteria were: (1) schizophrenia or any other DSM-IV psychotic disorder, history of bipolar disorder, or current major depressive disorder; (2) current dependence on alcohol or any sedative-hypnotic (by DSM-IV criteria); (3) cognitive impairment severe enough to preclude informed consent or valid self-report; and (4) medical illness that would compromise participation in the study. During screening, each participant underwent a structured interview, the Addiction Severity Index (ASI),¹¹ which included assessment of the participant’s typical work pattern over the past 3 years, and income over the past 30 days. The ASI also included a ranking of the social status of the participant’s usual occupation on a 7-point version of the Hollingshead scale.¹²

Procedure

The study was designed to assess the natural history of craving and lapse against a background of methadone maintenance, weekly drug counseling, and abstinence reinforcement; all participants received the same treatment. The study used Ecological Momentary Assessment (EMA), a technique in which participants’ reports of their moods and activities at randomly prompted times throughout the day (experience sampling) are combined with participant-initiated reports of specific events (such as drug use) at the moment they occur. In the analyses reported here, we used only the experience-sampling portion of the data.

Participants attended clinic 7 days a week for up to 28 weeks; methadone was administered daily (target dose 100 mg/day); urine drug screens were conducted three times per week.

Abstinence reinforcement (vouchers given in exchange for urine specimens negative for cocaine, opiates, or both) was in place from weeks 7–18 (12 weeks total; up to \$2,310 in vouchers were available for participants continuously abstinent from cocaine and opiates); voucher procedures were similar to those used in our prior studies.¹³

A PalmPilot (PDA) was issued to each participant at the end of week 3. The PDA models used were the original Palm Zire and its successor, the Palm Zire 21. Our internally developed Transactional Electronic Diary software¹⁴ running on the PDAs triggered five random prompts per day for 5 weeks, then two random prompts per day for 20 weeks. Random prompts were timed to occur only during each participant's typical waking hours, which were programmed for each day of the week before the PDA was issued, based on the participant's self-reported daily sleep/wake schedule. (Participants were also instructed to initiate an entry whenever they craved or used cocaine or heroin or both drugs; these entries were not used in the current analyses.) At each entry, participants selected on-screen buttons to report where they were (workplace, home, another's home, vehicle, store, etc.) and checkboxes to report whom they were with (no one, coworkers, friends, etc.), and what they were doing (working, resting, watching TV, talking, etc.). Each entry also included responses to the following eight questions, each asked separately: "Right now, do you (feel stressed)/(feel bored)/(feel irritated)/(feel tired)/(feel happy)/(feel relaxed)/(crave cocaine)/(crave heroin)?" The response anchors were "NO!!," "no??" "yes??" and "YES!!"; participants were told that the first and last anchors represented a "strong, definite" feeling. These response anchors have been used in EMA studies by Shiffman et al.¹⁵

Compliance to random prompting was good: participants responded to a mean of 77% of the prompts (median, 81%, range, 38–97% per participant).

Data Analysis

A "work entry" was defined as any entry in which the reported location was "work" and the reported activity was "working." All other entries were considered nonwork entries. The stress/mood/craving responses "NO!!," "no??" "yes??" and "YES!!" were recoded as 0, 1, 2, and 3.

To control for possible confounding effects of drug use, we created a dichotomous indicator for each random-prompt entry to reflect whether it had been made at a "urine negative" time point, defined as any time point 48 hours before provision of a urine specimen negative for both cocaine and opiates. We used urine data rather than EMA reports of drug use because not all urine-detected instances of use were reported. Results for this aspect of the data analysis will be mentioned only briefly in this paper because we have reported similar analyses previously.⁶

To determine relationships between working and stress/mood/craving, we analyzed each of the eight responses in a repeated-measures regression (SAS Proc Mixed), which produces output like that of a repeated-measures ANOVA but does not require imputation of missing data points.^{16,17} The predictors in each model were WorkEntry (yes or no; this was a time-varying predictor), Hollingshead ranking (Skilled, Semi/unskilled; this was a person-level predictor), and their interaction. Each model also included five control terms: race (White, other), sex, age, a count of the number of data points each participant had contributed, and a dichotomous time-varying covariate to indicate whether the entry had been made at a "urine negative" time point. The control terms were chosen a priori to improve the accuracy of the estimated effect sizes for WorkEntry and Hollingshead ranking. A first-order autoregressive error structure provided the best fit to the data by Akaike's Information Criterion.¹⁸

The output from Proc Mixed includes F tests, least-squares means (for categorical predictors), and beta coefficients (for continuous predictors). For each F test, we also calculated an effect size, expressed as a positive correlation coefficient (Pearson r).^{19,20}

In a supplemental analysis (discussed below), we ran similar models, restricting the dataset to entries at which the reported location was either “work” or “home” (thus excluding 30% of the entries) and added a dichotomous time-varying predictor indicating whether or not the participant was alone.

For all analyses, the criterion for significance was $p < .05$, two-tailed. To save space, most values for statistically nonsignificant results are not reported.

RESULTS

A total of 130 participants enrolled, of whom 114 attended clinic long enough to be issued a PDA, and 79 made at least one entry while working in a workplace. Those 79 (60 men, 19 women) make up the sample reported on here.

Hollingshead classifications were dichotomized into Skilled (1–5; $n = 48$) and Semi/unskilled (6–7; $n = 31$) to avoid problems with skew in the observed distribution. Examples of Hollingshead classifications are shown in Table 1. Demographic data are shown separately for the two groups in Tables 2 and 3 and are summarized here for the whole sample. The 79 participants carried PDAs for 11,462 person-days ($M = 145.1$ days per participant, $SD = 40.0$, median = 167, range 9–189). Their mean age was 40.9 years ($SD = 8.1$, median = 41, range 20–58), and they had completed a mean of 12.0 years of education ($SD = 1.4$, median = 12, range 7–15). Employment status during the 3 years before study intake was 28% unemployed, 38% employed full-time, and 34% employed part-time; mean total income in the 30 days before study intake was \$2,081 ($SD = \$1,176$, median = \$1,800, range \$350–\$5,400), of which a mean of 31% was from illegal sources ($SD = 39$, median = 0%, range 0–100%). Most (61%) had had at least some paid employment in the 30 days before intake. Marital status was 59% never married, 35% separated, divorced or widowed, and 6% married. Living arrangements at intake were 49% with parents or other family, 16% with spouse/partner alone, 9% with spouse/partner and children, 15% with friends, and 11% alone. Self-reported race/ethnicity was 58% Black, 39% White, and 3% Hispanic. In the 30 days before treatment entry, participants had used heroin on a mean of 29.2 days ($SD = 3.7$, median = 30, range 5–30; the participant reporting 5 days of use had transferred from a community methadone program) and cocaine on a mean of 19.5 days ($SD = 9.0$, median = 18, range 4–30). On all these demographic factors, the current sample of 79 was very similar to the full sample of 114; there was no sign that the current sample overrepresented participants of higher socioeconomic status (data not shown).

Table 4 summarizes the numbers of entries provided by the 79 participants whose data were used in these analyses. None of the measures in Table 4 differed by occupational status; this was true for the whole sample and for a subset of 53 who had provided at least 10 work entries (t -tests; data not shown).

Figures 1–3 show least-squares means for each of the eight outcome measures, adjusted for sex, race, age, current drug abstinence, and each participant’s number of data points. Results were similar without inclusion of these control terms (data not shown).

Correlates of Working

In work entries (vs. all other entries), participants reported significantly greater happiness, $F(1, 77) = 33.4$, $p < .0001$ (effect-size $r = .55$) and significantly lower stress, $F(1, 77) = 12.5$,

$p < .0008$ ($r = .37$), boredom, $F(1, 77) = 67.0$, $p < .0001$ ($r = .68$), irritation, $F(1, 77) = 42.2$, $p < .0001$ ($r = .60$), tiredness, $F(1, 77) = 196.2$, $p < .0001$ ($r = .85$), cocaine craving, $F(1, 77) = 77.5$, $p < .0001$ ($r = .71$), and heroin craving, $F(1, 77) = 9.5$, $p < .003$ ($r = .33$) (Figs. 1–3). Reports of relaxation interacted with Hollingshead status (see later). The finding that ratings of happiness varied in a direction opposite those of all other ratings (for stress, negative moods, and drug craving) rules out the possibility the findings were an artifact of hurried selection of the most convenient response option during work entries.

In Figs. 1–3, although many of the effects of work do not seem large in terms of the full range of the scale (0–3, as shown in the y-axes), the true robustness of the effects is reflected in the smallness of the error bars and in the effect sizes (r) given above. Even the work-associated decrease in stress among skilled workers, which seems nearly flat in Fig. 1A, was marginally significant in a post hoc t -test, $t(77) = 1.96$, $p < .06$ —though clearly the decrease was greater among semi/unskilled workers.

Correlates of Hollingshead Job-Status Ranking

In the same statistical models, across all entries (at the workplace and elsewhere), participants with skilled jobs, compared to those with unskilled jobs, reported significantly greater happiness, $F(1, 73) = 7.9$, $p < .007$ ($r = .31$) and significantly lower stress, $F(1, 73) = 545.8$, $p < .0001$ ($r = .65$), boredom, $F(1, 73) = 68.5$, $p < .0001$ ($r = .70$), tiredness, $F(1, 73) = 28.0$, $p < .0001$ ($r = .53$), and cocaine craving, $F(1, 73) = 22.9$, $p = .0001$ ($r = .49$)—but also reported significantly lower relaxation, $F(1, 73) = 50.9$, $p < .0001$ ($r = .64$).

Interactions between Working and Hollingshead Job-Status Ranking

For participants with skilled jobs, relaxation was lower in work entries than in other entries; however, for participants with semi/unskilled jobs, relaxation was actually higher in work entries than in other entries, $F(1, 77) = 19.0$, $p < .0001$ ($r = .44$) (Fig. 2B). Other statistical interactions showed that irritation, $F(1, 77) = 7.6$, $p < .008$ ($r = .30$), and tiredness, $F(1, 73) = 27.3$, $p < .0001$ ($r = .51$), decreased during work more robustly for semi/unskilled workers than for skilled workers (Figs. 1C and 1D), as did cocaine craving, $F(1, 77) = 6.0$, $p < .02$ ($r = .27$) (Fig. 3A).

Other Demographic Correlates of Stress, Mood, and Craving

Sex—In the same statistical models that produced the main results, men gave higher ratings of boredom than women did ($M = .86 \pm .02$ vs. $.72 \pm .02$), $F(1, 73) = 25.01$, $p < .0001$ ($r = .51$). Men also gave lower ratings of happiness ($M = 1.98 \pm .02$ vs. $2.23 \pm .03$), $F(1, 73) = 63.21$, $p < .0001$ ($r = .68$) and lower ratings of relaxation ($M = 1.76 \pm .02$ vs. $1.82 \pm .02$), $F(1, 73) = 4.78$, $p < .04$ ($r = .25$).

Race—In the same statistical models that produced the main results, White participants gave marginally higher ratings of stress than non-White participants ($M = .91 \pm .02$ vs. $.86 \pm .02$), $F(1, 73) = 3.89$, $p < .06$ ($r = .22$). White participants also gave higher ratings of tiredness ($M = 1.08 \pm .02$ vs. $1.04 \pm .02$), $F(1, 73) = 4.55$, $p < .04$ ($r = .24$), lower ratings of happiness ($M = 2.01 \pm .02$ vs. $2.19 \pm .02$), $F(1, 73) = 59.35$, $p < .0001$ ($r = .67$), and lower ratings of relaxation ($M = 1.70 \pm .02$ vs. $1.88 \pm .02$), $F(1, 73) = 65.93$, $p < .0001$ ($r = .69$).

Age—In the same statistical models that produced the main results, greater age was associated with lower ratings of stress ($b = -.011 \pm .002$), $F(1, 73) = 48.92$, $p < .0001$ ($r = .63$), lower ratings of boredom ($b = -.007 \pm .002$), $F(1, 73) = 23.19$, $p < .0001$ ($r = .49$), lower ratings of irritation ($b = -.008 \pm .002$), $F(1, 73) = 24.30$, $p < .0001$ ($r = .50$), lower ratings of tiredness ($b = -.014 \pm .001$), $F(1, 73) = 83.18$, $p < .0001$ ($r = .73$), higher ratings of happiness ($b = .005 \pm .002$), $F(1, 73) = 9.48$, $p < .003$ ($r = .34$), higher ratings of

relaxation ($b = .014 \pm .001$), $F(1, 73) = 91.32$, $p < .0001$ ($r = .75$), and lower ratings of heroin craving ($b = -.013 \pm .002$), $F(1, 73) = 50.54$, $p < .0001$ ($r = .64$). There was no effect of age on cocaine craving ($b = -.0003 \pm .002$, n.s., $r = .02$).

Correlates of Current Abstinence from Cocaine and Heroin

In the same statistical models that produced the main results, current abstinence from cocaine or heroin (inferred from urine results 48 hours later) was associated with lower ratings of stress ($M = .85 \pm .02$ vs. $.92 \pm .02$), $F(1, 45) = 7.15$, $p < .02$ ($r = .37$), lower ratings of boredom ($M = .76 \pm .02$ vs. $.82 \pm .02$), $F(1, 45) = 8.23$, $p < .007$ ($r = .39$), lower ratings of tiredness ($M = .98 \pm .02$ vs. $1.13 \pm .02$), $F(1, 45) = 48.73$, $p < .0001$ ($r = .72$), lower ratings of cocaine craving ($M = .39 \pm .02$ vs. $.79 \pm .02$), $F(1, 45) = 316.80$, $p < .0001$ ($r = .94$), lower ratings of heroin craving ($M = .37 \pm .02$ vs. $.57 \pm .02$), $F(1, 45) = 79.48$, $p < .0001$ ($r = .80$), and higher ratings of relaxation ($M = 1.83 \pm .02$ vs. $1.75 \pm .02$), $F(1, 45) = 11.28$, $p < .002$ ($r = .45$). Ratings of irritation ($M = .88 \pm .02$ vs. $.91 \pm .02$), n.s. ($r = .17$) and happiness ($M = 2.12 \pm .02$ vs. $2.09 \pm .02$), n.s. ($r = .19$) did not significantly differ by abstinence status.

Supplemental Analyses: Effect of Solitude at Work versus Home

When we reviewed the literature (see Discussion), we found evidence that for some clinical populations, mood might be worst when individuals are alone at home (presumably where symptoms are experienced most saliently) and best when they are alone at work (presumably where they can focus on a task). Therefore, we reran all our analyses, restricting the dataset to entries in which participants reported being either in the workplace or at home, and we included aloneness as an additional predictor, testing for its interaction with work. Results are shown in Table 5.

For happiness, the difference favoring work entries remained significant, but there was an interaction between location and aloneness, $F(1, 45) = 8.41$, $p < .006$ ($r = .40$), reflecting the finding that happiness ratings were lowest when participants were alone at home. However, happiness ratings at work were not especially enhanced by being alone.

For boredom, irritation, tiredness, and cocaine craving, the difference favoring work entries remained significant, but again, in each case, there was an interaction between location and aloneness, as follows: boredom, $F(1, 45) = 4.14$, $p < .05$ ($r = .29$), irritation, $F(1, 45) = 5.82$, $p < .03$ ($r = .34$), tiredness, $F(1, 45) = 16.80$, $p < .001$ ($r = .52$), and cocaine craving, $F(1, 45) = 13.47$, $p < .001$ ($r = .48$). These interactions reflected a different pattern from the one seen with happiness: the ratings were lowest (ie, least bad) when participants were at work in the company of others, but were not differentially affected by aloneness when participants were at home.

For stress, the difference favoring work entries was no longer significant ($p = .20$), but there was an interaction between location and aloneness, $F(1, 45) = 4.91$, $p < .04$ ($r = .31$), reflecting the finding that stress ratings were lowest when participants were alone at work.

For relaxation, the ratings at home were significantly higher than at work, $F(1, 77) = 8.26$, $p < .006$ ($r = .31$), but there was no interaction between location and aloneness. For heroin craving, none of the predictors had significant effects.

DISCUSSION

We found that being at work was associated with more positive and less negative mental states (lower stress, greater happiness, and lower drug craving) in outpatients with heroin and cocaine dependence. The association was strong, with work versus nonwork entries

accounting for 14% of the variance in stress, 30% of the variance in happiness, and 50% of the variance in cocaine craving from entry to entry (even after controlling for sex, race, age, current drug abstinence, and the skilled or unskilled nature of the work). Participants with skilled jobs reported more positive and less negative mood states (and lower cocaine craving) at all times when compared to participants with semi/unskilled jobs, although those with semi/unskilled jobs reported greater mood improvement at work.

The momentary mood and craving correlates of urine-verified drug abstinence were addressed in one of our prior publications.⁶ We performed the analysis slightly differently there, with emphasis on the time course of mood across the day; readers interested in that aspect of our findings are referred to that paper.

Comparison with Prior Findings on Mood and the Workplace in Other Populations

As we mentioned, in two experience-sampling studies of general-population samples, working hours were associated with a sense of obligation and a desire to be elsewhere⁹ and with relatively low ratings of happiness.¹⁰ Similarly, in a sample of cigarette smokers trying to quit, momentary ratings of negative affect were higher during work hours and during business-related social interactions than at other times.²¹

Most other published experience-sampling studies of mood have used samples of college students, who spend relatively little time in traditional workplaces. Therefore, most of those studies do not provide specific information on workplace correlates of mood or stress. However, they may provide some insight into our current findings. For example, one consistent finding from the college-student studies is that all social interactions were associated with increased positive mood (though not with decreased negative mood, which can vary independently of positive mood).²² Laboratory studies, also in college students, suggested that this association reflected causation of positive mood by socializing.^{22,23} Such a mechanism might partly explain our finding that better mood in the workplace was most pronounced in the presence of companions (Table 5).

Another mood-improving influence identified in the college-student experience-sampling studies and associated laboratory studies was physical activity.^{22,24} Many of our participants' jobs probably involved considerable physical activity (Table 1), so, if work did cause mood improvement in our participants, exercise may have been one of the mechanisms. However, even if future research were to demonstrate that physical labor causes momentary mood improvement and craving reduction in people with substance-use disorders, we doubt that acquisition of a labor-intensive job could "treat" addiction: as we noted earlier, our participants with semi/unskilled jobs reported worse moods and greater cocaine craving than our other participants during nonwork hours.

Comparison with a Prior Finding on Mood, Work, and Solitude in a Clinical Sample

To our knowledge, only one other experience-sampling study has shown mood improvement in association with being at the workplace. That study was done in a clinical sample of 15 bulimic women.²⁵ Unlike a small matched control group (and unlike the general population, but like our sample), the bulimic women reported greater happiness when at work than at home. However, that finding seemed to be largely a function of low mood when home alone, along with some mood improvement when at work alone, possibly reflecting mental "flow."²⁶ In our sample, we found little evidence of low mood associated with being home alone, and considerable evidence of mood improvement associated with being at work with coworkers rather than at work alone (Table 5). (This was not a general effect of having companions: in the initial examination of stress ratings that led to the current analyses, we found that coworkers were the only companions with whom stress was significantly reduced

relative to all other entries.) Thus, if work causes mood improvement in both bulimic women and outpatients with substance-use disorders, the mechanisms may differ.

Implications of the Effects of Person-Level Predictors (Hollingshead Job-Status Category, Age, Sex, and Race)

The study from which our data derive was powered primarily to examine effects of time-varying, within-person variables; in the current analyses, we included person-level variables mostly as control terms. Nonetheless, the person-level findings merit comment because the associations were substantial. Hollingshead job status accounted for 42% of the variance in stress; age accounted for 40% of the variance in stress and 41% of the variance in heroin craving; race accounted for 45% of the variance in happiness; and sex accounted for 46% of the variance in happiness.

The mood difference across the two Hollingshead groups is probably not explained by income, because the groups overlapped considerably in income. (Also, in the general population, momentary ratings of happiness are remarkably independent of income, once income exceeds a low subsistence-level threshold.²⁷) In an experience-sampling study that assessed job status in 108 women, those with low-status jobs (such as parking attendant or janitor) reported fewer positive moods than those with middle-status jobs (such as secretary) or high-status jobs (such as accountant or associate professor); the association in that study was partly mediated by group differences in perceived control and social strain.²⁸ Similar mechanisms may account for our Hollingshead findings.

Our other person-level findings are more difficult to explain. In experience-sampling (and global-self-evaluation) studies of the general population, reports of positive mood and subjective well-being are remarkably consistent across age, race, and sex²⁷; much of the variance is accounted for by personality.²⁹ One experience-sampling study of cigarette smokers showed that tobacco craving was higher in Black participants than in White participants (the opposite of what we found for cocaine craving), but that study found no racial differences in positive or negative moods.³⁰ Given that Baltimore is 64% Black and 30% White according to 2010 US Census data, our unexpected finding of better mood among Black participants might be partly explained by the deprivation-mitigating effects of ethnic density (or, for White participants, the deprivation-exacerbating effects of ethnic isolation).³¹ However, this explanation presumes that our participants spent most of their time in places whose racial composition was similar to that of the city as a whole. We will explore this issue further in our ongoing EMA work, which incorporates geolocation tracking.

Study Limitations

Like any analyses driven by a fortuitous observation, these analyses will require replication in an independent sample. However, our initial observation (which only involved stress) extended consistently to ratings of mood and craving, increasing the likelihood that the associations between work and mental states are genuine.

Our data cannot resolve questions of causation. However, we can probably rule out a large contribution of simple reverse causation (ie, better mood and lower craving at a given moment caused participants to work at that moment), because most of our participants did not have jobs that would have given them tight control over their work schedules.

It is possible that our participant population, from which we excluded people with major psychiatric comorbidity or alcohol/sedative dependence, is different from the broader population of methadone patients. It is also possible that our subsample of 79 out of 114 participants—excluding 35 participants who provided no work entries in their experience-

sampling data—is different from our participant population as a whole. However, the subsample showed no sign of being an elite group on any variable measured at study intake (such as income, legal history, or amount of drug use). In the participants who did provide entries, we cannot know whether more random prompts went unanswered at work than elsewhere.

It is conceivable, but in our view unlikely, that the finding of better mood at work was accounted for by acute effects of each day's methadone administration. Our clinic hours were 11:00 AM–1:00 PM and 4:00–6:30 PM, and fully one-third of doses were taken during the late-afternoon slot, so dosing after work was probably almost as common as dosing before work. Also, if the associations between work and mental state had been mediated by the acute actions of methadone, then the most robust finding should have been a work-associated decrease in heroin craving. Instead, the decrease in heroin craving was considerably weaker than the decrease in cocaine craving or the increase in happiness. Finally, laboratory data suggest that the acute effects of daily methadone on mood and craving are negligible.³²

We did not apply a correction for multiple comparisons, but our results were consistent across the eight outcome measures tested, reducing concerns that we capitalized on chance. If we had applied a Bonferroni correction (.5/8), the threshold for significance would have been $p = .006$, and almost all of our main findings would remain statistically significant.

The Hollingshead classifications were made during administration of ASI interviews and were not recorded in a form that permits assessment of their reliability. Furthermore, our dichotomous treatment of the Hollingshead data was driven by statistical considerations, not theoretical ones. These limitations mean that the Hollingshead findings should be interpreted with caution.

The qualitative comparisons we have made between our findings and prior findings (in the general population, in smokers, and in bulimics) carry all the usual limitations of historical controls. We do not see any methodological factors that could plausibly explain the differences in work-place mood across studies, but a single study of multiple populations would provide stronger evidence.

Questions for Future Research

Perhaps the biggest open question raised by our findings is whether they are specific to people with heroin and cocaine dependence (for whom work may offer a respite from drug-associated “people, places, and things” that are experienced as stressors) or whether they would hold for other urban dwellers of similarly low socioeconomic backgrounds (for whom work may offer a respite from any number of environmental stressors). A related question is whether the findings would hold for substance-dependent individuals who would not have qualified for our study because of severe medical or psychiatric comorbidity. These questions can only be addressed by additional experience-sampling studies in similar settings.

The other open questions concern the causal mechanisms for the associations we observed within substance-dependent individuals. Hypotheses about these mechanisms could be tested in established “therapeutic workplace” paradigms,^{33,34} where participants could be randomly assigned to varying work conditions (physical or office-based, with or without companions) and work schedules. As we noted above, it is extremely unlikely that work will suffice as a prescription for recovery from addiction, though finding work might be given a higher priority when treatment goals are set. However, further research could clarify the circumstances under which particular kinds of work are helpful—or harmful.

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FIGURE 1.

Least-squares means of ratings of stress and negative moods during work and nonwork entries, by Hollingshead classification of employment status, in 79 participants. Error bars indicate standard errors of the mean (SEMs). Values are from mixed models controlling for age, sex, race, current heroin, and cocaine use (thrice-weekly urine test), and the number of datapoints each participant contributed. The y-axes reflect the full range of the scale. In panel A, the numbers of entries represented by each point are: 10,977 (nonwork entries from skilled workers), 7,071 (nonwork entries from semi/unskilled workers), 1,849 (work entries from skilled workers), and 1,008 (work entries from semi/unskilled workers); these numbers vary slightly across panels and figures because of a few skipped responses. The main findings were: (1) in all participants, each of the four ratings was significantly lower during work entries than nonwork entries; (2) across all entries, skilled workers reported lower stress, boredom and tiredness than semi/unskilled workers; (3) ratings of irritation and tiredness decreased during work more robustly for semi/unskilled workers than for skilled workers.

FIGURE 2.

Least-squares means of ratings of positive moods during work and nonwork entries, by Hollingshead classification of employment status, in 79 participants. The main findings were: (1) in all participants, ratings of happiness (though not relaxation) were significantly higher during work entries than nonwork entries; (2) across all entries, skilled workers reported greater happiness but lower relaxation than semi/unskilled workers; (3) ratings of relaxation decreased during work for skilled workers, but increased during work for semi/unskilled workers. Details are otherwise the same as for Figure 1.

FIGURE 3.

Least-squares means of ratings of cocaine and heroin craving during work and nonwork entries, by Hollingshead classification of employment status, in 79 participants. The main findings were: (1) in all participants, ratings of cocaine craving and heroin craving were each significantly lower during work entries than non-work entries; (2) across all entries, skilled workers reported lower cocaine craving than semi/unskilled workers; (3) ratings of cocaine craving decreased during work more robustly for semi/unskilled workers than for skilled workers. Details are otherwise the same as for Figure 1.

TABLE 1

Hollingshead occupational status for the entire sample ($N = 79$)

Hollingshead rank definition	<i>N</i> in our sample	Examples from our sample
1. Higher executives, major professionals	0	None
2. Business managers, lesser professionals	0	None
3. Administrators, managers, minor professionals, owners of small businesses (bakery, car dealership, plumbing)	2	House manager at addiction center
4. Clerical and sales, technician, little businesses (bank teller, bookkeeper, clerk, draftsman, timekeeper, secretary, car salesperson)	3	Salesperson for a large communications company; vocational instructor
5. Skilled manual, usually with training (baker, barber, firefighter, mechanic, repair technician, plumber)	43	Auto mechanic; barber; carpenter; carpet installer; forklift operator; landscaper; roofer
6. Semiskilled (hospital aide, painter, bartender, cook, waiter, spot welder, machine operator)	23	Cashier; delivery driver; fast-food employee; nurse aide; office assistant at construction company; painter; waitress
7. Unskilled (attendant, janitor, construction helper)	8	Housekeeper; janitor; warehouse/shipping worker

For analysis, Hollingshead was dichotomized into Skilled (1–5; $n = 48$) and Semi/unskilled (6–7; $n = 31$).

TABLE 2

Demographic data for the two Hollingshead groups (numeric variables)

Variable	Mean (SD) for skilled workers (N = 31)	Mean (SD) for semi/ unskilled workers (N = 48)	<i>p</i> (<i>t</i> -test)
PDA days	144.1(40.1)	146.6(40.5)	n.s.
Age	41.2(7.5)	40.6(9.1)	n.s.
Education	11.9(1.5)	12.2(1.3)	n.s.
Total income, 30 days before intake	\$2,210 (\$1,185)	\$1,880 (\$1,151)	n.s.
Employment income, 30 days before intake	\$796 (\$1,070)	\$598 (\$769)	n.s.
Percentage of income from illegal sources	34.5(40.6)	26.6(35.6)	n.s.
Days heroin use, 30 days before intake	29.6(2.2)	28.7(5.2)	n.s.
Days cocaine use, 30 days before intake	21.0(8.8)	17.1(9.0)	.058

TABLE 3

Demographic data for the two Hollingshead groups (categorical variables)

Variable	Skilled workers (<i>N</i> = 48)	Semi/unskilled workers (<i>N</i> = 31)	<i>p</i> (Fisher exact)
Sex			.0005
Female	5(10%)	14(45%)	
Male	43(90%)	17(55%)	
Employment pattern, 3 years before intake			n.s.
Full-time	18(38%)	12(39%)	
Part-time	16(33%)	11(35%)	
Unemployed	14(29%)	8(26%)	
Any paid work, 30 days before intake			n.s.
Yes	29(60%)	19(61%)	
No	19(40%)	12(39%)	
Marital status			.09
Never married	33(69%)	14(45%)	
Separated/divorced/widowed	13(27%)	14(45%)	
Married	2(4%)	3(10%)	
Living arrangements			n.s.
Parents or other family	25(52%)	14(45%)	
Spouse/partner alone	9(19%)	4(13%)	
Spouse/partner and children	2(4%)	5(16%)	
Friends	7(15%)	5(16%)	
Alone	5(10%)	3(10%)	
Race/ethnicity			n.s.
White	21(44%)	10(32%)	
Black	26(54%)	20(65%)	
Hispanic	1(2%)	1(3%)	

TABLE 4Summary of random-prompt entries provided by the entire sample ($N = 79$)

Variable	Mean, SD	Median	Range
Random-prompt entries per participant	295.0, 103.0	309	11–475
Random-prompt entries that were “working” entries (for each participant)	38.6, 50.7	15	1–209
Percentage of random-prompt entries that were “working” entries (for each participant)	15.8%, 18.3%	8%	.2–82%

TABLE 5

Stress, mood, and craving as a function of location (work vs. home) and aloneness

Mood or craving	At work, alone	At work, not alone	Home, alone	Home, not alone	Significant predictors
Happiness	2.18 ± .04	2.16 ± .02	2.01 ± .02	2.11 ± .02	Location; Location x Aloneness
Stress	.90 ± .04	.81 ± .02	.89 ± .02	.88 ± .02	Aloneness; Location x Aloneness
Boredom	.75 ± .04	.65 ± .02	.82 ± .02	.80 ± .02	Location; Aloneness; Location x Aloneness
Irritation	.90 ± .04	.79 ± .02	.93 ± .02	.92 ± .02	Location; Aloneness; Location x Aloneness
Tiredness	1.10 ± .05	.86 ± .03	1.23 ± .02	1.21 ± .02	Location; Aloneness; Location x Aloneness
Cocaine craving	.63 ± .04	.50 ± .02	.65 ± .02	.66 ± .02	Location; Aloneness; Location x Aloneness
Relaxation	1.76 ± .05	1.80 ± .02	1.85 ± .02	1.87 ± .02	Location
Heroin craving	.49 ± .03	.45 ± .02	.50 ± .02	.49 ± .02	None

The range of each scale was 0 to 3. Table shows least-squares means ± SEMs from mixed models controlling for Hollingshead occupational status, age, sex, race, current heroin, and cocaine use (thrice-weekly urine test), and the number of datapoints each participant contributed. The "Significant predictors" column indicates only results for the main predictors (Location, Aloneness, and their interaction). See text for *F* and *p* values.