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# INTELLIGENCE AND JOB SATISFACTION

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**Previous research has emphasized either situational or dispositional/motivational variables as determinants of job satisfaction. The current study suggests that cognitive variables, and intelligence in particular, may also be important determinants. The relationship between intelligence and job satisfaction was analyzed on the basis of a model in which intelligence has a direct negative effect on job satisfaction, an indirect positive effect, mediated by job complexity, and an interactive effect with job complexity. The roles of background variables, in particular education, and the implications of the findings for theories of job satisfaction were also examined.**

He that increases knowledge, increases sorrow.
*Ecclesiastes*, 1: 18.

Happy is the man who finds wisdom, . . . and happy are those who hold her.
*Proverbs*, 3: 13

Intelligence is a strong correlate—perhaps even a determinant—of many important outcomes in life, such as educational and occupational attainment and job performance (e.g., Gottfredson, 1986a; O'Reilly & Chatman, 1994; Schmidt, Ones, & Hunter, 1992). The relationship between intelligence and these outcomes has received considerable attention in the academic literature and has been hotly debated in the public domain (e.g., Fraser, 1994; Hernstein & Murray, 1992; Lane, 1994). However, rarely mentioned in these debates are the ancient questions about the relationship between intelligence and satisfaction, between wisdom and happiness. Therefore, this study focused on this emotional facet of the study of intelligence by asking whether intelligence leads to job satisfaction.

The literature does not offer much of an answer to this question. Two studies that directly examined it found a negative relationship between intelligence and job satisfaction: Meulmann (1991) found a negative correlation between intelligence and young adults' satisfaction with their first jobs out of school, and Barrett and Forbes (1980) found a negative relationship between those variables in a sample of 29 radar and sonar operators. Additional information about the relationship between intelligence and job satisfaction has also been indirectly collected by Bagozzi (1978: 525), Stone, Stone, and Gueutal (1990: 426), and Colarelli, Dean, and Konstans (1987: 561). All three studies showed that the relationship between intelligence and job satisfaction was about zero.

One possible explanation for the differences in results among the cited studies is the samples that were used. Meulmann (1991) and Barrett and Forbes (1980) used homogeneous samples of people in low-level occupations. Bagozzi (1978) and Colarelli and colleagues (1987) used homogeneous samples of individuals in higher-level occupations (technically skilled salespeople and accountants in a top accounting firm, respectively), and Stone and colleagues (1990) used a heterogeneous sample. In the model presented in the next section, the differences in the results of these studies are explained by the differences in their samples.

## MODEL AND HYPOTHESIS

### A Causal Model of the Relationships among Intelligence, Job Complexity, and Job Satisfaction

Intelligence may be related both to the actual complexity of the jobs people hold and the complexity that they desire in their work. First, intelligence is positively related to actual job complexity because jobs differ in the intellectual ability they require (Gottfredson, 1986a). Although some arguments counter to this proposition have been raised (e.g., Collins, 1979), recent empirical research strongly suggests that intelligence has a strong association with job complexity (e.g., Blackburn & Neumark, 1993; Farkas & Vicknair, 1996). In particular, Wilk, Desmarais, and Sackett (1995) demonstrated that a gravitation process—a process by which people gravitate toward jobs commensurate with their abilities—underlies the positive rela-

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tionship between intelligence and job complexity (cf. McCormick, DeNisi, & Shaw, 1979; Wilk & Sackett, 1996).

Second, intelligence is positively related to desired job complexity. This statement is consistent with Holland's view that "within a given class of occupations, the level of occupational choice is a function of intelligence" (1959: 58). It is also consistent with the literature suggesting that people desire environments that fit their characteristics (O'Reilly, Chatman, & Caldwell, 1991) and, in particular, their intellectual characteristics (Gottfredson, 1986b). Finally, it is consistent with the goal-choice literature, which suggests that the choice of a goal depends on ability—the higher the ability, the more difficult the goal (see Locke and Latham [1990] for a review; see also the earlier level-of-aspiration literature, including Lewin [1936], and Gopala [1977]).

These two effects of intelligence can explain the inconsistent correlations between intelligence and job satisfaction observed in the studies reviewed in the previous section. As the model in Figure 1 suggests, intelligence can affect job satisfaction via two opposing processes. The first is associated with the tendency of intelligent people to find complex occupations and consequently—since complexity is positively related to satisfaction (Hackman & Oldham, 1976)—to have higher job satisfaction. The second is associated with the tendency of intelligent people to desire more complex work and consequently (since many occupations lack complexity [Hackman & Oldham, 1980]), to be more dissatisfied with their work. The latter process yields a direct negative effect of intelligence on job satisfaction that is revealed only when job complexity is held constant (Hypothesis 1); the former yields an indirect positive effect, mediated by job complexity, that is revealed when job complexity is varied (Hypothesis 2). These two hypothesized effects are shown by the solid lines in Figure 1.

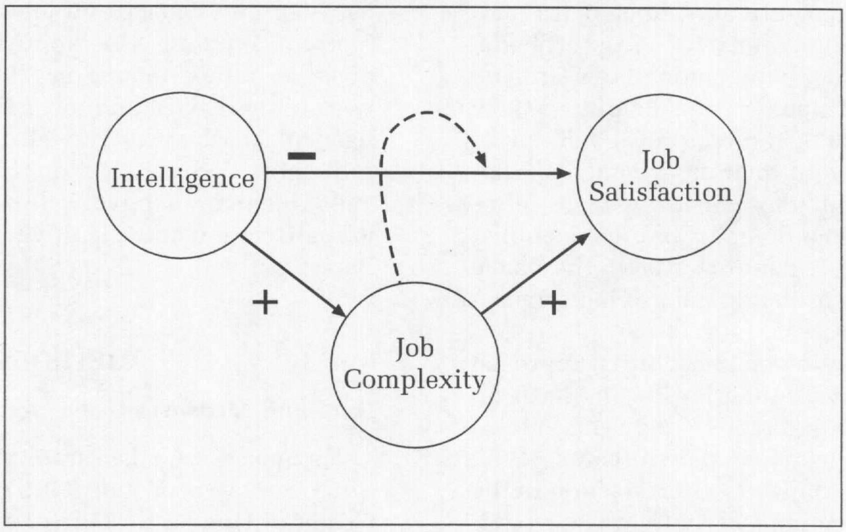
However, the direct effect of intelligence on job satisfaction may vary as a function of job complexity, since highly complex jobs may satisfy even highly intelligent individuals. Thus, it is also hypothesized that (Hypothesis 3) job complexity may moderate the negative direct effect of intelligence on job satisfaction: the higher the job complexity, the less negative the relationship between intelligence and job satisfaction. This moderation is depicted by the broken line in Figure 1.

Finally, note that the causal directions of the relationships between the three variables in Figure 1 are unequivocal. Intelligence (particularly if it is measured earlier than the other two variables) cannot be the result of either job complexity or job satisfaction, and job complexity (particularly if it is measured objectively) is most likely the cause of job satisfaction. However, it is possible that these relationships are spurious and can be accounted for by variables such as socioeconomic status and education. In the analyses described below, I attempted to control for such background variables.

### Intelligence, Education, and Job Satisfaction: The Overeducation Hypothesis

A model similar to the causal model in Figure 1 in which education replaces intelligence as the de-

**FIGURE 1**
**A Causal Model of the Relationships among Intelligence, Job Complexity, and Job Satisfaction[a]**




[a] Solid lines represent linear effects, and the broken line represents a moderating effect.

terminant of job satisfaction has been discussed in the literature. In this model, education contributes to job satisfaction indirectly by increasing both intrinsic and extrinsic rewards, but it diminishes satisfaction by increasing occupational expectations (e.g., Arvey, Carter, & Buerkley, 1991). Within the context of this model, a hypothesis that has received special attention is the *overeducation hypothesis*, according to which excess education may be detrimental to job satisfaction (e.g., Freeman, 1976). This hypothesis has received empirical support in a number of studies, including Burris (1983), Quinn and Baldi de Mandilovitch (1977), and Tsang, Rumberger, and Levin (1991) (but see Glenn and Weaver [1982]), and it is consistent with recent studies about the effect of underemployment among college graduates (e.g., Feldman & Turnley, 1995).

However, the finding that education can be detrimental to job satisfaction could be explained by a causal model in which intelligence determines both the level of education and the desired level of job complexity, making the effects of education spurious. Thus, a major question examined in this study was whether intelligence explains the relationship between education and job satisfaction previously observed in the literature, and in particular, whether it explains the overeducation hypothesis.

## Intelligence and Theories of Job Satisfaction

Recent social cognitive theories of personality suggest that, in trying to understand behavioral and affective outcomes, researchers should move the emphasis away from traditional *personality* variables, such as motivational traits and affective dispositions, to the following: cognitive *person* variables, such as cognitive competencies and information-processing strategies (e.g., Shoda, Mischel, & Wright, 1993); interaction between people and their environments (e.g., Bandura, 1986; Mischel & Shoda, 1995); and reciprocal determination between people and their environments (Bandura, 1978). Although these theories have influenced research in some domains of organizational behavior (e.g., Wood & Bandura, 1989), they have been largely ignored in the domain of job satisfaction.

In the current study, a social-cognitive approach to individual differences underlay the emphasis on intelligence and the interaction between intelligence and job complexity as determinants of job satisfaction. I conceptualized job satisfaction in the model as being determined by individuals' cognitive characteristics rather than by their motivational traits and affective dispositions (intelligence was hypothesized as having a direct effect on job satisfaction). Job satisfaction was conceptualized as being determined by an interaction between these cognitive characteristics and the environment (intelligence and job complexity were hypothesized to interact in determining job satisfaction). And job satisfaction was conceptualized as being the result of reciprocal determination between people and their environments. Not only does the environment determine the affective state of the person (job complexity was hypothesized to directly affect job satisfaction)—the person also determines the environment in which he or she acts (intelligence was hypothesized to determine the level of job complexity).

What do existing approaches to job satisfaction say about the relationship between intelligence and such satisfaction? First, the situational approach to job satisfaction (e.g., Hackman & Oldham, 1980; Herzberg, 1966) in which job satisfaction is viewed as primarily determined by the characteristics of the work, takes into account only motivational person variables, such as growth-need strength, and considers these variables only to the extent that they moderate the relationship between job complexity and job satisfaction, rather than directly influencing job satisfaction. Thus, this theory predicts neither the direct effect of intelligence on job satisfaction, nor the moderating effect of job complexity. Second, the dispositional approach to job satisfaction, according to which affective dispositions are the prime determinant of job satisfaction (e.g., Staw, Bell, & Clausen, 1986), takes into account only affective personality variables, such as negative affectivity (cf. Levin & Stokes, 1989). Therefore, the dispositional approach does not predict that job complexity mediates the relationship between intelligence and job satisfaction. Furthermore, if anything, this approach would predict a positive, rather than a negative, relationship between intelligence and job satisfaction—that intelligence causes affective well-being, which in turn influences job satisfaction (cf. Diener & Fujita, 1995), or that affective well-being influences both job satisfaction and cognitive performance (Staw & Barsade, 1993).

# METHODS

## Data and Measures

The data were taken from the National Longitudinal Survey of Youth (NLSY), conducted by the Center of Human Resource Research with a probability sample of 12,686 Americans (with an oversampling of African Americans, Hispanics, and economically disadvantaged whites) born between 1957 and 1964. Thus, whereas the basic sampling was of a specific cohort, some variability in age existed in the sample. The interviews, which have been conducted annually since 1979, are primarily intended to assess the labor market experience of the respondents. This study focused on the surveys conducted in 1982, since they contained a measurement of perceptions of job complexity. The only other survey that contained this measure was the first one, administered in 1979. At that time, however, many of the respondents were still in school, or were at the very beginnings of their working careers. Thus, all the measures, except the measure of intelligence and some background variables, were taken from the 1982 survey. Intelligence was measured only once, in 1980, and this is the measure used in the present study.

Only the 5,423 respondents who reported spending most of their time at work at the time the 1982 survey was conducted were included in the study. However, because of missing values, the number of respondents in each of the analyses below is somewhat lower than 5,423 and varies slightly between analyses.

***Intelligence.*** The measure of intelligence was derived from respondents' test scores on the Armed Forces Qualifying Test (AFQT). This test was administered to groups of five to ten respondents between June and October 1980; respondents were compensated, and the overall completion rate was 94 percent. The intelligence score was the sum of standardized scores on four tests: arithmetic reasoning, paragraph comprehension, word knowledge, and mathematics knowledge. However, since this score was correlated with age ($r = .21$), I standardized it within each age group to obtain an age-independent measure of intelligence.

***Occupation.*** Occupation was derived from respondents' open-ended descriptions of their jobs. NLSY staff members categorized this information into 591 occupational categories using the three-digit 1970 U.S. census classification.

***Job complexity.*** Two measures of job complexity were used. The first measure was derived from evaluations of the complexity of their jobs that respondents made using a seven-item questionnaire in which each item represented one factor of the Job Diagnostic Index (Sims, Szilagyi, & Keller, 1976). The respondents were asked to evaluate their jobs with regard to the degree to which they involved dealing with others, autonomy, feedback, opportunities for establishing friendships, opportunities to complete tasks, task identity, and task variety. I averaged the ratings on these items to construct an overall index of job complexity labeled "incumbent perception of job complexity" (IPJC). The internal consistency of this index was .75.

The second measure of job complexity, labeled "DOT complexity," was derived by Roos and Treiman (1980) from the fourth edition of the *Dictionary of Occupational Titles (DOT).* It is a summary index of evaluations of the following characteristics of occupations, evaluated by objective observers (job analysts): complexity with regard to data, required educational and vocational preparation, the degree to which the work is abstract and creative, and the degree to which it requires verbal and numerical aptitudes.

Although a number of researchers have used DOT complexity as a measure of job complexity (e.g., Gerhart, 1987; Spector & Jex, 1991; Xie & Johns, 1995), reliance on this measure can be questioned on the grounds that it includes job analysts' judgments regarding required education and aptitudes. Therefore, I also estimated the models discussed here using a measure of job complexity that could be derived from the *DOT* and did not involve such judgments. Specifically, this measure was based on job analysts' judgments of a job's complexity with regard to data and its complexity with regard to people. The correlation between this measure of job complexity and the standard *DOT* complexity measure is .90, and because the results of the models based on this measure were very similar to the results of the models based on the standard measure, they are not reported below.

***Global job satisfaction.*** The measure of global job satisfaction was derived from answers to the question "How much do you like your job?" expressed on a four-level response scale ranging from "dislike it very much" to "like it very much." Although reliance on a single-item measure is often questionable, in the case of job satisfaction, the construct validity of a single-item measure may be higher than that of a multiple-item measure (Scarpello & Campbell, 1983), and no serious loss in reliability is likely to occur (Wanous & Reichers, 1996; Wanous, Reichers, & Hudy, 1997). This single-item measure was also used by Gerhart (1987) and by Staw and Ross (1985) in their studies of job satisfaction, which were based on the NLSY. It should also be noted that the results of the analyses reported below were very similar when a multiple-item measure of job satisfaction that is also available in the NLSY was used instead of the single-item scale.

***Control variables.*** These variables included sex (1 = woman, 0 = man), age, ethnic origin (two dummy variables, with 1 = African American or

Hispanic and 0 = other in both cases), area of residence (0 = rural, 1 = nonrural), years of education, family income, education of mother and father, the father's rating on the Duncan index (a measure of occupational prestige), family income, and whether the respondent was living with his or her parents in 1978. Of these variables, age, education, and area of residence were taken from the 1982 survey. The other background variables—education of father and mother, father's Duncan index, and family income (used only for respondents who were living with their parents in 1978)—were taken from the 1979 survey. Values on these four variables were standardized and then averaged to create an index of parental socioeconomic status (SES).

## RESULTS

This section is organized into six parts. The first part provides descriptive statistics of the variables. The second part describes the results of an analysis of the linear part of the causal model shown in Figure 1. Since in this analysis the moderating relationship between job complexity and intelligence was ignored, the results of the analysis represent the average effects of the independent variables on the dependent variable (Cohen & Cohen, 1983). The third part introduces education into the linear model, and the fourth part introduces, in addition to education, other important control variables. The fifth part examines the interaction between intelligence and job complexity. Finally, the last part of this section provides a simplified analysis of the relationship between intelligence and job satisfaction that does not involve a measurement of job complexity, instead examining the relationship between intelligence and job satisfaction within and between occupations.

In most of the analyses, both incumbent perception of job complexity (IPJC) and DOT complexity were used to measure job complexity. I considered IPJC likely to be the better measure for this study, since subjective perception of job complexity was the relevant determinant of job satisfaction. However, the causal relationship between this subjective measure and job satisfaction may be bidirectional (e.g., James & Tetrick, 1986; Salancik and Pfeffer, 1977), which is inconsistent with the model shown in Figure 1. This problem does not occur if an objective measure, such as DOT complexity, is used as the measure of job complexity.

### Descriptive Statistics

Table 1 presents the means, standard deviations, and correlations between the variables. The mean intelligence score was 43.8 (on a percentile scale), indicating that (as a result of the sampling procedure) the average intelligence of the respondents was below the population's average. The mean DOT complexity rating (3.38 on a 1–10 scale) indicated that, on the average, the respondents in the sample had low-level occupations. For example, the largest numbers of respondents were sales clerks (229), secretaries (169), cashiers (163), waiters (138), and cooks (127). Some higher-level occupations were also represented; examples are accountants (48), teachers (25), computer programmers (24), bank officers (16), and social workers (15).

One interesting correlation in Table 1 is that between intelligence and global job satisfaction. In line with the studies of Bagozzi (1978), Stone and

**TABLE 1**
**Means, Standard Deviations, and Correlations among Variables**

| Variable | Unit | *N* | Mean | s.d. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Global job satisfaction | 1–4 scale | 5,419 | 3.22 | 0.75 | | | | | | | | | | | |
| 2. Intelligence | Percentiles[a] | 5,188 | 43.80 | 27.80 | −.02 | | | | | | | | | | |
| 3. DOT complexity | 1–10 scale | 5,413 | 3.38 | 1.79 | .16 | .36 | | | | | | | | | |
| 4. IPJC | 1–5 scale | 5,104 | 3.46 | 0.77 | .41 | .24 | .27 | | | | | | | | |
| 5. Education | Years | 5,400 | 12.20 | 1.92 | .02 | .58 | .40 | .20 | | | | | | | |
| 6. Age | Years | 5,344 | 22.30 | 2.10 | −.01 | .21 | .22 | .10 | .36 | | | | | | |
| 7. Family income | Dollars | 2,974 | 18,240.00 | 12,700.00 | .03 | .34 | .16 | .15 | .26 | .12 | | | | | |
| 8. Mother's education | Years | 5,116 | 10.90 | 3.10 | .00 | .40 | .20 | .13 | .39 | .09 | .34 | | | | |
| 9. Father's education | Years | 4,778 | 11.00 | 3.80 | .01 | .44 | .23 | .14 | .39 | .07 | .36 | .64 | | | |
| 10. Father's Duncan index | 1–100 scale | 3,873 | 37.80 | 23.20 | −.01 | .42 | .23 | .13 | .38 | .15 | .43 | .41 | .58 | | |
| 11. Ethnic background | 0, no; 1, yes | 5,423 | 0.20 | | −.06 | −.35 | −.13 | −.13 | .00 | .01 | −.21 | −.01 | −.10 | −.20 | |
| 12. Sex | 1, woman; 0, man | 5,423 | 0.46 | | .03 | .06 | .13 | .06 | .17 | −.01 | .00 | .04 | .04 | .02 | −.01 |

[a] Percentiles of the general population.

colleagues (1990), and Colarelli and colleagues (1987), this correlation is not significant ($r = -.02$, $p > .2$). Another interesting correlation is that between DOT complexity and IPJC, which is significantly positive but moderate ($r = .27$, $p < .0001$). This correlation is in line with, although somewhat higher than, those reported by Gerhart (1988), who concluded that despite the moderate level of correlation he found, both variables were valid measures of job complexity. Note also that the correlation between job satisfaction and IPJC ($r = .41$) is in line with the correlations reported in the literature; for instance, Loher, Noe, Moeller, and Fitzgerald (1978) reported a mean correlation of .39 in a meta-analysis of 28 studies.

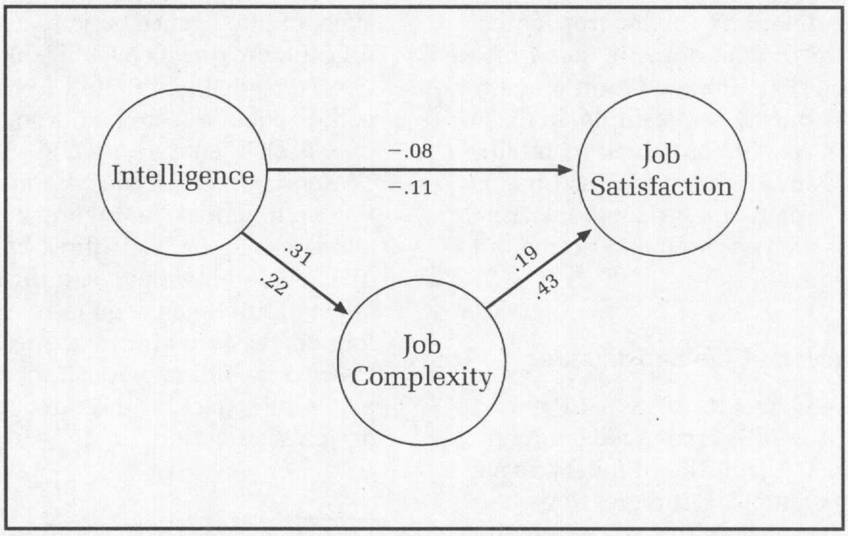
## Intelligence, Job Complexity, and Job Satisfaction: A Three-Variable Linear Model

Figure 2 presents the results of a path analysis of intelligence, job complexity, and job satisfaction. The numbers above the arrows show the standardized regression coefficients for the models in which DOT complexity was used as the measure of job complexity, and the numbers below the arrows show the standardized regression coefficients for the models in which IPJC was used as the measure of job complexity ($N$s = 5,180 and 4,878, respectively). All the path coefficients in the figure are significant at the .0001 level.

The two models reveal the same pattern of relationships between intelligence and job satisfaction. Both indicate that intelligence has a direct negative effect on job satisfaction: beta is −0.08 when DOT complexity is used as the measure of job complexity and −0.11 when IPJC is used as the measure of job complexity. The models also reveal that intelligence has an indirect positive effect on job satisfaction: beta is 0.06 ($0.31 \times 0.19$) when DOT complexity is used and 0.10 ($0.22 \times 0.43$) when IPJC is used. Finally, since the direct and the indirect effects are approximately equal in magnitude but opposite in sign, the zero-order correlation between intelligence and satisfaction is not significantly different from zero.

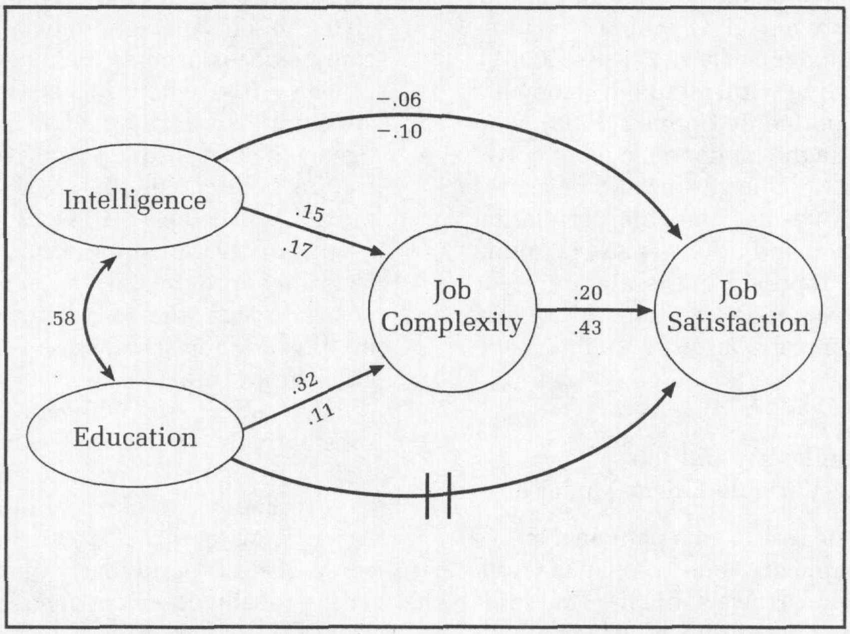
Is the effect of intelligence on job satisfaction substantively important? Since the path coefficients in Figure 2 are standardized, they allow a comparison of the effect of intelligence on job satisfaction with the effect of job complexity. This comparison is particularly interesting since the latter is probably the most prominent effect in the job satisfaction literature. It is clear from the figure that, using the path coefficients as a measure of effect size, the effect of intelligence on job satisfaction is not negligible when compared with the effect of job complexity. It is about half the size of the effect of job complexity in the DOT complexity model (.08/.19) and about a quarter of the size of that effect in the IPJC model (.11/.43). Note that this

**FIGURE 2**
**Path Models of the Relationships among Intelligence, Job Complexity, and Job Satisfaction[a]**




[a] The numbers above the arrows show the standardized regression coefficients for the models in which DOT complexity was used as the measure of job complexity, and the numbers below the arrows show the standardized regression coefficients for the models in which IPJC was used. The number of observations was 5,180 for the models involving DOT complexity and 4,878 for the models involving IPJC. The $R^2$s are .10 and .05 for the DOT complexity and IPJC models, respectively, and .03 and .18 for the job satisfaction models with DOT complexity and IPJC, respectively. All path coefficients are significant at the .0001 level.

FIGURE 3
**Path Models of the Relationships among Intelligence, Education, Job Complexity, and Job Satisfaction[a]**




[a] The numbers above the arrows show the standardized regression coefficients for the models in which DOT complexity was used as the measure of job complexity, and the numbers below the arrows show the standardized regression coefficients for the models in which IPJC was used. The number of observations was 5,160 for the models involving DOT complexity and 4,860 for the models involving IPJC. The $R^2$s are .17 and .06 for the DOT complexity and IPJC models, respectively, and .03 and .17 for the job satisfaction models with DOT complexity and IPJC, respectively. All path coefficients are significant at the .0001 level.

latter comparison deflates the relative effect of intelligence, because the path coefficient between IPJC and job satisfaction is likely to be inflated as IPJC to some extent reflects job attitudes (Salancik & Pfeffer, 1977). It should also be noted that all the path coefficients in the models in Figure 2 and Figure 3 are underestimations of the true paths. When the reliability of the measures is taken into account, by estimating structural equation models, the effects are much stronger. For example, in these structural models, the coefficient relating intelligence to satisfaction is more than twice as high as the coefficient in the path analysis models (the detailed results of this analysis are not reported but are available upon request).

### Education, Intelligence, and Job Satisfaction

Figure 3 presents the results of a path model relating education and intelligence to job complexity and job satisfaction. Again, the numbers above the arrows show the standardized regression coefficients for the models in which DOT complexity was used as the measure of job complexity, and the numbers below the arrows show the standardized regression coefficients for the models in which IPJC was used as the measure of job complexity. Again, all the path coefficients in the figure are significant at the .0001 level.

It is clear from these results that both intelligence and education have a significant, positive impact on job complexity, and therefore both have an indirect effect on job satisfaction. However, whereas the direct effect of intelligence on job satisfaction is highly significant, the direct effect of education on job satisfaction is negligible; the null hypothesis that the latter path is equal to zero could not be rejected ($p > .05$, $p > .2$, DOT complexity and IPJC, respectively).

A comparison of the path model in Figure 3 with the path model in Figure 2 reveals that adding education to the basic three-variable model (Figure 2) considerably (and significantly) decreases the effect of intelligence on job complexity—and therefore decreases its indirect effect on job satisfaction. However, adding education to this model has a negligible effect on the direct effect of intelligence on job satisfaction.[1]

[1] One way to view these results is that much of the indirect effect of intelligence on job satisfaction—but little of its direct effect—is mediated by education (perhaps because higher intelligence facilitates higher education).

TABLE 2
**Results of Regression Analysis with Control Variables**

| | Job Complexity | | Job Satisfaction | |
|---|---|---|---|---|
| Variables | Model 1[a] | Model 2[b] | Model 1[c] | Model 2[d] |
| DOT complexity | | | 0.20***** | |
| IPJC | | | | 0.43***** |
| Intelligence | 0.13***** | 0.14***** | −0.10***** | −0.13 |
| Education | 0.25***** | 0.07***** | 0.00 | 0.02 |
| Age | 0.12***** | 0.07***** | −0.05*** | −0.06***** |
| Residence | −0.06***** | 0.00 | 0.05*** | 0.02 |
| Hispanic | 0.04*** | 0.00 | 0.01 | 0.02 |
| African American | −0.07***** | −0.09***** | −0.07***** | −0.04*** |
| Sex | −0.07***** | 0.05*** | 0.00 | 0.00 |
| Parental SES | −0.07***** | 0.05*** | 0.00 | 0.01 |
| $R^2$ | 0.20 | 0.07 | 0.04 | 0.18 |

[a] DOT complexity is the dependent variable.
[b] IPJC is the dependent variable.
[c] DOT complexity is the measure of job complexity.
[d] IPJC is the measure of job complexity.
*** $p < .01$ (marginally significant)
***** $p < .0001$

## Other Variables

To assess whether background variables other than education could explain the effects of intelligence on job satisfaction, I estimated models similar to the models examined above, adding, in addition to education, the control variables noted in the Measures section: age, ethnic origin, area of residence, sex, and parental socioeconomic status.

The results of these models are given in Table 2, where columns 2 and 3 respectively present the job complexity models using DOT complexity and IPJC as dependent variables, and columns 4 and 5 present the job satisfaction models using these two variables respectively as independent variables. The results of the models suggest that the direction of the effects of intelligence on job satisfaction is not changed by the inclusion of the additional control variables; both the direct negative effect and the indirect positive effect remain highly significant. However, adding additional control variables to the model that included only education as a control variable (Figure 3) *decreases* the effect of intelligence on job complexity but *increases* the (direct) effect of intelligence on job satisfaction. These results are similar to the results obtained when education was added to the basic three-variable model (Figure 2). Thus, whereas the indirect effect of intelligence on job satisfaction can be partially explained by background variables, its direct effect cannot be explained by them. Rather, the background variables tend to function as suppressors with regard to the direct relationship between intelligence and job satisfaction (see Tzelgov and Henik [1991] for a discussion of suppression effects).

Some additional results are worth mentioning. First, both models of job satisfaction indicated that both African American ethnicity and age had significant, direct negative effects on job satisfaction.[2] Second, whereas the results of the two job satisfaction models were similar, the results of the two job complexity models were somewhat different. In the DOT complexity model (column 2 of Table 2), all the control variables had a significant effect on job complexity, but in the IPJC model (column 3 of Table 2), only African American ethnicity and age had such an effect. This difference is probably associated with the fact that DOT complexity is a better measure of occupational attainment than

[2] The effect of African American ethnicity is consistent with previous research indicating that African Americans have lower job satisfaction (Herman, Dunham, & Hulin [1975] and Tuch and Martin [1991]; but see Bartel [1981] for an exception), perhaps as a result of discrimination in the workplace (e.g., Greenhaus & Parasuraman, 1990). The effect of age suggests that among the young people in this sample, aging may have increased occupational expectations. This result is consistent with the argument that the relationship between age and job satisfaction is U-shaped and with findings suggesting that among younger people, age has a negative effect on job attitudes (e.g., Clark, Oswald, & Warr, 1996; Herzberg, Mausner, Peterson, & Campbell, 1957).

IPJC (indeed, the $R^2$s of the DOT complexity and IPJC models are .20 and .07, respectively).

### The Moderating Effect of Job Complexity

To examine the hypothesis about the moderating effect of job complexity, I estimated a model in which job satisfaction was the dependent variable and intelligence, job complexity, and their interaction were the independent variables. Table 3 gives the results of this model, with both dependent and independent variables standardized, for each of the two measures of job complexity. The coefficients of the main effects represented the typical effects of the independent variables, and indeed, their signs and sizes were consistent with the results of the linear models of the previous analyses. The interaction coefficient represented the moderating effect of job complexity. When IPJC was used as the measure of job complexity, the sign of this coefficient was significantly positive, and its effect was quite strong (the incremental variance due to the interaction was about 2 percent).[3] This positive sign implies that, in agreement with my theory, the negative direct effect of intelligence on job satisfaction decreases with increase in job complexity.

However, the interaction was not significant when DOT complexity was used as the measure of job complexity. One reason for this is that, despite the large sample, the ability to detect an interaction using DOT complexity was rather low because of the large error variance in the DOT complexity model, which was exacerbated by problems associated with detecting interactions for correlated, low-reliability measures (McCleland & Judd, 1993). Nevertheless, I view the interaction between IPJC and intelligence as a reliable indicator of the true relationship between intelligence and job complexity, since it is consistent with previous experimental work showing that specific task ability is negatively related to task satisfaction in a low-demand task, but not in a high-demand task (Forbes & Barrett, 1978). This interaction is also consistent with the results reported in the next part of this section.

**TABLE 3**
**Moderating Effects of Job Complexity and Intelligence on Job Satisfaction[a]**

| Variable | Model 1 | Model 2 |
|---|---|---|
| Intelligence | −0.11***** | −0.08***** |
| Job complexity | 0.45***** | 0.19***** |
| Job complexity × intelligence | 0.13***** | 0.01 |
| $R^2$ | 0.20 | 0.03 |

[a] Variables were standardized prior to the analysis. In model 1, IPJC was the measure of job complexity; in model 2, DOT complexity was the measure.

***** $p < .0001$

### Intelligence and Job Satisfaction within and between Occupations

This final part of the Results section presents a simplified analysis of the relationship between intelligence and job satisfaction in which I avoided the need to measure job complexity by examining the relationship between intelligence and job satisfaction within and between occupations. This analysis was based on the simplified assumption that within occupations, there is very little variance in job complexity. In this case, the direct effect of intelligence on job satisfaction could be represented by the correlation between intelligence and job satisfaction within occupations. In addition, since the typical intelligence required by an occupation is directly related to its complexity, the indirect effect of intelligence on job satisfaction could be represented by the correlation between occupational intelligence (the mean intelligence of the members of the occupation) and occupational satisfaction (the mean job satisfaction of the members of the occupation).

In the following analyses, I selected the 74 occupations in which there were 20 or more respondents and calculated occupational intelligence and occupational satisfaction for each. In addition, I calculated for each occupation the within-occupation correlation of intelligence and job satisfaction; this was the correlation between job satisfaction and intelligence among the members of the occupation. Thus, the following analyses were performed on data that included 74 observations and three variables.

Three major results emerged from these analyses. First, across occupations, the correlation between occupational satisfaction and occupational intelligence was significantly positive ($r$ = .47, $p$ <

[3] Since in the presence of multicollinearity between independent variables (in this case, the correlation between IPJC and intelligence is .24), a significant interaction coefficient may result from curvilinear relationships between independent variables and a dependent variable (Cortina, 1993; Ganzach, 1997, 1999; Lubinski & Humphreys, 1990), I also estimated a model in which the quadratic terms of IPJC and intelligence were added to their linear and interaction terms as independent variables. However, the addition of the quadratic terms had little effect on the interaction. The results also indicated that the quadratic term of intelligence was not significant and the quadratic term of IPJC was significantly positive.

.0001). Thus, *between occupations*, intelligence had a positive relationship with job satisfaction. This correlation is consistent with the existence of a positive indirect effect of intelligence on job satisfaction.

Second, the mean within-occupation correlation of intelligence and job satisfaction across occupations was significantly negative ($t[73] = 3.7$, $p < .0005$; $\bar{x} = -.07$, s.e. $= .02$). Thus, on average, the correlation between intelligence and job satisfaction *within occupations* was negative. Since within-occupation job complexity is relatively constant, this correlation is consistent with the negative direct effect of intelligence on job satisfaction reported above.

Third, the correlation between occupational intelligence and the within-occupation correlation of intelligence and job satisfaction was significantly positive ($r = .28$, $p < .01$). This correlation is consistent with a moderating effect of job complexity on the relationship between intelligence and job satisfaction in which the higher the job complexity, the less negative the relationship between intelligence and job satisfaction.

## DISCUSSION

Although the two biblical maxims, both by King Solomon, cited at the beginning of this article appear to be contradictory, each one reflects a certain truth, at least in the domain of job satisfaction. Intelligence is associated positively with job satisfaction because more intelligent people get better, more interesting, and more challenging jobs. But intelligence is also associated negatively with satisfaction when job complexity is held constant: many jobs, at least most of the jobs held by the respondents in our sample, are not challenging or interesting enough, and the dissatisfaction that stems from this lack of interest is stronger for more intelligent people. Finally, this negative direct effect of intelligence on job satisfaction is mediated by job complexity: the effect decreases with an increase in job complexity. Thus, there is no simple answer to the question about the relationship between intelligence and job satisfaction. The answer depends on whether this relationship is analyzed between-jobs or within-jobs, and it depends on the jobs being analyzed.

The indirect positive effect of intelligence on job satisfaction, mediated by job complexity, can be explained to a certain extent by background variables such as education, ethnic origin, and parental socioeconomic status. However, the direct negative effect of intelligence cannot be explained by these background variables and, in particular, it cannot be explained by education. Furthermore, the results indicate that, with intelligence controlled, the direct effect of education on job satisfaction is negligible. These results demonstrate the discriminant validity of intelligence and education as predictors of job satisfaction and make the present findings less susceptible to alternative explanations suggesting that the relationships between intelligence and important real-life outcomes are spurious (e.g., Fischer, Hout, Jankowski, Lucas, Swidler, & Voss, 1996).

The fact that the direct effect of education on job satisfaction is negligible when intelligence is controlled is particularly important, since it is inconsistent with the overeducation hypothesis. Contrary to the overeducation hypothesis, our results suggest that the negative relationship between education and job satisfaction observed in previous research is an artifact of the positive association between intelligence and education, and they suggest that an increase in education is likely to lead to an increase in job satisfaction, through an increase in job complexity, and not to a decrease in job satisfaction. It should be noted that the evidence against the overeducation hypothesis is particularly strong because, whereas the indirect effects of intelligence and education on job satisfaction are similar, the direct effects are different. This difference strengthens the internal validity of the present results, since it implies that they cannot be explained either by common determinants of intelligence and education, or by differences in the validity of the measurement of the underlying constructs.

One interesting aspect of the results is that, despite the low correlation between the two measures of job complexity, most of the effects were similar whether DOT complexity or incumbent perception of job complexity was used to measure this construct. There has been much concern in the applied psychology literature about the validity of measures of job characteristics that are based on incumbents' subjective perceptions of their jobs and about conclusions derived from research based on these measures (e.g., Ilgen & Hollenbeck, 1991; Roberts & Glick, 1981). Almost all of the studies in this area have shown significant but moderate correlations between objective and subjective measures of job characteristics. However, whereas some of these studies have concluded that subjective measures of job characteristics were valid (Adelman, 1987; Alegra, 1983; Gerhart, 1987), others have concluded that the validity of these measures was in doubt (Brief & Aldag, 1978; Jenkins, Nadler, Lawler, & Cammann, 1975; Spector & Jex, 1991). The convergence between DOT complexity and

IPJC in the results of the current models—despite the moderate correlation between them—should strengthen researchers' trust in the validity of subjective measures of job characteristics. (Xie and Johns [1995] also found that the two measures yielded similar results despite their moderate correlation.)

However, it is also important to emphasize that, despite the convergence between the objective and subjective measures of job characteristics found here, the sizes of the effects often depended on the measure that was used in a way that indicated systematic differences between the measures. For example, whereas the effect of education on DOT complexity was much larger than its effect on IPJC, the effect of intelligence on each of the two measures was rather similar (Figure 3). The reasons for the differences and similarities between these measures is an interesting issue for future research.

Another interesting aspect of the results is the moderating effect of job complexity on the relationship between intelligence and job satisfaction. One aspect of this moderation is that for highly complex jobs, the relationship between intelligence and job satisfaction may be positive. This is consistent with the finding that work stress is often the consequence of insufficient resources vis-à-vis the cognitive demands required by work (e.g., Schaubroeck & Ganster, 1993; Xie & Johns, 1995). To the extent that stress is a precursor of dissatisfaction at work, these findings also suggest that a positive relationship between cognitive ability and job satisfaction is typical only for highly complex jobs.

Although the model in Figure 1 depicts job complexity as a moderator of the relationship between intelligence and job satisfaction, it is mathematically equivalent to a model in which intelligence moderates the relationship between job complexity and job satisfaction. That is, our model can also be viewed as suggesting that, for highly intelligent people, the complexity of work is more important than it is for less intelligent people. Furthermore, conceptually, the moderating role of intelligence in this model is not very different from the moderating role of growth-need strength in need theories of job satisfaction, in that it suggests that people with higher intelligence desire more interesting and challenging work. Therefore, the question of which concept to use—growth-need strength or intelligence—is more a question of theoretical and empirical utility than a question of descriptive validity.

From an empirical perspective, it should be noted that the support for a moderating effect of growth-need strength on the relationship between job complexity and job satisfaction is weak and inconsistent (e.g., Bottger & Chew, 1986; Graen, Scandura, & Graen, 1986; Kulik, Oldham, & Hackman, 1987; O'Brien, 1982; Tiegs, Tetrick, & Fried, 1992; but Loher, Noe, Moeller, and Fitzgerald [1978] found contrary results). The study of Tiegs and colleagues (1992) is particularly interesting; using IPJC and a sample comparable in size to the sample used in the current study ($N = 6{,}405$), they failed to find any moderating effect of growth-need strength on the relationship between job complexity and job satisfaction.

From a theoretical perspective, growth-need strength is a problematic concept, since like other need concepts, it is poorly specified and ambiguous (Salancik & Pfeffer, 1977). It is a description, but not an explanation, of the observed relationships, and therefore it does not add to a theory of job satisfaction beyond simply stating that people vary on the importance they assign to job complexity as a determinant of job satisfaction. As a result, the concept of growth-need strength cannot be defined independent of the theoretical role it plays in a need theory. These problems are not encountered when intelligence is used as a moderator variable, since the concept of intelligence can be conceptually distinguished from the role it plays in a theory.

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