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Learning and Strain Among Newcomers: A Three-Wave Study on the Effects of Job Demands and Job Control

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ABSTRACT. The present 3-wave longitudinal study was an examination of job-related learning and strain as a function of job demand and job control. The participants were 311 newcomers to their jobs. On the basis of R. A. Karasek and T. Theorell's (1990) demand–control model, the authors predicted that high demand and high job control would lead to high levels of learning; low demand and low job control should lead to low levels of learning; high demand and low job control should lead to high levels of strain; and low demand and high job control should lead to low levels of strain. The relation between strain and learning was also examined. The authors tested the hypotheses using ANCOVA and structural equation modeling. The results revealed that high levels of strain have an adverse effect on learning; the reverse effect was not confirmed. It appears that Karasek and Theorell's model is very relevant when examining work socialization processes.

Key words: job control, job demands, learning, strain, work socialization

THE ISSUE OF VOLUNTARY JOB MOBILITY has been a subject for researchers over the last two decades. One important line of research examined turnover in the context of *socialization processes*, defined as the formal and informal social influence processes through which individuals acquire the skills, values, and beliefs necessary for them to function as members of a work group (Dawis & Lofquist, 1984; Feij, Whitely, Peiró, & Taris, 1995; Louis, 1980; Nicholson, 1996). In this perspective, mobility is often considered the outcome

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of a socialization process that has failed, resulting in a mismatch between the values, skills, expectations, or interests of individuals and their organizational environments (e.g., Feij, Van der Velde, Taris, & Taris, 1999; Wilk & Sackett, 1996).

However, job mobility must not necessarily be construed as the result of an unsuccessful socialization process. In a comprehensive review of the organizational socialization process of newcomers, Fisher (1986) distinguished among five types of learning during the organizational socialization process: (a) preliminary learning, (b) learning to adapt to the organization, (c) learning to function in the work group, (d) learning to do the job, and (e) personal learning (e.g., about one's own career interests). The first four types ideally lead to a status quo, in the sense that workers are presumed to reach a stable end point at which there is an equilibrium between what they want from their job and what the organization they work for wants from them. In contrast, personal learning does not necessarily lead to such an end point. Personal learning may involve growth in the sense that workers become increasingly aware of their personal wishes and interests for the development of their careers as well as the degree to which they are qualified for better jobs.

Stated differently, during the organizational socialization phase, workers may learn what they actually want from their jobs as well as what they have to do to improve their chances for advancing in the organization. This does not necessarily imply that workers become dissatisfied or unhappy in present positions: A certain level of aspiration and personal growth is often considered an integral part of worker well-being (Ryff & Singer, 1998; Van Horn, Taris, Schaufeli, & Schreurs, 2004; Warr, 1990, 1994). However, absence of any intentions to move up (either within or outside the organization) may be construed as signaling an incomplete or a failed socialization process rather than a sign of successful socialization.

In the present study, we focused on the development of personal learning during the first 30 months after the transition from vocational school to work. At the heart of this research is the assumption that a particular work environment may or may not provide a good opportunity for personal learning. In fact, earlier research has shown that job characteristics, such as job demand and job control, influence levels of work-related strain and learning and that strain and learning mutually influence each other (Holman & Wall, 2002; Karasek, 1979; Karasek & Theorell, 1990; Parker & Sprigg, 1999; Taris, Kompier, De Lange, Schaufeli, & Schreurs, 2003).

The central issue in the present study is how job demands, job control, and job-related strain affect the development of the work aspirations of young workers, defined in terms of the degree to which newcomers are motivated to learn from their colleagues and superiors. Learning from others is an important mechanism for achieving successful socialization (Feij et al., 1995; Nicholson, 1996). By examining the development of work aspirations among newcomers, we contribute to the literature on organizational socialization processes; by examining the effects of work characteristics on both strain and learning, we enhance understanding of the interrelation between the latter two concepts, an interrelationship that is currently poorly understood (Holman & Wall, 2002).

Job Characteristics, Strain, and Learning

Karasek´s (1979) job demand–control model (JDC model) has been a leading work stress model in occupational health psychology since the 1980s. The JDC model assumes that a psychological work environment can be characterized by a combination of the demands of the work situation and the amount of control employees have to cope with these demands. Whereas early formulations of the JDC model mainly focused on the effects of various combinations of job demands and job control on stress and health-related outcomes (Karasek, 1979), more recent formulations consider their implications for learning new behavior patterns as well (Karasek & Theorell, 1990).

The JDC model distinguishes among four different job types. In low control and high demand jobs, high levels of strain and relatively low levels of learning were predicted because the individual cannot respond optimally to situational demands (Karasek & Theorell, 1990). If high job demands occur in conjunction with high job control, employees should be able to deal adequately with these demands, protecting them from excessive strain. Learning and feelings of mastery may result. These, in turn, may help a worker cope with the inevitable strain-inducing situations of the job, resulting in reduced strain and even higher levels of productivity.

Workers in low demand and low control jobs will experience low levels of strain because the demands of the situation are low, in spite of the fact that they have little opportunity to influence their work situation. These jobs are presumed to offer little opportunity for learning and personal development. According to Karasek (1998), such jobs even lead to “negative learning or gradual loss of previously acquired skills” (p. 34). Finally, low job demand and high job control are expected to lead to a low level of strain because workers have numerous ways to cope with situational demands. Moderate levels of learning are expected for such jobs because workers can explore different ways of dealing with job demands, a situation that is conducive to learning (Bandura, 1997).

Evidence for the JDC model. The JDC model has generated an impressive body of research, most of which has been focused on its predictions for employee strain and ill health. This line of research offered quite some support for the prediction that the combination of high job demands with low job control leads to high levels of strain, in the form of main effects or as a Demand × Control interaction effect (see De Jonge & Kompier, 1997; De Lange, Taris, Kompier, Houtman, & Bongers, 2003; Van der Doef & Maes, 1999, for reviews). However, the implications of the model for learning and motivation have been examined considerably less often. According to Parker and Sprigg (1999, p. 926), "Few, if any, investigations have tested the learning-related predictions of the [. . .] demands-control model put forward by Karasek and Theorell (1990)." Virtually none of the longitudinal studies on the JDC model reviewed by De Jonge and Kompier, De Lange et al., or Van der Doef and Maes explicitly considered learning-oriented concepts. The paucity of research addressing learning-oriented outcomes is striking, even more so because many current management practices and philosophies promote the development of self-managing and development-oriented employees (Parker & Sprigg).

Taris et al. (2003) conducted a review of the relevant literature and concluded that little research has addressed the learning-oriented predictions of the JDC model, and in the studies that have been conducted, methodological problems (e.g., cross-sectional designs; outcome measures that do not adequately reflect learning) prevent strong conclusions regarding the causal effects of job demands and job control on worker learning. In spite of these limitations, most research on the effects of job demands and job control on learning has confirmed the expectations of the JDC model: High levels of learning (or outcomes of learning, such as feelings of efficacy and mastery; Parker & Sprigg, 1999) occur in jobs in which there is high demand and high job control, whereas workers in low demand and low control jobs report low levels of learning.

Relations between strain and learning. One major issue that has not been addressed so far is the issue of how learning and strain influence each other. Karasek and Theorell (1990) argued that high levels of strain inhibit learning, whereas high levels of learning inhibit stress. As Holman and Wall (2002) show, there is support for both assumptions. Evidence for the effects of strain on learning and learning-oriented outcomes such as efficacy, mastery, and skill utilization comes largely from studies conducted from cognitive, clinical, and educational perspectives. Experimental work has shown that anxiety (a major dimension of strain; Warr, 1990) reduces the effectiveness of information processing, which is crucial in the early stages of skill acquisition. Attention focused on anxiety provokes nontask activities, inhibits understanding and experimenting with new ideas, and thus reduces learning (Warr & Downing, 2000). Studies in educational settings have shown that there is a negative relationship between anxiety and outcomes such as test scores (Warr & Downing) and skill acquisition (Colquitt, LePine, & Noe, 2000). Similar findings have been obtained for the effects of depression (another major dimension of strain; Warr, 1990).

Conversely, there is also some reason to expect that learning inhibits stress. Greater knowledge, skill, and efficacy enable the individual to cope more effectively with work demands, thus reducing strain (cf. Lazarus & Folkman, 1984). There is some evidence that individuals with high self-efficacy are less likely to suffer from depression and anxiety (Saks, 1994) and feel more able to cope with challenging situations (Ozer & Bandura, 1990).

Given the empirical evidence for both assumptions, it would seem plausible that strain and learning mutually influence each other. Consistent with this idea, Parker and Sprigg (1999) found that high levels of mastery (a measure tapping work-related efficacy) were associated with low levels of strain. The causal direction of this effect could not be determined, however, because of the cross-sectional nature of their study. In a partly longitudinal study, Holman and Wall (2002) tested various models for the association between job characteristics, learning, and strain. Their study provided support for both the "strain inhibits learning" and the "learning inhibits strain" hypotheses, showing that the effects of job control on learning and strain were mediated through strain and learning, respectively. Thus, the evidence available so far suggests that learning and strain mutually influence each other.

Effects of prolonged exposure to particular demand and control combinations. Finally, what happens if workers remain in the same job for a long period? What are the cumulative effects of exposure to a particular combination of job demands and control? According to Karasek and Theorell (1990), in low demand and low control jobs, low levels of strain and low levels of learning are expected. An absence of high demand implies that this type of job has a low potential for strain. Furthermore, from the perspective of German action theory, demands provide goals to overcome (Frese & Zapf, 1994), and an absence of demands means that workers have little challenge. Karasek and Theorell state that "The passive [i.e., low demand/low control] job setting is [a] major psychosocial problem . . . lost skills, lack of job challenges, and environmentally rigid restrictions preventing workers from testing their own ideas for improving the work process can only mean an extremely unmotivating job setting and result in long term loss of work motivation and productivity" (p. 38). Thus, a prolonged stay in a low demand and low control job is expected to lead to a lower level of learning.

For high job demand and high job control, the opposite prediction is made: This type of job is presumed to offer challenging goals; the high level of job control means that workers have enough opportunity to deal with these demands (resulting in moderate levels of strain) and that they can experiment with different ways of dealing with these demands, which stimulates learning. A prolonged stay in this type of job is expected to result in even higher levels of learning across time ("ad infinitum"; Karasek & Theorell, 1990, p. 103).

Karasek and Theorell (1990) did not explicitly address the implications for learning of a prolonged stay in high demand and low control or low demand and high control jobs. As argued earlier, in these types, moderate levels of learning are expected. However, cumulative exposure to high demand with low control is presumed to result in increased high levels of strain, whereas low demand and high control jobs are expected to result in low levels of strain.

Hypotheses

On the basis of these ideas, we developed three sets of hypotheses. The first concerns the within-wave differences between the four Karasek job types.

Hypothesis 1a. High levels of learning are expected for workers in high demand and high control jobs.
Hypothesis 1b. Low levels of learning are expected for workers in low demand and low control jobs.
Hypothesis 1c. For the other two job types, intermediate levels of learning are expected.
Hypothesis 1d. High levels of strain are expected among workers in high demand and low control jobs.
Hypothesis 1e. Low levels of strain are expected among workers in low demand and high control jobs.
Hypothesis 1f. For the two other job types, intermediate levels of strain are expected.

The second set focuses on the development of learning and strain among the four Karasek job types.

Hypothesis 2a. Workers in high demand and high control jobs are expected to report increasing levels of learning across time.
Hypothesis 2b. Workers in low demand and low control jobs are expected to report decreasing levels of learning across time.
Hypothesis 2c. No change in learning behavior is expected for low demand and high control or high demand and low control jobs.
Hypothesis 2d. Workers in high demand and low control jobs are expected to report increasing levels of strain.
Hypothesis 2e. Workers in low demand and high control jobs are expected to report decreasing levels of strain.
Hypothesis 2f. For the two other job types, no changes in strain are expected.

Our third set of hypotheses focused on the relationships between strain and learning. According to Karasek and Theorell (1990), strain and learning mutually influence each other.

Hypothesis 3a. High levels of strain lead to lower levels of learning at a later time.
Hypothesis 3b. High levels of learning lead to lower levels of strain.

Method

Sample

We collected the data in a three-wave prospective cohort study among newcomers on the labor market. At the first wave of the study, 1,301 employed youth (M_{age} = 20.6, *SD* = 3.2; 63% men) who were working as either machine operators (48%) or office technicians (52%) were contacted for participation in the study. The participants came from four countries (Belgium, England, the Netherlands, and Israel). The machine operators were all in production and manufacturing organizations and included job titles such as die casting machine operator, moulder, and welder. The office technology group included job titles such as word processing operator, data entry worker, and microcomputer operator. The samples were not intended to be representative of either national or regional labor forces, but they do reflect the typical gender composition of particular occupations in the participating countries (Feij et al., 1995).

We acquired the samples either by contacting training schools for the names, addresses, and work location of potential participants or by contacting employers for the same information. To be selected, participants had to be between 17 and 22 years old at the beginning of the study; they were also required to have been employed for 3 to 9 months at the beginning of the study (which coincides with the common probationary period in Europe). The data collection for the second (*N* = 1,043, 80.2% response) and third (*N* = 882, 67.8% response) wave of the study occurred 1 and 2 years, respectively, following the initial data collection. This particular time lag was chosen because developmental outcomes may require a 6- to 12-month period to occur (Feij et al., 1995; Van Maanen & Schein, 1979).

In the present study, we examined the effects of prolonged exposure to particular combinations of job demands and job control. We dropped participants who reported changes in either variable or who changed jobs (either within or outside the organization that employed them at the beginning of the study). Finally, listwise deletion of missing values resulted in a final sample of 311 participants. This relatively low number of participants reflects the fact that young employees tend to change employers at a relatively high rate (cf. Taris & Feij, 1999). Because we collected the data in a prospective cohort design, this data set is especially suitable for testing the hypotheses formulated earlier on. As all the participants were in a similar stage of their careers and of about the same age, between-participant differences in job experience, job-related expectations, and the like should be minimized.

Measures

The questionnaires used in this study were originally developed in English and then translated into the native languages of the three non-English speaking countries (i.e., Dutch for Belgium and the Netherlands, and Hebrew for Israel). We established the linguistic equivalence of all the measures used in this study through the use of back-translation procedures. In conducting these back translations, we used individuals who were fluent in both the language of that country and English. We did not use a mechanical back translation procedure of first having one person translate from English to the native language, then another from the native language back to English. Rather, the procedure used was to discuss each question and the alternatives in a small group of persons fluent in both languages. Discussion occurred until agreement was reached as to the linguistic equivalence of the questions in both languages. These procedures for establishing equivalent measures were used in all the non-English-speaking countries (cf. Feij et al., 1995).

Job characteristics. We measured job demands by using a three-item scale tapping time demands in one's job (Rizzo, House, & Lirtzman, 1970). Items were "I have too much work to do everything well"; "I never seem to have enough time to get everything done on my job"; and "On my job the amount of work I do interferes with how well I do my work." Responses ranged from *not descriptive* (1) to *very much descriptive* (5). This scale was measured at the first and third wave of the study; alphas were .61 and .67, respectively, which seems acceptable given the limited number of items in this scale.

We measured job control by using Graen's (1976) scale for decision latitude. These items asked about the frequency with which respondents could make decisions about (a) what tasks or assignments to do, (b) the way they performed their work, and (c) the timing or sequence in which they did their work. Responses ranged from *never at all* (1) to *very frequently* (5). This concept was measured at Time 2 and Time 3; alphas were .78 and .77, respectively.

Following De Lange et al. (2003) and Karasek and Theorell (1990), all measures of job demand and job control were dichotomized on their respective means. We dropped participants whose scores on job demands or job control varied across time (for example, they belonged to the 50% high control participants on one occasion and to the 50% low control participants on another). We then assigned the remaining participants ($n = 311$) to one of four groups, consisting of participants who held either a stable low demand and low control job, a low demand and high control job, a high demand and low control job, or a high demand and high control job during the observed interval.

Outcomes. We measured levels of strain by using Goldberg's (1972) General Health Questionnaire (GHQ; 12-item version). This scale taps the degree to which participants suffer from stress-related mental health complaints such as sleeplessness, worry, lack of self-confidence, and stress. The scale measures how often these variables can be applied during the last few weeks compared with how participants normally felt. Responses range from *less often than usual* (1) to *much more often than usual* (4). The reliability of the GHQ for this study was .77, .78, and .80 for Time 1, Time 2, and Time 3, respectively.

Learning was measured using a six-item scale based on Backman (1978) and Penley and Gould (1981). Consistent with Karasek and Theorell's (1990) definition of active learning as the "motivation to develop new behavior patterns" (p.

32), these items tapped the degree to which workers engaged in activities targeted toward the enlargement of their repertoire of skills needed to realize their work aspirations and the degree to which they had actually learned new skills. Three items were drawn from Backman (1978), respectively: "I have recently sought advice from my co-workers, family or other people about additional training or experience I need to improve my future work prospects"; "Since I have worked here I have initiated talks with my supervisor about training or work assignments I need to develop skills that will help my future work chances"; and "I have made my supervisor aware of my work aspirations and goals." Responses ranged from *not at all* (1) to *a great deal* (5).

Three more items were drawn from Penley and Gould (1981), namely, "I have developed skills which may be needed in future positions"; "I have gained experience in a variety of work assignments to increase my knowledge and skills"; and "I have developed more knowledge and skills critical to my work unit's operation." Confirmatory factor analyses revealed that at each of the three time points one factor accounted for the associations among the items. For the present study, the reliability of this scale was .69, .73, and .75 at Time 1, Time 2, and Time 3, respectively.

Background variables. Finally, in the present study, we included measures of participant age, gender, and vocation (machine operators vs. office technicians) as control variables, but we formulated no hypotheses concerning their effects. Table 1 presents the means and standard deviations of the sample on the study variables.

Procedure

Nonresponse analysis. Our comparison of the Time 1 scores on the study variables of those who participated in the third wave with the Time 1 scores with all other participants revealed that nonresponse had been selective, $F(5, 1272) = 4.98$, $p < .001$, $\eta^2 = .02$; follow-up analysis revealed that those who dropped out of the study reported slightly more strain ($M = 1.79$, $SD = .38$) than those who remained in the study ($M = 1.69$, $SD = .42$), $F(1, 1276) = 17.02$, $p < .001$, $\eta^2 = .01$. Thus, restriction of range effects may occur for this variable; we found no evidence of selective dropout for the other variables.

Development of strain and learning across time. We tested Hypotheses 1a–c and 2a–c by using a multivariate analysis of covariance (MANCOVA). For each type of outcome variable (i.e., strain and learning), we used a 3 (Time: Time 1 outcome vs. Time 2 outcome vs. Time 3 Outcome) × 4 (Job type: the four Karasek job types) MANCOVA, with planned contrasts on Time. The first contrast (linear time) tested the difference between the Time 1 and Time 3 measure of the outcome variable, thus focusing on the linear trend across time. The second con-

TABLE 1. Means and Standard Deviations for the Variables in this Study as a Function of Job Type

Variable	High demand, low control (n = 72) *M*	*SD*	High demand, high control (n = 81) *M*	*SD*	Low demand, high control (n = 71) *M*	*SD*	Low demand, low control (n = 87) *M*	*SD*	F^{e}
Learning									
Time 1	2.50[b]	1.00	3.01[acd]	.81	2.47[ab]	1.02	2.30[b]	.94	8.84*
Time 2	2.47[bc]	.93	2.85[ad]	.99	2.82[ad]	1.03	2.27[bc]	.94	8.16*
Time 3	2.73	1.06	2.95[d]	.91	2.83[d]	.90	2.29[bc]	.97	8.21*
Strain									
Time 1	1.82[cd]	.42	1.81[cd]	.43	1.53[ab]	.30	1.62[ab]	.29	11.89*
Time 2	1.89[cd]	.37	1.78[c]	.42	1.53[abd]	.32	1.74[ac]	.40	10.95*
Time 3	1.94[bcd]	.41	1.73[ac]	.40	1.53[ab]	.29	1.71[ac]	.28	16.66*
Age	21.67[cd]	3.50	20.19	3.06	19.11[a]	3.24	19.31[a]	3.50	9.64*
% Female	29		37		46		37		1.70

[a]Mean differed significantly from the mean of the high demand and low control group, $p < .05$. [b]Mean differed significantly from the mean of the high demand and high control group, $p < .05$. [c]Mean differed significantly from the mean of the low demand and high control group, $p < .05$. [d]Mean differed significantly from the mean of the low demand and low control group, $p < .05$. [e]All univariate comparisons had (3, 307) degrees of freedom.
*$p < .001$.

trast (nonlinear time) tested whether the Time 2 measure of the outcome variable differed from the average of the Time 1–Time 3 measure of the same outcome variable, thus focusing on possible nonlinear deviations from a linear trend. We included participants' ages and gender as covariates, together with a variable indicating whether they belonged to the office automation or the machine operator group.

To ease interpretation of the findings, we have provided measures of effect size (η^2) for all inferential outcomes. Eta-squared is a measure of effect size, equal to the ratio of the between-groups sum of squares to the sum of squares for all main, interaction, and error effects (but not covariate effects). Eta-squared is interpreted as the percentage of variance in the dependent variable explained by the factor(s).

Relationships between strain and learning. We examined the relationships between strain and learning using structural equation modeling (SEM; Jöreskog & Sörbom, 1993). In this approach, several competing a priori models that can reasonably be expected to account for the relationships between strain and learning are specified and fitted to the data (MacCallum, Roznowski, &

Necowitz, 1992). The fit of these models can be compared, and the best-fitting model is accepted as the model that best approximates the latent structure that generated the data. For the present study, we assessed the model fit by using the chi-square test, as well as the root mean square error of approximation (*RMSEA*), the comparative fit index (CFI), and the nonnormed fit index (NNFI). Values of .05 and lower (for *RMSEA*) and .90 and over (for CFI and NNFI) indicate acceptable fit.

In the present study, we tested four models. The first (the *stationary* model) assumes that strain and learning may be related, but that these concepts develop independently across time. That is, whereas there may be an association between strain and learning at the first wave of the study, strain and learning are not related in any way. We included Time 1–Time 2, Time 2–Time 3, and Time 1–Time 3 stability effects in this model for both learning and strain.

The second model (the *strain inhibits learning* model) is a variation on the first but tests whether strain influences learning across time (i.e., Hypothesis 3a). Apart from the effects mentioned for Model 1, the second model included direct effects from Time 1 strain on Time 2 and Time 3 learning, and from Time 2 strain on Time 3 learning. The effects of Time 1 strain on Time 2 learning and of Time 2 strain on Time 3 learning were constrained to be equal, as there was no a priori reason to expect the strength of the effects of strain on learning to vary across time.

The third model (the *learning inhibits strain* model) is a straightforward analog of the second, in the sense that it tests whether learning influences strain across time (Hypothesis 3b). Thus, this model included all effects mentioned for Model 1, as well as Time 1–Time 2, Time 1–Time 3, and Time 2–Time 3 lagged effects of learning on strain.

Finally, the fourth model (the *reciprocal effects* model) tests whether strain and learning influence each other reciprocally. This model included all effects mentioned for the other three models.

Results

Development of Strain and Learning Across Time

Learning. An analysis of covariance (ANCOVA) revealed a main effect of job type, $F(3, 307) = 11.00$, $p < .001$, $\eta^2 = .10$. Scheffé range tests revealed that the highest level of learning was reported in high demand and high control jobs (M = 2.94, SD = 72), the lowest level of learning was reported in low demand and low control jobs (M = 2.28, SD = .74), and intermediate levels of learning were reported in the other two job types. Thus, Hypotheses 1a, 1b, and 1c were supported. Table 1 reveals that this pattern of effects varied across occasions; whereas the average levels of learning in high demand and high control jobs were consistently higher than that in low demand and low control jobs, the differences between these two job types and the high demand and low control and

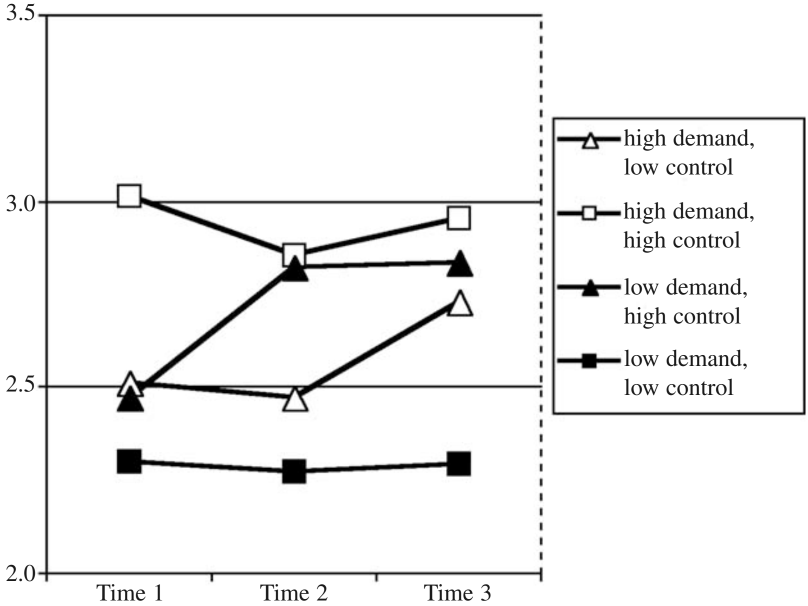

FIGURE 1. Learning among newcomers as a function of prolonged exposure to particular combinations of job demand and job control.

low demand and high control jobs were not always significant. Indeed, as Figure 1 shows, levels of learning were more or less stable for the high demand and high control and low demand and low control groups, whereas the level of learning for the two other groups tended to approach that reported for the high demand and high control group in time.

We also found a main effect of Time (linear), $F(1, 307) = 4.47$, $p < .05$, $\eta^2 = .04$; participants reported higher levels of learning across time (Time 1: $M = 2.59$, $SD = .98$; Time 2: $M = 2.69$, $SD = 1.01$; Time 3: $M = 2.73$, $SD = 1.01$). Finally, there was a significant Job Type × Time (linear) interaction, $F(3, 307) = 2.71$, $p < .05$, $\eta^2 = .02$. Tests for simple main effects revealed that there was a significant increase in learning behavior across time for the low demand and high control group, $F(1, 70) = 7.29$, $p < .01$, $\eta^2 = .09$, $M = 2.47$ ($SD = 1.02$) and $M = 2.83$ ($SD = .90$) for Time 1 and Time 3, respectively. No further effects were significant. Thus, we rejected Hypotheses 2a–c.

Strain. ANCOVA revealed a main effect of job type, $F(3, 304) = 20.81$, $p < .001$, $\eta^2 = .17$. Scheffé range tests indicated that workers in low demand and high control jobs reported the lowest levels of strain ($M = 1.53$, $SD = .23$), and workers in high demand and low control jobs reported the highest levels of strain (M = 1.88, SD = .29), with workers in the two other job types reporting intermediate levels of strain. Hypotheses 1d–1f were confirmed. Again, this pattern varied across occasions and across time, especially in high demand and low control jobs (Figure 2).

Furthermore, there was a Job Type × Time (linear) interaction effect, $F(3, 304) = 3.04$, $p < .05$, $\eta^2 = 03$. Tests for simple main effects revealed an effect of time (linear) for the high demand and low control group, $F(1, 70) = 4.27$, $p < .05$, $\eta^2 = .05$, for the high demand and high control group, $F(1, 79) = 4.43$, $p < .05$, and for the low demand and low control group, $F(1, 85) = 5.30$, $p < .05$, $\eta^2 = .06$. The number of health complaints increased for both the high demand and low control group (Ms were 1.82 and 1.94 at Time 1 and Time 3, respectively, supporting Hypothesis 2d) and the low demand and low control group (Ms were 1.62 and 1.71 at Time 1 and Time 3, respectively), whereas the number of health complaints decreased for the high demand and high control group (Ms were 1.81

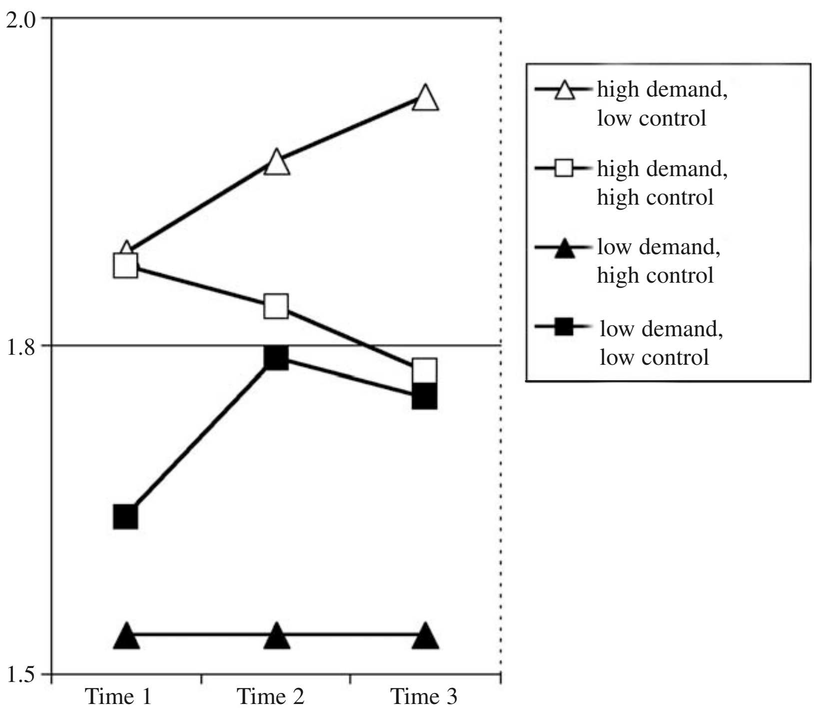

FIGURE 2. Stress among newcomers as a function of prolonged exposure to particular combinations of job demand and job control.

and 1.73 for Time 1 and Time 3, respectively). No further effects were significant. We rejected Hypotheses 2e–f.

Relationships Between Strain and Learning

The second set of analyses focused on the effects of learning on strain and vice versa. Table 2 contains the fit indexes for the four models that may account for the relationships between strain and learning. Assuming that strain and learning do not temporally affect each other, Model 1 fit the data reasonably well; all fit measures had quite acceptable values. However, assuming that high levels of strain have an adverse effect on learning, Model 2 fit the data significantly better than did Model 1, $\chi^2(1, N = 311) = 5.89$, $p < .05$. The model that assumes that learning inhibits strain (Model 3) fit the data about equally well as Model 1 but had 1 less degree of freedom, meaning that Model 3 did not improve on Model 1. Finally, the reciprocal effects model (Model 4) that assumed that strain inhibits learning and learning inhibits strain fit the data significantly better than did Model 1 and Model 3 and about equally well as Model 2. However, because Model 2 had 1 more degree of freedom than Model 4, the strain inhibits learning model was accepted as the best model. Figure 3 presents the standardized maximum likelihood estimates for Model 2.

Figure 3 shows that strain and learning are both rather stable across time, as evidenced by Time 1–Time 2 stability effects varying from .36 to .46 (all *p*s < .001) and Time 1–Time 3 stabilities of .25 and .14, respectively (*p*s < .05). Of more substantive interest are the lagged effects of Time 1 and Time 2 strain on Time 2 and Time 3 learning. Figure 3 shows that participants who reported high levels of strain at Time 1 report relatively low levels of learning at Time 2 (lagged effects of –.08, $p < .05$), which is consistent with the assumption that strain inhibits learning. We confirmed Hypothesis 3a, and we rejected Hypothesis 3b.

TABLE 2. Comparison of the Fit of Four Models (*N* = 311)

Model	*df*	χ^2	CFI	NNFI	*RMSEA*
1. Stationary	8	10.48	.96	.97	.031
2. Strain inhibits learning	7	4.59[a]	.98	1.04	.000
3. Learning inhibits strain	7	10.37	.95	.95	.039
4. Reciprocal effects	6	4.48[a]	.98	1.03	.000

Note. CFI = Comparative Fit Index; NNFI = Nonnormed Fit Index; *RMSEA* = root mean square error of approximation.
[a]Model 2 was a significant improvement over Models 1 and 3 ($p < .05$).

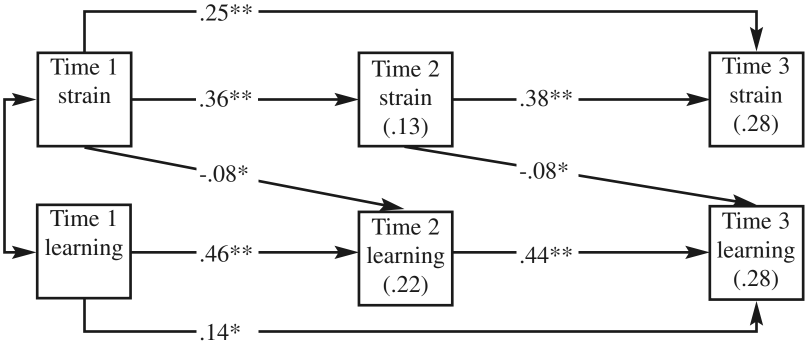

FIGURE 3. Effects for the strain inhibits learning model (Model 2, N = 311, standardized maximum likelihood estimates—proportion of explained variance in paraentheses).
$*p < .05$. $**p < .001$.

Discussion

In the present study, we examined the cumulative effects of various combinations of job demands and job control on learning and strain, as well as the relation between learning and strain, in the context of a three-wave prospective cohort study among newcomers. Our central assumption in this study was that particular combinations of demands and control facilitate the development of young workers, as evidenced in the degree to which they are motivated to acquire new skills needed to get ahead in their jobs as well as in the degree to which their work leads to strain. Incorporation of the latter concept was important, as there is some evidence that strain inhibits learning.

On the basis of Karasek's (1979; Karasek & Theorell, 1990) JDC model, we formulated hypotheses concerning the across-time development of learning and strain. Whereas the cross-sectional results were largely in line with the predictions (i.e., high levels of learning for high demand and high control jobs; low levels of learning for low demand and low control jobs; high levels of strain for high demand and low control jobs; and low levels of strain for low demand and high control jobs), our results reveal little support for Karasek and Theorell's assumptions concerning the across-time development of strain and learning. The expected cumulative effects of prolonged exposure to these demand and control combinations on strain and learning are only partly confirmed. We did not find that high demand in combination with high control led to higher levels of learning. Also, low demand in combination with low control did not lead to lower levels of learning, and low demand combined with high control did not lead to lower levels of strain. Furthermore, whereas strain inhibited learning, learning did not inhibit strain. However, the hypothesis that the combination of high demand with low control results in higher strain is supported.

We also found some unexpected results. Whereas we predicted no across-time differences in the development of strain for the high demand and high control group, strain tended to decrease for this group. This is consistent with Karasek and Theorell's (1990) assumption that high job demands initially result in high levels of strain, but that strain decreases in time because workers in this job type have the opportunity to experiment with new (and better) ways of dealing with these demands, resulting in lower levels of strain (note that the level of learning was relatively high in this job type; cf. Table 1).

A second unexpected finding was that the level of strain reported by workers in low demand and low control jobs increased slightly across time. Although no change was expected for this group, Karasek (1998) holds that this job type may result in "negative learning or gradual loss of previously acquired skills" (p. 34). Loss of skills may result in increasing levels of strain because workers become unable to deal with situational demands (note that learning was consistently low for this job type). Thus, this result can also be interpreted within the JDC model.

Finally, our results reveal that workers in low demand and high control jobs reported more learning across time. One interpretation of this finding is that the low level of strain in these jobs (cf. Table 1) facilitates learning, which is consistent with the findings of the SEM as well as with Karasek and Theorell's (1990) assumption that absence of strain promotes learning. Thus, it appears that the unexpected results reported here provide additional evidence for the assumptions of the JDC model rather than contradict them.

Study Limitations

Before discussing the practical and scientific implications of these findings, it is important to address the limitations of the current research. First, in the present study, job demand and job control were not measured with the standard measures of these concepts proposed by Karasek (1985). This implies that some caution should be exercised in comparing the present set of results with the findings of other studies. However, conceptually the current measures do not seem to differ substantially from the Karasek (1985) measures, and we therefore believe that similar results would have been obtained had we employed Karasek's scales.

A potentially more serious threat to this study is that job demand and job control were measured at only two of the three waves of the study, whereas a reliable assessment of the absence of change during the observed interval would require that these concepts be measured at all occasions. This shortcoming implies that the four "stable" groups examined in the present study included an unknown number of participants who were experiencing some change regarding either their job demand or job control, or both.

As some of our key hypotheses concerned the effects of cumulative exposure to particular demand and control combinations, the presence of these "unstable" participants introduces some bias in our results. It would seem likely that this bias results in conservative estimates of the cumulative effects of job demand and job control on learning and strain because effects are expected to become more pronounced with prolonged exposure. However, bias in the sample might partially account for the fact that we rejected five of our six hypotheses concerning the across-time effects of prolonged exposure to particular job demands and job control because of the absence of change.

We do not put much faith in this explanation. Whereas it is true that five of the six hypotheses concerning the across-time development of learning and strain were rejected, in three other instances we did find across-time change in learning and strain. Although these changes were not a priori hypothesized, they could be interpreted very well using the axioms of the JDC model. Thus, although most of our hypotheses concerning the across-time development of learning and strain were rejected, it is not the case that there was no (interpretable) across-time change at all. This suggests that although demand and control were only measured at two of the three occasions in our study, this did not strongly reduce the amount of across-time change for the four Karasek job types.

A third limitation concerns the interval between the waves of the study. The present study employed two 1-year time lags. This particular time lag may or may not correspond with the "true" causal interval for the process under study, meaning that effects of prolonged exposure to a particular demand and control combination may have been underestimated. The lagged effects work on the assumption that demand and control will have their effect on strain and learning over a 1-year or a 2-year period, but this may not be the period over which effects occur. Unfortunately, as yet it is unknown how long this underlying causal lag is (see Taris & Kompier, 2003, for a discussion). The fact that *within* each occasion we found the expected differences in learning behavior and strain among the four Karasek job types might suggest that a shorter time lag would have provided stronger support for the cumulative effects of job demand and job control on learning and strain. However, it should also be noted that the present 1-year time lag was not too long to reveal lagged effects from strain on learning, which suggests that a 1-year time lag is appropriate for examining the effects of strain (and, perhaps, work characteristics) on learning.

The theoretical framework of the present study may be considered a final limitation. At the heart of this study was the assumption that work characteristics affect newcomer learning and strain. To some, this may sound as if we construed the individual participants as being malleable recipients of environmental influences (the traditionalist view on socialization processes; Nicholson, 1996) rather than as active producers of their own work environment (Feij et al., 1995; Lerner, 1984), which is currently the dominant perspective on socialization processes. To some degree this is correct. However, one of the main objectives of the present study was to examine how the work environment facilitates employees' motivation and attempts to acquire new skills. This undoubtedly leads to change in the procedures applied by these workers and, thus, to innovation in the content of their jobs. In this sense, the present study is a direct link to the modern transactional view on work socialization processes.

Implications of the Study

Although the limitations discussed above imply that our results should be interpreted with care, we believe that the present study has interesting implications for both theory and practice. The *scientific implications* may be that further research on job socialization processes would benefit from incorporating the effects of job characteristics. Work socialization is really about learning new skills and learning how to deal with job demands (cf. Nicholson, 1996). The present study revealed that the degree to which young workers learn new skills and suffer from work-related strain depended partly on the combination of job demands and job control, underlining the need to control these aspects of the work situation of newcomers.

Furthermore, learning did not increase across time for the high demand and high control group and did not decrease for the low demand and low control group. This finding is interesting, given the nature of the current sample. In more experienced samples, it might be assumed that floor or ceiling effects occur (i.e., workers in high demand and high control jobs may have reached an optimal level of learning, given the characteristics of their jobs, and prolonged exposure to these characteristics will not lead to any increment in learning). For the current sample of relative newcomers, floor and ceiling effects would not a priori be expected, as initially it seemed unlikely that newcomers would reach the end point of their learning process within months after entering their first job.

In contrast, the present set of findings suggests that the learning process develops fast (i.e., within months after entering a job) when the learning opportunities are favorable (i.e., in high demand and high control jobs), whereas the learning process develops at a slower rate for jobs in which learning opportunities are less favorable (in high demand and low control jobs and in low demand and high control jobs). Ultimately, however, similar levels of learning will be reached in all Karasek job types, with the exception of the low demand and low control job, in which the level of learning stays woefully low. This finding again underlines the need to examine socialization processes against the background of exposure to particular job characteristics, but it also suggests that it is important for future research on socialization processes to examine the rate at which the socialization process unfolds: Some workers may already have reached the end point of this process within months after entering a job.

A third interesting venue for future research would be the interrelations between strain and learning. Whereas previous research provides some evidence that strain and learning mutually influence each other (Holman & Wall, 2002), results of the present study confirm only the adverse effect of high strain on learning. In the future, researchers should address this issue as well.

The *practical implications* of this study are no less interesting. In the past, jobs have been designed on the basis of Karasek and Theorell's (1990) assumptions that the combination of high demand with high control results in optimal outcomes for both workers and the organizations they work for (i.e., moderate strain and high learning result in high productivity). Our results revealed that similar levels of learning occur across time for workers in other job types in which levels of strain may be much lower. Most notably, workers in low demand and low control jobs reported similar levels of learning as workers in high demand and high control jobs, although the first group of workers reported considerably lower levels of strain.

Thus, it appears that low demand and high control jobs produce more desirable outcomes than high demand and high control jobs; from a worker's perspective, high demand and high control jobs are even inferior to low demand and low control jobs. This finding implies that the standard assumption in job redesign that both workers and organizations have the same interest in realizing high demand and high control jobs is not valid.

Finally, our results suggest that it is more important for workers to have high control jobs than to have low demand jobs. Positive outcomes in terms of learning and strain occurred in high control jobs, irrespective of the amount of job demand; in contrast, low demand was associated with low levels of strain, but low demand did not always result in high levels of learning.

Whereas the results reported in this study are compelling, our study presents only a first step in examining the role of job demand and job control in the socialization process of newcomers. Future research should corroborate our findings, preferably avoiding the shortcomings of the present study and dealing with the knowledge gaps discussed earlier. Perhaps the most important contribution of the present study is that it shows how significant the role of job demand and job control is in examining the socialization process of newcomers. Whereas previous research has examined the social environment as an antecedent of organizational socialization (e.g., Feij et al., 1995), no studies have tested the predictions of the JDC model for newcomer socialization. The results of the present study clearly reveal that this is an important omission.

REFERENCES

Backman, J. (1978). *Adolescence to adult change and stability in the lives of young men.* Ann Arbor: University of Michigan Press.

Bandura, A. (1997). *Self-efficacy: The exercise of control.* New York: Freeman.

Colquitt, J. A., LePine, J. A., & Noe, R. A. (2000). Toward an integrative theory of training motivation: A meta-analytic path analysis of 20 years of research. *Journal of Applied Psychology, 85,* 678–707.

Dawis, R. V., & Lofquist, L. H. (1984). *A psychological theory of work adjustment.* Minneapolis: University of Minnesota Press.
De Jonge, J., & Kompier, M. A. J. (1997). A critical examination of the demand–control–support model from a work psychological perspective. *International Journal of Stress Management, 4,* 235–258.
De Lange, A. H., Taris, T. W., Kompier, M. A. J., Houtman, I. L. D., & Bongers, P. M. (2003). The very best of the millennium: Longitudinal research and the demand–control–(support) model. *Journal of Occupational Health Psychology, 8,* 282–305.
Feij, J. A., Van der Velde, M. E. G., Taris, R., & Taris, T. W. (1999). The development of person–vocation fit: A longitudinal study among young employees. *International Journal of Selection and Assessment, 7,* 12–25.
Feij, J. A., Whitely, W. T., Peiró, J. M., & Taris, T. W. (1995). The development of career-enhancing strategies and content innovation: A longitudinal study of new workers. *Journal of Vocational Behavior, 46,* 231–256.
Fisher, C. D. (1986). Organizational socialization: An integrative review. In G. R. Ferris & K. M. Rowland (Eds.), *Research in personnel and human resources management* (Vol. 4, pp. 101–145). Greenwich, CT: JAI Press.
Frese, M., & Zapf, D. (1994). Action as the core of work psychology: A German approach. In H. C. Triandis, M. D. Dunnette, & L. M. Hough (Eds.), *Handbook of industrial and organizational psychology* (Vol. 4, pp. 271–340). Palo Alto, CA: Consulting Psychologists Press.
Goldberg, D. (1972). *The detection of mental illness by questionnaire.* London: Oxford University Press.
Graen, G. B. (1976). Role-making processes within complex organizations. In M. D. Dunnette (Ed.), *Handbook of industrial and organizational psychology* (pp. 1201–1245). Chicago: Rand-McNally.
Holman, D. J., & Wall, T. D. (2002). Work characteristics, learning-related outcomes, and strain: A test of competing direct effects, mediated, and moderated models. *Journal of Occupational Health Psychology, 7,* 283–301.
Jöreskog, K. G., & Sörbom, D. (1993). *Lisrel-8* (computer program). Chicago: Scientific Software.
Karasek, R. A. (1979). Job demands, job decision latitude, and mental strain: Implications for job design. *Administrative Science Quarterly, 24,* 285–308.
Karasek, R. A. (1985). *Job content instrument: questionnaire and user's guide* (rev. 1.1). Los Angeles: University of Southern California Press.
Karasek, R. A. (1998). Demand–control model: A social, emotional, and physiological approach to stress risk and active behavior development. In J. M. Stellmann (Ed.), *Encyclopaedia of occupational health and safety* (4th ed., p. 34). Geneva, Switzerland: International Labour Office.
Karasek, R. A., & Theorell, T. (1990). *Healthy work: Stress, productivity, and the reconstruction of working life.* New York: Basic Books.
Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal, and coping.* New York: Springer.
Lerner, R. M. (1984). *On the nature of human plasticity.* New York: Cambridge University Press.
Louis, M. R. (1980). Surprise and sense-making: What newcomers experience in entering unfamiliar organizational settings. *Administrative Review Quarterly, 5,* 329–340.
MacCallum, R. C., Roznowski, M., & Necowitz, L. B. (1992). Model modification in covariance structure analysis: The problem of capitalization on chance. *Psychological Bulletin, 111,* 490–504.
Nicholson, N. (1996). Careers in a new context. In P. B. Warr (Ed.), *Psychology at work* (4th ed., pp. 161–187). Harmondsworth, England: Penguin.

Ozer, E. M., & Bandura, A. (1990). Mechanisms governing empowerment effects: A self-efficacy analysis. *Journal of Personality and Social Psychology, 58,* 472–486.

Parker, S. K., & Sprigg, C. A. (1999). Minimizing strain and maximizing learning: The role of job demands, job control, and proactive personality. *Journal of Applied Psychology, 84,* 925–939.

Penley, L., & Gould, S. (1981). *Measuring career strategies: The psychometric properties of the Career Strategies Inventory.* San Antonio: University of Texas.

Rizzo, J. R., House, R. J., & Lirtzman, S. I. (1970). Ambiguity and role conflict in complex organizations. *Administrative Science Quarterly, 15,* 150–163.

Ryff, C. D., & Singer, B. (1998). The contours of positive health. *Psychological Inquiry, 9,* 1–28.

Saks, A. M. (1994). Moderating effects of self-efficacy for the relationship between training method and anxiety and stress reactions of newcomers. *Journal of Organizational Behavior, 15,* 639–654.

Taris, T. W., & Feij, J. A. (1999). Measuring career mobility: An empirical comparison of six mobility indexes. *Quality & Quantity, 33,* 157–168.

Taris, T. W., & Kompier, M. (2003). The challenges of longitudinal designs in occupational health psychology. *Scandinavian Journal of Work, Environment and Health, 27,* 1–4.

Taris, T. W., Kompier, M. A. J., De Lange, A. H., Schaufeli, W. B., & Schreurs, P. J. G. (2003). Learning new behavior patterns: A longitudinal test of Karasek's active learning hypothesis among Dutch teachers. *Work & Stress, 17,* 1–20.

Van der Doef, M. P., & Maes, S. (1999). The job demand–control(-support) model and psychological well-being: A review of 20 years of empirical research. *Work & Stress, 13,* 87–114.

Van Horn, J. E., Taris, T. W., Schaufeli, W. B., & Schreurs, P. J. G. (2004). The structure of occupational well-being: A study among Dutch teachers. *Journal of Occupational and Organizational Psychology, 77,* 365–375.

Van Maanen, J., & Schein, E. H. (1979). Toward a theory of organizational socialization. In B. M. Staw (Ed.), *Research in organizational behavior* (Vol. 1, pp. 209–264). Greenwich, CT: JAI Press.

Warr, P. B. (1990). The measurement of well-being and other aspects of mental health. *Journal of Occupational Psychology, 63,* 193–210.

Warr, P. B. (1994). A conceptual framework for the study of work and mental health. *Work and Stress, 8,* 84–97.

Warr, P. B., & Downing, J. (2000). Learning strategies, learning anxiety and knowledge acquisition. *British Journal of Psychology, 91,* 311–333.

Wilk, S. L., & Sackett, P. R. (1996). Longitudinal analysis of ability–job complexity fit and job change. *Personnel Psychology, 49,* 937–967.

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