Drug Dependence Enviromics: Job Strain in the Work Environment and Risk of Becoming Drug-Dependent

Philip L. Reed¹, Carla L. Storr², and James C. Anthony¹

¹ Department of Epidemiology, College of Human Medicine, Michigan State University, East Lansing, MI.
² Department of Mental Health, Bloomberg School of Public Health, Johns Hopkins University, Baltimore, MD.

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In a prospective epidemiologic study of a sample of young adults, the authors estimated the risks of being drug-dependent and becoming drug-dependent in relation to the psychosocial work environment encountered during young adulthood. Data were obtained from two young adult assessments of 2,311 children who entered the first grade of primary school in 1985–1986. A total of 1,692 participants completed the first young adult assessment (YAT₀) in 2000–2002, and a follow-up young adult assessment (YAT₁) was completed approximately 1 year later. Work environments characterized by high job strain (low job control combined with high job demands assessed at YAT₀) signaled a 2- to 3-fold excess risk of being drug-dependent (adjusted prevalence ratio = 2.3, 95% confidence interval: 1.4, 4.0). In reestimation for 861 young adults (61% female) with no drug dependence at YAT₀, low job control alone was associated with a 2- to 3-fold excess risk of developing drug dependence (adjusted relative risk = 2.6, 95% confidence interval: 1.1, 6.5) between YAT₀ and YAT₁. The relative risk estimates did not change appreciably with statistical adjustment for demographic covariates, individual drugs used, childhood predispositional traits, job characteristics, and measurements of socioeconomic status at three time points (first grade, adolescence, and young adulthood).

Abbreviations: SES, socioeconomic status; YAT, young adult assessment.

In a prospective epidemiologic study, we aimed to estimate the risks of being drug-dependent and becoming drug-dependent in relation to the psychosocial work environment encountered during young adulthood. For this study, we harnessed Karasek and Theorell’s (1, 2) well-known conceptualization of the psychosocial work environment in relation to a set of interrelated dimensions of job demand and control. Within the general framework of enviroomics, we sought to map dimensions of the work environment that might impinge on human health and its determinants (3).

Karasek and Theorell’s model postulates that work environments can be characterized with respect to levels of physical and psychological demands (job demand) and in terms of the degree of decision-making authority or latitude workers are allowed as they perform their jobs (job control). According to the model, job environments characterized by a combination of high demand and low control (job strain) increase the risk of ill health, particularly regarding cardiovascular disease (1, 2, 4, 5).

Extensive studies of the relation of job strain to smoking and alcohol use have produced inconsistent findings (5–20). While drug dependence is not as frequently studied, the idea that risk of becoming drug-dependent might be related to job environment is not new. For example, 10 years ago, our research group studied 11,789 employed adult household residents in five US metropolitan areas (21). Over 1 year of follow-up, the estimated risk of developing drug dependence and related drug problems was approximately five
times greater for workers employed in jobs with a combination of high physical demands and low decision-making authority and/or skill discretion than for workers with other combinations of these psychosocial work characteristics. Storr et al. (22) conducted a nationally representative survey of 2,302 registered nurses and found that higher levels of job strain were associated with more frequent use of non-medical drugs. In contrast, Mensch and Kandel (23) and Lehman et al. (24–26) concluded that personal characteristics, not work environment, were responsible for drug use among workers.

In most of the studies just mentioned, the retrospective or cross-sectional approach can be a problem. One problematic issue is the interplay of social causation and social selection, with possibilities that the job entrant brings predisposing characteristics to the hazardous work environment (23–27). For these reasons, our approach was prospective, and we sought to constrain individual-level predispositions. Studying participants in an ongoing epidemiologic study, we estimated the job strain association with 1) being an active case of drug dependence and 2) becoming an incident case of drug dependence. To limit the possibility that incipient drug dependence might foster job strain or might cloud the perception of job strain, our analysis of the development of drug dependence was based on young adults for whom an initial standardized interview assessment indicated no (zero) clinical features of drug dependence.

The present study differs from previous research in its focus on early work experiences of young adults during their early twenties (i.e., soon after entry into the full-time labor force) and on the occurrence of drug dependence in young adulthood. The prevalence of illegal drug dependence or abuse among US young adults (ages 18–25 years) was recently reported to be 7.8 percent (9.8 percent for males and 5.9 percent for females) (28). Our research was focused on young adults for three main reasons. First, for young adults, job selection processes have had less time to exert their influences. Second, the risk of becoming drug-dependent has become large enough by young adulthood to yield estimates of relative risk with reasonable statistical precision (29). Third, there is a theoretical possibility that job strain exerts stronger influence soon after entry into the labor force and that this influence may wane, or become complicated by the just-mentioned selection processes, as job security and advancements increase with passing time. For example, persons who are especially vulnerable to drug dependence may be passed over for promotion or may be less competitive as new jobs with better conditions become available. As seniority increases, workers with drug dependence may be left behind in the lower job strata and workers without drug dependence may advance, leaving a residually increasing concentration of drug dependence cases in entry-level jobs with less favorable psychosocial work environments.

Because this work was nested within a long-term longitudinal study with early-life measurements of suspected determinants, we were able to consider an array of hypothesized susceptibility characteristics, with a resulting partial constraint upon selection processes and individual-level predispositional traits. We were also able to adjust our results for some of the work characteristics and individual-level variables implicated in studies of adolescents, such as work intensity, years of working, and having children (30–34). Our principal aim was to test the hypothesis that young adults in work environments with a high level of job strain would be more likely to become drug-dependent during a 1-year follow-up interval.

**MATERIALS AND METHODS**

This analysis built on a program of epidemiology and prevention research initiated by Drs. Sheppard Kellam and James C. Anthony and their colleagues at the Prevention Research Center of the Johns Hopkins Bloomberg School of Public Health (Baltimore, Maryland). The research design and methods of the program were recently described by Storr et al. (35) and in more detailed reports by others (36–38). The design is that of a prospective longitudinal study, with multiple waves of follow-up assessment after initial recruitment of an epidemiologically credible sample of children as they entered primary school in a single metropolitan area. The present study was based mainly on information gathered as parts of two waves of assessment carried out approximately 1 year apart during the period 2000–2002, by which time the participants had become young adults aged 19–24 years. These two waves will be referred to as young adult assessments 1 and 2 (YAT 0 and YAT 1). The actual “baseline” measures (T 0 ) were taken in 1985–1986 when these young adults were children entering the first grade of primary school. Many of the first-graders were reassessed during primary school (39).

**Study sample at follow-up in young adulthood**

At follow-up in 2000–2002, approximately 75 percent of the original 2,311 youths were traced, rerecruited, and reassessed at YAT 0 (n = 1,692), as described in prior reports (35, 40). An additional 13 percent were located, but 133 could not be reached (e.g., because of military postings outside of the country or living out of state with no telephone number), 142 refused to be interviewed, and 32 had died.

Among the 1,692 young adults assessed at YAT 0, 274 were ineligible on the basis of employment status. Of the 274 ineligible youths, 34 were self-employed and 81 were students. The remaining 159 were not working for pay or had never held a job for 6 months or more. As such, job strain was not assessed for these young people. Each of the 1,418 eligible young adults completed a Karasek-based assessment of their current job demand and control dimensions as part of the YAT 1 assessment. Approximately 1 year later, at YAT 1, 70 percent (n = 985) were reassessed with respect to drug dependence before study funds were exhausted. Comparisons were made between the 70 percent of youths participating in follow-up and the 30 percent not participating in follow-up. There was no appreciable difference between the two groups with respect to drug dependence at YAT 0 or years of schooling completed. In addition, the association between level of job strain (measured at YAT 0 ) and YAT 1 participation was null.
The study protocol was approved by the institutional review board for protection of human subjects at the Johns Hopkins University. There was also a school system ethics review, and many principal-teacher-parent meetings were held to review the details of the study protocol prior to its implementation. In addition, the Michigan State University (East Lansing, Michigan) institutional review board approved the protocol for the analysis of the young adult data.

**Measures**

In this research, our assessment of drug dependence conformed to a general approach used in the National Comorbidity Study (41). This approach involves asking respondents about their drug experiences, including 15 standardized interview questions about clinical features of drug dependence. Drug dependence was conceptualized here as a clinical syndrome manifest in 1) disturbances of mental life (e.g., obsessive ruminations or cravings that foster drug-taking), 2) disturbances of behavior (e.g., compulsive repetitions of drug-using or -seeking behavior; narrowing of non-drug-related behavior as drug involvement increases in salience), and 3) manifestations of neuroadaptation, such as subjectively felt withdrawal or pharmacologic tolerance after repeated drug use (42). Thus, the key response variables in this study were the occurrence of clinical features of drug dependence, with focuses on 1) being drug-dependent and 2) developing drug dependence between the first young adult follow-up (YAT0) and the second young adult follow-up (YAT1). The construct of drug dependence was made operational by counting the number of clinical features of drug dependence, as observed at YAT0, and again at YAT1, when the same set of 15 standardized questions was readministered. To meet the study’s case definition for being a newly incident case, the YAT0 count had to be three or greater (with clustering since YAT0) and the YAT0 count had to be zero. It follows that being a prevalent case of drug dependence involved having a count of three or more recently active clinical features at YAT1, without the requirement that the YAT0 count equal zero.

The issue of drug specificity was taken into account in the analysis phase, with \( k = 1 \) terms being included for the \( k \) drug categories under study. The \( k \) drug categories were cannabis, crack or other cocaine, smoked methamphetamine ("ice"), heroin, opium, 3,4-methylenedioxymethamphetamine ("ecstasy"), inhalants, hallucinogens, anxiolytics and sedatives, stimulants, and analgesics such as OxyContin (Purdue Pharma, Stamford, Connecticut). This is an approach that has been previously used to tease apart the sources of variation in the occurrence of drug dependence, with use of individual drugs being considered one source of influence on drug dependence (43).

The suspected causal determinant of central interest was job strain, conceptualized and measured via multiple-item scales as a high level of demand on the job concurrent with a low level of control (2, 44, 45). We formed a summary job demand score containing nine items (Cronbach’s \( \alpha = 0.7 \)) and a summary job control score containing nine items (\( \alpha = 0.8 \)). High job strain consisted of concurrent scores above the sample median for job demand and below the sample median for job control, a convenient approach used in prior studies (5, 46).

A set of covariates measured soon after the youths’ entry into primary school was also held constant in the regression analyses: 1) family socioeconomic status (SES) at the time of school entry (SES-1), 2) misbehavior, 3) problem-solving, and 4) risk-taking. SES-1 was gauged via eligibility for federally subsidized or free lunch at the time of school entry, based on family income being 185 percent or less of the federal poverty level in 1986. Misbehavior was measured using mean values on standardized teacher ratings of pupil misbehavior and conduct problems as assessed at ages 6–8 years, soon after school entry (47, 48). The mean of the standard scores from first-grade math and reading achievement assessments was used as the measure of problem-solving. Four assessments of risk-taking tendencies were administered during 4 consecutive years of elementary school. The mean value from these assessments of risk-taking was used for covariate control of the suspected vulnerability trait with respect to drug dependence (James C. Anthony, Michigan State University, unpublished manuscript).

In addition to SES-1, we included in our regression models the following control variables: 1) family SES in early adolescence, measured by the highest level of education achieved (SES-2a) and the unemployment status (SES-2b) of the head of the household at the participant’s home in early adolescence; 2) young adult SES (SES-YA), as indicated by the number of years of education completed by the participant as of YAT1; 3) variables indicating characteristics of the young adult’s work history, including having worked prior to age 17 years ("early work"), hours of work per week, and holding more than one job at YAT1; and 4) lifestyle variables, such as whether the young adult was a current smoker or had children at YAT1. Data on age, sex, free or subsidized lunch eligibility, and the race/ethnicity of the participants were abstracted from the school system’s administrative database. In one model, we also adjusted for level of alcohol use, as indexed by frequency of alcohol use and the amount of alcohol used as assessed at YAT0.

**Statistical analysis**

The guiding conceptual model was one in which being drug-dependent and developing drug dependence were expressed as a function of the YAT0 job strain constructs, prior history of drug dependence, and covariate terms. The regression analyses were based on the general linear model implemented under the Stata software procedure “binreg” (Stata, version 8.0; Stata Corporation, College Station, Texas), which can generate estimates of both odds ratios (logit link function) and risk ratios (log link function) (49).

After initial analytical steps of regression modeling with covariates, we stratified our sample in terms of subgroups, with special focus on the 861 YAT1 respondents who had endorsed zero clinical features of drug dependence at YAT0. Analyses that included covariates were completed with statistical adjustment for classroom intervention assignment, taking into account the clustering of students within classrooms, a part of the sampling design. Our final exploratory analytical steps involved evaluation of subgroup variation in
the slope estimates and a search for overly influential observations and outliers; this postanalysis exploration did not alter the main conclusions.

RESULTS

Table 1 offers a description of the study sample and various subgroups defined with respect to assessment wave, inclusion criteria, and participation. For example, the mean age at YAT_0 was approximately 21–22 years for all subgroups, and the mean number of years of schooling completed was approximately 12.

At YAT_0, 52 youths met our case definition for prevalent drug dependence (≥3 clinical features at YAT_0) and 933 did not qualify as cases. At the time of the YAT_1 follow-up, 45 youths met our case definition for prevalent drug dependence (≥3 clinical features at YAT_1); 940 did not qualify as cases. The crude estimated probability of being an active case of drug dependence at YAT_0 was 52/985 or 5.3 percent, and at YAT_1 the estimated probability of being an active case was 45/985, or 4.6 percent.

The main study estimates are presented in table 2, with and without covariate adjustment, in the form of relative probabilities of being drug-dependent or developing drug dependence. The estimates in table 2 disclose a modest but statistically robust association between job strain at YAT_0 and both 1) the probability of being actively drug-dependent at YAT_1 and 2) the risk of developing drug dependence between YAT_0 and YAT_1 (after restriction of the sample to 861 respondents who were found to have no clinical features of drug dependence at YAT_0). The sizes of the ratio estimates fell within a range from 2.0 to 3.0, with and without covariate adjustments (table 2).

A number of exploratory analyses were carried out. For example, male and female subgroups were analyzed separately, and we added covariate product terms to multiple regression models to examine whether subgroup variation might be present in relation to the association between drug dependence at YAT_0 and job strain when no other covariates were included in the model. No evidence of different slopes for males and females was found. However, this exploratory analysis did suggest that different slopes describe the association of work environment with subsequent drug dependence, and that the slope values might vary in relation to the level of drug dependence that was present at the time of assessment of job strain.

On this basis, we then subdivided the sample into groups with low, medium, and high scores in relation to the dimensions of job demand and job control (table 2, models A and B). This approach permitted a more detailed examination of patterns of association between drug dependence and combinations of levels of job demand and job control.

First, for both subgroups, job demand was not associated with risk of subsequent moderate–high drug dependence, nor was job control associated with drug dependence when all young adults in the study were considered. However, among young adults with no drug dependence at baseline, persons in the lowest tertile of job control had an adjusted relative risk for moderate–high dependence at YAT_1 of 2.6 (95 percent confidence interval: 1.1, 6.5; p = 0.038). This was not appreciably different from the adjusted relative risk estimate found for high job strain (adjusted model 2; relative risk = 2.3).

DISCUSSION

The main findings of this epidemiologic study may be summarized succinctly. First, as hypothesized, there was evidence of a statistically robust association linking work environments characterized by high job strain with subsequent risk of drug dependence. Post hoc analysis revealed that in the subgroup of young adults with no drug dependence at YAT_0, low job control alone was associated with a greater risk of developing drug dependence.

Two features of this new study are noteworthy. First, it was strengthened by a prospective research design with assessments conducted relatively early in the adult work career of the young people under study. Second, the estimates were based on statistical models that held constant some of the suspected early-life determinants of drug dependence in young adulthood.

Several of the more important limitations of this study merit attention. Of central concern is the generalizability of the findings. Whether other samples selected in other places at other times would produce similar findings is an open question. There is a possibility that young adults who were eligible for our study disproportionately represented the presence or absence of some factor regarding vulnerability to drug dependence in comparison with those who were ineligible for inclusion by virtue of employment status. Sample attrition is also a concern. With respect to our exposure of interest, job strain, our assessment was based on a standard self-report Karasek scale (2). Some may see this as an advantage, arguing that perceived stress is the appropriate level of analysis (30). There may be biases in an assessment of work environment based on self-reporting, although these shortcomings seem more crucial when the research is based on a cross-sectional study design as compared with the prospective design of our YAT_0–YAT_1 contrast.

Notwithstanding limitations such as these, the present study also possessed a number of counterbalanced strengths. For example, the epidemiologically credible sample and the prospective study design helped to constrain sources of bias and error that otherwise can complicate cross-sectional research in highly selected samples. The homogeneity of our sample of youths (predominately urban and African-American), who were growing up and going to school together in a single metropolitan area, was also a strength.

Newcomb et al. (27) have suggested that individual characteristics, such as personality dimensions, predispose some people to harmful drug use and also influence their choice of occupation. However, characteristics of the job or work environment were not found by Newcomb et al. to be associated with harmful drug use either on or off the job (27). To address this issue, we included in our prediction model several individual-level predisposition constructs as assessed during primary school. None of these covariates, either individually or together, attenuated the estimated association between low job control and risk of becoming drug-dependent.

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TABLE 1. Demographic characteristics of the Prevention Research Center cohort and subgroups included in a study of the risk of drug dependency in relation to young adulthood psychosocial work environment, 2000–2003*

<table>
<thead>
<tr>
<th></th>
<th>A. All persons recruited into the initial cohort, 1985–1986 (n = 2,311)</th>
<th>B. All persons rerecruited for YAT0, 2000–2001 (n = 1,692)</th>
<th>C. All persons working for pay, not self-employed, and completing the job strain assessment at YAT0 (n = 1,418)</th>
<th>D. All persons working for pay, not self-employed, completing YAT0 and also completing YAT1, 2001–2002 (n = 985)</th>
<th>E. All persons in section D who had no clinical features of drug dependence at YAT0 (n = 881)</th>
<th>F. Persons assessed at YAT1 with three or more clinical features of drug dependence (cases) (n = 45)</th>
<th>G. Persons assessed at YAT1, with zero, one, or two clinical features of drug dependence (noncases) (n = 940)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
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</tr>
<tr>
<td>Male</td>
<td>1,151 49.8%</td>
<td>790 46.7%</td>
<td>637 44.9%</td>
<td>415 42.1%</td>
<td>337 39.1%</td>
<td>27 60.0%</td>
<td>388 41.3%</td>
</tr>
<tr>
<td>Female</td>
<td>1,160 50.2%</td>
<td>902 53.3%</td>
<td>781 55.1%</td>
<td>570 57.9%</td>
<td>524 60.9%</td>
<td>18 40.0%</td>
<td>552 58.7%</td>
</tr>
<tr>
<td>Mean age (years) at YAT0† (with SD)</td>
<td>21.79 0.70%</td>
<td>21.77 0.69%</td>
<td>21.77 0.68%</td>
<td>21.77 0.69%</td>
<td>21.77 0.69%</td>
<td>21.93 0.69%</td>
<td>21.76 0.69%</td>
</tr>
<tr>
<td>Race/ethnicity</td>
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<tr>
<td>Non-Hispanic African</td>
<td>1,514 65.5%</td>
<td>1,201 71.0%</td>
<td>973 68.6%</td>
<td>723 73.4%</td>
<td>641 74.5%</td>
<td>21 46.7%</td>
<td>702 74.7%</td>
</tr>
<tr>
<td>Non-Hispanic White</td>
<td>761 32.9%</td>
<td>474 28.0%</td>
<td>429 30.3%</td>
<td>254 25.8%</td>
<td>213 24.7%</td>
<td>24 53.3%</td>
<td>230 24.5%</td>
</tr>
<tr>
<td>Other</td>
<td>36 1.6%</td>
<td>17 1.0%</td>
<td>16 1.1%</td>
<td>8 0.8%</td>
<td>7 0.8%</td>
<td>0 0.0%</td>
<td>8 0.8%</td>
</tr>
<tr>
<td>Mean years of schooling completed (with SD)</td>
<td>NA †</td>
<td>11.92 1.8%</td>
<td>12.04 1.7%</td>
<td>12.04 1.7%</td>
<td>12.10 1.7%</td>
<td>11.58 1.8%</td>
<td>12.06 1.7%</td>
</tr>
</tbody>
</table>

* Data were obtained from the Johns Hopkins University Prevention Research Center cohort, originally recruited from 19 schools in a Mid-Atlantic school system at entry into first grade in 1985–1986 and reassessed as young adults in 2000–2001 and again 1 year later.
† YAT0, the first young adult assessment; YAT1, the second young adult assessment; SD, standard deviation; NA, not applicable.
‡ The initial cohort consisted of students entering first grade in 1985 and 1986. Considering late and early school starters, a range of 4 years would be expected between the oldest student enrolled in 1985 and the youngest student enrolled in 1986. In addition, the first young adult assessment (YAT0) took nearly 2 years to complete, adding to the range of age at YAT0. There were nine young adults aged 24 years and 65 aged 23 years. The remainder of the 1,692 young adults were between the ages of 19 and 22 years.
Previous studies of job strain and drug-use disorders have used a variety of formulations of job strain. For example, Karasek and Theorell (2) reported that the standard formulation of job strain (e.g., high psychological demand/low control) was associated with greater use of sleeping pills and tranquilizers in a population of Swedish adults. However, Muntaner et al. (21) found a five times’ higher risk of drug dependence associated with physical demands in combination with either low skill discretion or high decision-making authority, but not with the standard job strain formulation. In our sample of young adults, it was primarily low job control that was associated with a greater risk of developing drug dependence.

One possible source of discrepancies across studies is that the study by Muntaner et al. (21) involved a cross-section of adults ranging in age from 18 years to 64 years, while our sample of young adults was aged 19–24 years at YAT0. The importance of physical demands in the Muntaner et al. study may reflect the much longer spent time on the job by their sample as compared with our sample, which was younger. Our study also differed from Muntaner et al.’s in that we measured job demand and control using self-report rating scales, while Muntaner et al. used externally generated scale values assigned by job title. Future studies could benefit from using both of these research approaches in order to clarify whether and how these different measurement modalities may produce variability in outcome. A recent prospective study of the impact of psychosocial dimensions of the work environment on alcohol use employed such an approach, finding that self-reported job stress predicted higher levels of alcohol use (50), but the association with job title was null.

### TABLE 2. Estimated prevalence ratio and relative risk for a moderate–high level of drug dependence in association with high job strain, job control, and job demand in young adulthood, 2000–2003*,

<table>
<thead>
<tr>
<th>Job strain</th>
<th>All young adults (n = 985)</th>
<th></th>
<th></th>
<th>Young adults with no clinical features of drug dependence at baseline†</th>
<th>(n = 861)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Prevalence ratio</td>
<td>95% confidence interval</td>
<td>p value</td>
<td>Relative risk</td>
<td>95% confidence interval</td>
<td>p value</td>
<td></td>
</tr>
<tr>
<td>Unadjusted model</td>
<td>2.2</td>
<td>1.2, 3.9</td>
<td>0.010</td>
<td>2.2</td>
<td>1.1, 4.6</td>
<td>0.031</td>
<td></td>
</tr>
<tr>
<td>Adjusted model 1§</td>
<td>2.6</td>
<td>1.4, 4.8</td>
<td>0.001</td>
<td>2.4</td>
<td>1.2, 5.2</td>
<td>0.023</td>
<td></td>
</tr>
<tr>
<td>Adjusted model 2#</td>
<td>2.3</td>
<td>1.4, 4.0</td>
<td>0.002</td>
<td>2.3</td>
<td>1.0, 5.2</td>
<td>0.044</td>
<td></td>
</tr>
<tr>
<td>Job demand and control</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Model A#</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Low job demand</td>
<td>1.0</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Medium job demand</td>
<td>1.5</td>
<td>0.6, 3.4</td>
<td>0.353</td>
<td>1.0</td>
<td>0.4, 2.6</td>
<td>0.930</td>
<td></td>
</tr>
<tr>
<td>High job demand</td>
<td>1.8</td>
<td>0.8, 4.0</td>
<td>0.169</td>
<td>0.8</td>
<td>0.3, 2.3</td>
<td>0.642</td>
<td></td>
</tr>
<tr>
<td>Model B#</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High job control</td>
<td>1.0</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium job control</td>
<td>1.0</td>
<td>0.6, 1.8</td>
<td>0.898</td>
<td>1.1</td>
<td>0.5, 2.9</td>
<td>0.819</td>
<td></td>
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<tr>
<td>Low job control</td>
<td>1.6</td>
<td>0.8, 3.0</td>
<td>0.157</td>
<td>2.6</td>
<td>1.1, 6.5</td>
<td>0.038</td>
<td></td>
</tr>
</tbody>
</table>

* Data were obtained from the Johns Hopkins University Prevention Research Center cohort, originally recruited from 19 schools in a Mid-Atlantic school system at entry into first grade in 1985–1986 and reassessed as young adults in 2000–2001 and again 1 year later.
† The definition of a case was three or more clinical features of dependence on any of 12 illegal or prescription drugs.
§ Excluded from this analysis were 124 young adults who had already developed clinical features of drug dependence by the time of the first young adult assessment (YAT0).
# Adjusted for use of crack or other cocaine, methamphetamine, heroin or opium, “ecstasy,” inhalants, hallucinogens, sedatives, stimulants, and analgesics (reference drug: cannabis).
# Adjusted for age; sex; measurements of socioeconomic status (SES) at three time points (first grade (SES-1), adolescence (SES-2a and SES-2b), and young adulthood (SES-YA)); race/ethnicity; use of crack or other cocaine, methamphetamine, heroin, opium, “ecstasy,” inhalants, hallucinogens, sedatives, stimulants, and analgesics, and frequency and amount of alcohol (reference drug: cannabis); misbehavior; classroom intervention; risk-taking; problem-solving; being a smoker at YAT0; having children at YAT0; having worked for pay prior to age 17 years (“early work”); hours of work per week at YAT0; and number of jobs held at YAT0.
control than with the full job strain configuration (4, 51, 52). Marmot and Siegrist (53, 54) positioned these outcomes in the broader context of health disparities associated with variations in psychosocial environment linked to the SES gradient. In contrast, Macleod et al. (55) argued that the association of psychosocial dimensions such as job control with adverse health outcomes results from residual confounding of unmeasured components of low SES. In our study, we were able to make statistical adjustments for family SES in early childhood, family SES in adolescence, and young adult SES. In this context, we observed no attenuation in the excess risk of developing drug dependence that was associated with low job control. We conclude that the association of low job control with increased risk of drug dependence cannot be attributed to residual confounding by SES components, nor can it be attributed to the early predispositional individual characteristics studied here. Other conditions or processes must account for the observed association between job control and risk of drug dependence.

While the present research constitutes an advance in control of potentially confounding variables in the study of psychosocial work environment and risk of drug dependence, the possibility exists that additional confounders remain. For example, SES is complex and multifaceted. There may remain unmeasured facets of SES that could influence vulnerability or resilience to drug dependence. In addition, sociodemographic factors (e.g., marital status, drug dependence of parents and spouse, income) or work characteristics such as shift work remain as unmeasured potential confounders. Unmeasured individual-level covariates (e.g., personality or depression) or lifestyle characteristics may be influencing both job choice and vulnerability to drug dependence. Certain forms of co-twin research and case-crossover study designs could help in clarifying these issues. Covariation of personality dimensions with both career choice and harmful drug use may become more evident with the passage of time, because a longer and possibly more reliable pattern of exposure to work environment develops as young adults mature in their careers.

In conclusion, we observed a modest but statistically robust relative risk (relative risk = 2.6; \( p = 0.038 \)) of developing drug dependence in association with low levels of job control, as measured by subscales of the Karasek job strain formulation (low decision-making authority and low skill discretion). In future research, it may be possible to consider more specifically the manner in which characteristics of the work environment might function in the causal pathway that leads to drug dependence.

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