The Big Five Personality Traits and Individual Job Performance Growth Trajectories in Maintenance and Transitional Job Stages

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This study extends the literature on personality and job performance through the use of random coefficient modeling to test the validity of the Big Five personality traits in predicting overall sales performance and sales performance trajectories—or systematic patterns of performance growth—in 2 samples of pharmaceutical sales representatives at maintenance and transitional job stages (K. R. Murphy, 1989). In the maintenance sample, conscientiousness and extraversion were positively associated with between-person differences in total sales, whereas only conscientiousness predicted performance growth. In the transitional sample, agreeableness and openness to experience predicted overall performance differences and performance trends. All effects remained significant with job tenure statistically controlled. Possible explanations for these findings are offered, and theoretical and practical implications of findings are discussed.

Organizational researchers have long been interested in relationships between personality traits and job performance. With the resurgent interest in trait theories of personality and the "discovery" of the Big Five model of trait structure (e.g., Goldberg, 1990; Tupes & Christal, 1992), research in this area has flourished. Authors of personality–performance studies (e.g., Bing & Lounsbury, 2000; Crant, 1995; Judge, Erez, Bono, & Thoresen, 2002; Stewart, 1999) frequently make the implicit assumption that performance is a stable construct and thus rely on cross-sectional, one-time (as opposed to multiple-time) measures of performance to capture something that by its very nature unfolds across time. In large part, studies of the relationship between personality and static performance measures have been the norm despite longstanding evidence that performance is dynamic (Bass, 1962; Ghiselli, 1956; Ghiselli & Haire, 1960).

Incorrect assumptions about the stability of performance might result in erroneous conclusions about personality–performance relationships. These assumptions could be quite costly to organizations that rely on such research findings to make selection and training decisions. As noted by Hanges, Schneider, and Niles (1990), "Every personnel decision in organizations is predicated on the belief that long-term performance can be predicted... Thus the degree to which performance is stable has direct implications for the accuracy of any personnel decision" (p. 658). Indeed, if personnel selection decisions are based on a top–down model using trait measures demonstrated to be valid predictors of performance at a particular point in time and the rank-ordering of individuals on the criterion significantly changes with time and experience, the utility of such a system likely would be compromised (Deadrick & Madigan, 1990; Henry & Hulin, 1987, 1989; Hulin, Henry, & Noon, 1990).

Given the centrality of these two areas of inquiry—the nature of relationships between personality traits and job performance and the changing nature of performance across time—it is somewhat surprising that more research has not attempted to integrate these two literatures. In fact, authors of recent reviews have pointed to the need to examine motivational constructs such as personality traits in the context of more sophisticated models of individual performance change (Steele-Johnson, Osburn, & Pieper, 2000). In the current study we attempted to achieve such an integration by capitalizing on recent innovations in the measurement of change. In so doing, we drew upon Murphy’s (1989) distinction between job performance at maintenance versus transitional job stages. First, we advanced hypotheses concerning different patterns of performance change or growth for employees working in these two divergent job conditions. Second, we used the familiar Big Five
framework to generate substantive hypotheses about individual differences in performance trajectories—which we defined as idiosyncratic patterns of systematic performance growth across a specified period of time or a series of performance observations—at both maintenance and transitional job stages.

Logistics of Performance Change Measurement

Once performance is conceptualized as a dynamic construct, the matter of how to measure performance change arises. Devising correct methods for the study of change is a problem that long has plagued research in all areas of scientific psychology (Cronbach & Furby, 1970), and the industrial–organizational field is no exception (Lance, Vandenberg, & Sief, 2000). Fortunately, new statistical techniques provide sophisticated strategies for answering questions about intraindividual performance change. In particular, use of random coefficient modeling (RCM; Bliese & Ployhart, 2002), also known as hierarchical linear modeling (Bryk & Raudenbush, 1992; Davison, Kwak, Seo, & Choi, 2002; Hofmann, 1997), has led to great advancements in this area.

One of the primary advantages of RCM is its ability to simultaneously estimate within-person (Level 1; L1) and between-person (Level 2; L2) effects across time. L1 analyses concern performance stability and change—specifically, the extent to which mean levels of performance for a group of individuals change across a specified period of time. For example, performance may increase or decrease at a linear rate, accelerate or decelerate (evidenced by significant higher order polynomial terms), or display some combination of these trends (Mitchell & James, 2001; Ployhart & Hakel, 1998; Raudenbush, 2001; Willett & Sayer, 1994). Conversely, L2 analyses address whether individual difference variables (e.g., abilities, personality traits) predict both between-person differences in overall performance across a specified period of time (L2 intercept parameters; which we refer to from this point forward as mean performance differences) and individual differences in shapes of performance trajectories—or rates of change—across this specified period (L2 slopes; Bliese & Ployhart, 2002).

Performance Change and the Job Stage Context

Perhaps nowhere are the issues of individual differences in performance change more salient than in job stage research. In an oft-cited theoretical piece, Murphy (1989) distinguished between maintenance and transitional job stages (see also Deadrick, Bennett, & Russell, 1997; Dodd, Wollowick, & McNamara, 1970). Murphy defined the maintenance stage as a point at which “the worker has learned to perform all major job tasks and is no longer confronted with situations that present novel or unpredictable demands” (p. 190). In contrast, the transitional period involves a stage when “methods of operation are undefined; the workers must learn new skills and tasks and make decisions about unfamiliar topics” (p. 190). Thus, some form of change (usually an increase) in job performance is expected during the transitional job stage as workers familiarize themselves with job-specific demands.

Murphy (1989) originally proposed that cognitive ability would be most highly predictive of performance during transitional stages, which require learning of new knowledge and skills. In contrast, volitional dispositional factors would predict performance during maintenance or steady-state stages. That is, once the necessary knowledge and skills have been obtained, personality traits should become key forces in determining job-related behavior. In support of this reasoning, Keil and Cortina (2001) used meta-analysis to demonstrate a temporal deterioration of the validity of general cognitive ability for predicting performance of a variety of tasks, with the degree of validity deterioration being greatest for consistent (i.e., easily routinized or automated) tasks than for more complex ones.

Although considerable research has been conducted examining cognitive ability and performance change, relatively little research effort has been directed at understanding the role of personality and dynamic criteria within the context of Murphy’s (1989) maintenance and transitional job stage model. Stewart (1999) found that conscientiousness was positively associated with sales performance for both maintenance and transitional stage employees. In subsequent analyses, Stewart found that the order component of conscientiousness was more strongly related to performance for transitional employees, whereas the achievement component was a better predictor of performance for maintenance employees. On the basis of these results, Stewart concluded that “when the criterion is dynamic, broad traits such as conscientiousness may be appropriate [for selection] because they exhibit robust relationships with the various behaviors that affect success over time” (p. 966). However, because of the cross-sectional nature of his study’s design, Stewart was unable to explicitly model individual performance trajectories in these two samples as a function of conscientiousness.

Level 1 Predictions

One possible reason that personality traits have rarely been examined in longitudinal analyses of performance among job incumbents at different job stages is that the categorical distinction between maintenance and transitional stages is difficult to operationalize. Murphy (1989) argued that people experience transition when “major duties or responsibilities of a job change” (p. 190). In the abstract, maintenance stages occur when employees have been performing a job long enough to have gained familiarity with task requirements, whereas transitional stages are associated with learning and adapting to new task requirements. The most obvious illustration of a transitional stage involves a shifting of one’s job, occupation, or organization. However, it certainly is possible to experience a transitional stage without leaving one’s job, occupational group, or employer. In practice, there is no hard and fast categorical distinction between the two stages, and judgments concerning maintenance versus transitional-stage status for a given set (or sets) of workers typically require inside knowledge of the context surrounding data collection, because different job characteristics make it nearly impossible to define universal criteria for what constitutes a maintenance versus a transitional stage.

We believe that there are empirical criteria that can help support a priori assumptions about whether a group of employees is experiencing a maintenance versus transitional job stage. For instance, if one has reason to believe that a sample of employees is experiencing job transition (e.g., changes in required knowledge or task demands), this can be confirmed by examining the performance pattern for that group of employees to see if the pattern is consistent with a transitional stage. Conversely, if one has reason
to believe that two samples of employees are at different job stages, one can test this hypothesis by contrasting mean levels of performance across a specified time period in these two groups. Gradual, uniform increases (or complete stability) of performance across time would provide indirect evidence of a maintenance stage, whereas drastic performance increases would suggest a period of transition.

Results from several studies provide a useful starting point for identifying performance patterns associated with specific job stages. To illustrate, long-term studies of the relationship between job tenure and performance have found an initially positive linear and then plateauing relationship (e.g., Avolio, Waldman, & McDonald, 1990; Jacobs, Hofmann, & Kriska, 1990; Schmidt, Hunter, & Outerbridge, 1986; for exceptions see Hofmann, Jacobs, & Gerras, 1992; Russell, 2001). Thus, performance growth appears to be more dramatic in early (transitional) job stages and then tapers off in later (maintenance) job stages. Further supporting these conclusions concerning temporal aspects of job performance, Hofmann, Jacobs, and Baratta (1993) found a mean group trend of linear then plateauing performance over a 3-year period for newly hired insurance sales personnel. It is clear that the initial performance measures reflected a transitional phase for the new hires, and one might infer that the employees were entering the maintenance phase when their performance gains started to decelerate. In a similar vein, Ployhart and Hakel (1998) investigated sales performance over eight consecutive business quarters. These researchers found support for a classic learning curve indicated by linear, quadratic, and cubic models in which performance increased sharply in initial quarters (positive linear change) and then continued to increase, albeit at a decelerated rate (evidenced by significant quadratic and cubic terms, respectively). Thus, results clearly supported a pattern in which the greatest incremental gains in performance occurred in the initial stages of the study. In sum, cumulative evidence from these studies suggests that performance increases over time; however, the nature of this increase is more dramatic in earlier observations. On the basis of these results, we predicted different patterns of performance for samples of employees working in maintenance versus transitional stages. Specifically, we hypothesized the following:

**Hypothesis 1:** The overall performance trend for employees identified a priori as being in a maintenance stage will be positive and linear.

**Hypothesis 2:** The overall performance trend for employees identified a priori as being in a transitional stage will be positive and linear but will also show evidence of deceleration via a significant negative quadratic trend.

**Level 2 Predictions**

Regrettably, there is a paucity of research addressing exactly how individual characteristics influence adaptive (i.e., transitional) job performance, or “responsiveness to changing job demands” (Hesketh & Neal, 1999, p. 47; see also Pulakos, Arad, Donovan, & Plamondon, 2000). To the extent that novel (i.e., transitional) job environments would seem to constitute weak situations (Mischel, 1977), relationships between personality traits and job performance may be most evident for employees embedded in novel job environments (Hesketh & Neal, 1999). In addition to contrasting differences in performance trends between employees in maintenance and transitional job stages, one of our central goals in the current study was to examine predictors of individual differences in performance both in terms of (a) mean level performance across a specified period of time and (b) interindividual differences in performance growth trajectories during this period. Partly on the basis of Murphy’s (1989) research, we proposed that different personality traits may be salient at these two stages. We specifically investigated the usefulness of the Big Five personality traits as predictors of mean performance and performance trajectories in maintenance- and transitional-stage samples of employees.

**Mean Performance Differences in Maintenance and Transitional Job Stages**

Two traits should positively influence mean job performance levels in both maintenance and transitional job stages. One such trait is conscientiousness. Conscientious persons are dependable, reliable, and achievement oriented, whereas low scorers are careless, lackadaisical, and undependable (Digman, 1990). Meta-analytic research has consistently supported conscientiousness as one of the few personality-based predictors with generalizable validity across occupations and job situations (Barrick & Mount, 1991; Barrick, Mount, & Judge, 2001; Hurtz & Donovan, 2000; Mount & Barrick, 1995; Salgado, 1997), and such research has confirmed the positive association between conscientiousness and sales performance as well (Vinchur, Schipmann, Switzer, & Roth, 1998).

A second trait associated with success in sales is extraversion. Extraverts are characterized by gregariousness, assertiveness, positive emotionality, activity, and sociability, whereas those low in this trait tend to be aloof, timid, and socially withdrawn (Digman, 1990). Although the generalizability of extraversion in predicting performance across all jobs has not been supported in empirical research (Barrick & Mount, 1991; Barrick et al., 2001; Hurtz & Donovan, 2000; Mount & Barrick, 1995; Salgado, 1997), this trait does seem to have particular salience for sales effectiveness. In a meta-analysis restricted to the predictors of sales success, Vinchur et al. (1998) found extraversion to be a valid predictor of both supervisory ratings of sales performance and actual sales volume. Barrick, Stewart, and Piotrowski (2002) found that extraverts were motivated to obtain status and rewards at work and subsequently had increased sales.

Because of differences between the maintenance and transitional stages of employment, we also propose that openness to experience is related to performance in the transitional stage but not necessarily in the maintenance stage. Highly open people display intellectual curiosity, creativity, flexible thinking, and culture (Digman, 1990). Most meta-analytic research has failed to support a consistent and positive correlation between openness and job performance across broad occupational categories (Barrick et al., 2001), including sales success (Vinchur et al., 1998); however, Tett, Jackson, and Rothstein (1991) found that openness predicted performance in a meta-analysis of 10 confirmatory studies that specifically hypothesized such a relationship. We propose that openness to experience may be a critical factor for performance under certain job circumstances. Specifically, we suggest that openness should be positively related to sales performance during...
transitional employment periods because in this stage, an employee will benefit from adaptability and flexibility characterizing openness (Goldberg, 1990). Results from a handful of experimental and field studies support this assertion. Using an undergraduate sample, LePine, Colquitt, and Erez (2000) found that openness helped participants adapt to changing task demands in a computerized decision-making study. Highly open subjects were better able to adapt their decision-making and problem-solving heuristics to changing situational cues. In a field setting of managerial success, Judge, Thoresen, Pucik, and Welbourne (1999) found that openness was positively related to managers’ ability to cope with various organizational changes, such as mergers, acquisitions, downsizing, and the like.

Taken together, these results suggest that openness to experience should foster effective performance at the transitional job stage. Because of their increased ability for flexible thinking, as well as their preference for novel stimuli, open salespeople should be more effective during times of job change. Thus, as with conscientiousness and extraversion, openness to experience should be positively associated with sales for transitional stage employees. We made the following hypotheses:

**Hypothesis 3:** Conscientiousness will be positively related to mean performance differences in the maintenance sample.

**Hypothesis 4:** Extraversion will be positively related to mean performance differences in the maintenance sample.

**Hypothesis 5:** Conscientiousness will be positively related to mean performance differences in the transitional sample.

**Hypothesis 6:** Extraversion will be positively related to mean performance differences in the transitional sample.

**Hypothesis 7:** Openness to experience will be positively related to mean performance differences in the transitional sample.

**Prediction of Performance Trajectories in Maintenance and Transitional Job Stages**

The prediction of performance trajectories (slopes) is somewhat more complex. A handful of investigators have studied such relationships in an exploratory manner (e.g., Ployhart & Hakel, 1998) or have used characteristics such as general cognitive ability and job tenure to forecast performance change (e.g., Deadrick et al., 1997). However, we are aware of no longitudinal research directly contrasting the validities of various personality traits within the context of maintenance and transitional stages. Deadrick et al. (1997) found that both job experience and psychomotor ability were positively associated with initial individual job performance in a sample of sewing machine operators. Additionally, general mental ability was positively correlated with performance increases, whereas previous job experience was negatively related to positive performance trends for individuals. In addition, Ployhart and Hakel (1998) found that individual differences in trait empathy were positively and negatively associated with individual differences in initial performance increases (linear growth) and subsequent performance plateauing (quadratic growth), respectively. Furthermore, a trait measure of persuasion was positively associated with both initial growth and later plateauing, providing some evidence for individual differences as predictors of performance growth patterns. Finally, Russell (2001) tested whether individual differences in managerial competencies could predict performance growth curves of top-level executives. Results indicated that resource problem-solving-oriented competencies predicted initial performance and that people-oriented competencies predicted later performance growth.

We propose that certain traits are related to individual differences in intraindividual performance patterns, although research in this area admittedly is scant. Conscientiousness—the trait most strongly and consistently related to performance—should predict not only mean performance but also performance growth. Behavioral correlates of this trait include the use of self-regulatory tactics such as automatic goal setting (Barrick, Mount, & Strauss, 1993) and time management (Macan, 1994) as well as the ability to cope with stress (Watson & Hubbard, 1996). Thus, we predict that the performance of conscientious persons will reflect continuous improvement, although this effect may take some time to manifest itself. In support of this view, Helmreich, Sawin, and Carsrud (1986) found that the trait work orientation (which is very similar conceptually to conscientiousness) demonstrated a stronger relationship with performance after several months on the job (e.g., when incumbents likely had moved from a transitional to a maintenance period) than with an initial “honeymoon period” measure of performance taken shortly posthire, when motivation should be high among all new employees.

With respect to the differential predictions for mean performance trajectories within maintenance versus transitional employees, we expected a slightly different relationship between conscientiousness and performance growth. Conscientiousness should be positively correlated with linear performance growth in the maintenance sample, reflecting the desire for continuous performance improvement for conscientious persons in the steady-state sample. In the transitional sample, we would expect this same tendency to be manifested by a negative relationship between conscientiousness and negative quadratic growth. In other words, the performance of conscientious persons should be less likely to peak with movement from the transitional or honeymoon period to a time when job-related duties have become somewhat routinized. Hence, we offered the following hypotheses:

**Hypothesis 8:** Conscientiousness will be positively related to positive linear growth in performance within the maintenance sample.

**Hypothesis 9:** Conscientiousness will be negatively related to negative quadratic growth in performance within the transitional sample.

In addition to conscientiousness, past personality–performance research suggests that openness to experience should relate to performance trajectories for people in transitional job stages. Because openness has been shown to relate positively to effectiveness under changing conditions requiring adaptive performance (e.g., Judge et al., 1999; LePine et al., 2000), people high in openness should show steady performance gains initially (i.e., a positive linear trend). This prediction is consistent with results obtained by Russell (2001), who found that resource-oriented problem solv-
Hypothesis 10: Openness will be positively related to positive linear performance growth in performance within the transitional sample.

Method

Participants and Procedure

Maintenance sample. The population of interest to the maintenance stage study consisted of 137 sales representatives employed by a large pharmaceutical firm headquartered in the United States. Primary job responsibilities for this position include duties such as gaining access to potential client physicians, detailing or educating physicians as to the indications for particular products, and strategic targeting of high-potential client physicians in one’s sales territory. Survey materials were sent to the homes of all potential respondents as part of a large, company-wide study of relationships between personality traits, job attitudes, and sales performance. These surveys were accompanied by a letter from the primary investigator explaining the purpose of the study, along with a similar letter on company letterhead from an organizational representative indicating that although purely voluntary, participation in the study could provide the organization with useful information regarding factors that influence sales success.

A total of 99 complete responses were received in the maintenance sample, for a response rate of 72.2%. The mean age of respondents was 41.76 years ($SD = 9.51$), and respondents reported a mean job tenure of 11.11 years ($SD = 9.45$). A majority (61.6%) of respondents were men, and 38.4% were women. A company representative confirmed that these figures were roughly characteristic of the demographic makeup of this particular population.

Transitional sample. The population of interest for the transitional sample was 78 sales representatives employed by the same organization involved in a product launch of a new medication. There was no overlap of participants between the maintenance and transitional samples. The procedure used in the transitional sample was identical to that used in the maintenance sample. We received a total of 48 responses from the transitional group (response rate = 61.5%). Mean age for respondents was 36.77 years ($SD = 7.79$), and mean job tenure was 7.92 years ($SD = 7.51$) years.

A slight majority (52.1%) of respondents from the transitional sample were women, and 47.9% were men. Again, these figures appeared to match the demographic profile of the population from which the transitional sample was drawn, as confirmed by a company representative.

The validity of our study hinges on the difference in job responsibilities between the maintenance and transitional samples—that in fact, the changes experienced by the latter truly were transitional in nature. This issue deserves some further comment. All members of our transitional sample had previously been working in the primary care area, focusing on marketing a variety of products (similar to those carried out by participants in the maintenance sample) to general practitioner physicians. On the basis of a corporate-wide decision, members of the primary care sales force were reassigned to a new product launch involving the marketing of a hormone replacement therapy product. Thus, participation in the product launch was not voluntary for this sample of employees. Employee compensation was directly correlated with sales of the new product. There was no systematic relationship between previous individual job performance and reassignment to the product launch project, as this decision was made at the group level (i.e., salespeople working in primary care were shifted to the new assignment regardless of their previous levels of effectiveness). This is a critical point, as nonrandom assignment of individuals to the transitional sample (e.g., highly conscientious persons or persons with a history of outstanding performance) could complicate the interpretation of our study results.

Changes experienced by this group constituted entry into a transitional phase for at least two reasons. First, transitional sample employees were required to focus exclusively on the marketing of one particular product and hence were shifting to a specialty area. This change required mastering a great deal of technical information regarding issues such as the physiological mechanisms by which the product had been found to effectively treat the condition for which it is prescribed, indications for the product, potential interactions with other drugs, and so forth. Because the product was new, this was novel information for transitional participants. The company provided participants with extensive technical training in these areas, and each individual salesperson was required to pass a job knowledge examination covering these areas. Individuals who failed to pass this examination on the first try were subsequently retested until a previously specified level of declarative knowledge was reached.

Second, employees assigned to the product launch were required to solicit business from an entirely new client base. Specifically, individual salespeople had to shift their focus from calling on general practitioners to specialists in obstetrics and gynecology (ob/gyn). An organizational representative confirmed that there was little if any overlap for the transitional sample in terms of their previous versus new client bases. Thus, to achieve success, sales representatives had to strategically target potentially high-prescribing ob/gyn specialists (in part on the basis of information concerning prescription history of similar competitor products, as provided by the research group within the organization), and “get a foot in the door” in gaining access to these individuals. The potential frustrations due to short-term setbacks inherent in the sales occupation (Corr & Gray, 1995) are particularly salient here, as initial efforts to influence ob/gyn specialists to change their prescribing habits (i.e., switch from familiar products to the new medication) were likely to meet with failure. Furthermore, given the importance of return business, it was necessary for participants in the transitional sample to establish interpersonal credibility and long-term, professional business relationships with this new set of potential clients. Although the two issues discussed here may not constitute an exhaustive list of the changes experienced by the transitional group, we believe that they provide a sufficient basis for inferring that these persons were entering a transitional job stage at the time of reassignment to the product launch.

Measures

The Big Five traits. The Big Five traits were assessed using the 12-item scales from the NEO-FFI (Costa & McCrae, 1992) in both the maintenance and transitional samples. This measure has been shown to predict job performance in numerous organizational field studies (Costa, 1996). All responses were scored on a 9-point scale with response options ranging from 0 (strongly disagree) to 8 (strongly agree). Internal consistency (coefficient alpha) reliabilities for the Big Five traits obtained in the current study were as follows: emotional stability ($\alpha = .80$ in the maintenance sample, $\alpha = .87$ in the transitional sample), extraversion ($\alpha = .79$ maintenance, $\alpha = .83$ transitional), openness to experience ($\alpha = .69$ maintenance, $\alpha = .62$ transitional), agreeableness ($\alpha = .72$ maintenance, $\alpha = .80$ transitional), and conscientiousness ($\alpha = .79$ maintenance, $\alpha = .87$ transitional).
α = .71 (transitional), and conscientiousness (α = .88 (maintenance, α = .78 (transitional)). The reliability values obtained for openness to experience were somewhat lower than those reported in the NEO-FFI manual (Costa & McCrae, 1992), although the reason for this difference was unclear.

Control variables. Although we offered hypotheses concerning only three of the Big Five traits (conscientiousness, extraversion, and openness to experience), we included the remaining two traits in all estimated models for two reasons. First, it is well established that the Big Five traits are not entirely orthogonal (Digman, 1997). Thus, for us to determine the independent contribution of conscientiousness, extraversion, and openness to experience as predictors of growth parameters (L2 intercept and slope terms), we felt it necessary to include the remaining traits (emotional stability and agreeableness) in all of the relevant models. Second, as so few studies have incorporated a temporal perspective to the prediction of performance from personality traits, we felt that the inclusion of these dimensions could provide valuable exploratory information.

Job tenure was used as a control variable in all subsequent RCM analyses. Although we offered no formal hypotheses concerning the relationships between job tenure and performance growth parameters, we included this variable for three reasons. First, past meta-analytic research has revealed moderate positive relationships between measures of job tenure and work experience and job performance (Hunter & Hunter, 1984; McDaniel, Schmidt, & Hunter, 1988a; 1988b; Quiñones, Ford, & Teachout, 1995), with the magnitude of the relationship decreasing with increasing levels of job tenure (McDaniel et al., 1988b). Second, the potentially complex nature of relationships between work experience and job performance trajectories is worthy of further investigation in its own right. In a rare study of this type, Deadrick et al. (1997) found that previous work experience was positively related to mean levels (i.e., intercepts) of job performance—but negatively related to subsequent performance increases (slopes)—in one sample of sewing machine operators. Likewise, Tesluk and Jacobs (1998) have posited that the benefits of job tenure may be negated by transitional job environments in which the stimuli one encounters bear little similarity to past work experiences. Third, failing to control for tenure could result in upwardly biased estimates of personality-performance relationships if levels of the Big Five traits were substantially correlated with job tenure in our samples and if tenure were related to performance. This possibility is indirectly supported by research demonstrating robust relationships between traits (in particular, conscientiousness) and voluntary turnover (Barrick & Mount, 1996; Barrick, Mount, & Strauss, 1994; Salgado, 2002).

Job performance. We used results-oriented (i.e., hard sales) criteria to operationalize job performance for both the maintenance and transitional samples. In the maintenance sample, the outcome measure was a simple count of territory sales aggregated on a quarterly basis (November 1998–January 1999, February 1999–April 1999, May 1999–July 1999, and August 1999–October 1999) such that performance was assessed at four points in time (99 persons × 4 = 396 observations). In the transitional sample, performance was operationalized as quarterly product market share (raw sales divided by all sales in the given product class for each individual salesperson’s territory) because of large differences in market size for products carried by this sample. Although the scaling of the criterion measure was not strictly equivalent across samples, we do not see any reason to believe that raw versus market-adjusted sales figures differ from a construct perspective, and such market size adjustments are frequent in studies of sales success (see Cravens & Woodruff, 1973; Lucas, Weinberg, & Clowes, 1975; McManus & Brown, 1995; and Ryan & Weinberg, 1979, for in-depth discussions of this issue). Market share data were available for the same 4 consecutive business quarters in the transitional sample as for the maintenance group, coinciding with the month of the product launch in the former sample (48 persons × 4 = 192 observations).

Analyses

Power analyses. Because of the different number of participants in the maintenance and transitional samples, as well as the modest sample size in the latter, we sought to estimate the relative power for analyses in the two groups. Power analyses in random coefficient models are complex. Although exact methods have been developed for power analyses of discrete predictors, Raudenbush and Xiao-Feng (2001) noted that approximations are possible in cases in which explanatory variables are continuous (e.g., traits, job tenure). For these analyses, we used the PINT computer program (Snijders & Bosker, 1999) to estimate the relative power between a sample with 99 respondents and four time periods and a sample with 48 respondents and four time periods.

In the comparative power analysis, we assumed that personality would have a direct and cross-level effect size (in a correlation metric) of .30. We chose this value because a validity coefficient of .30 corresponds to a practically significant effect for a given trait in a selection context and is consistent with meta-analytic research estimating the size of associations between traits such as conscientiousness and extraversion and sales performance (e.g., Mount & Barrick, 1995; Vinchur et al., 1998). Given a sample size of 99 in the maintenance sample and a conservative two-tailed test of statistical significance, power was estimated at .99 for both the direct and cross-level effects. Using the same parameters in the transitional sample with a sample size of 48 resulted in a power estimate of .89.

Random coefficient analyses. We tested random coefficient models examining the nature of relationships between the Big Five traits, job tenure, mean sales performance levels, and performance trajectories by using Bliese and Ployhart’s (2002) six-step model estimation procedure. To test hypotheses of interest to the current study, we estimated random coefficient models separately for the maintenance and transitional samples. All analyses were conducted using the Nonlinear and Linear Mixed Effects program (Pinheiro & Bates, 2000) in the statistical package R (Bliese & Ployhart, 2002).

Step 1 of the procedure involves estimating the intraclass correlation coefficient (ICC1) for the criterion measure. In our context, ICC1 indicates how much variability in quarterly sales (i.e., among 396 and 192 individual observations in the maintenance and transitional samples, respectively) can be attributed to between-person differences across the 4 quarters studied (Bryk & Raudenbush, 1992). Step 2 involves estimating the nature and shape of the time–performance relationship through the use of orthogonal polynomial terms (e.g., linear, quadratic, cubic). Each polynomial term reflects a change in the direction of performance change for the sample as a whole (Hypotheses 1–2). Step 3 involves testing for significant variability across persons in intercepts (mean level differences in performance, as suggested by Hypotheses 3–7). This step also tests for individual differences in the slopes of the time–performance relationships (Hypotheses 8–10). As Bliese and Ployhart (2002) noted, tests for intercept and slope differences are based on a log-likelihood ratio test contrasting models with and without random effects (see also Pinheiro & Bates, 2000). In Step 3, separate tests are performed for all relevant higher order polynomial terms (e.g., linear, quadratic, cubic) to specifically determine potential sources of between-person slope variability.

Step 4 involves estimating the structure of errors (autocorrelation, heteroskedasticity) in the criterion measure. Accounting for correlated errors and nonconstant variance is critical in random coefficient models for deriving accurate standard errors for estimated parameters in estimating the L1 solution (DeShon, Ployhart, & Sacco, 1998). Results from tests of error structures at Step 4 provide parameter estimates for the final L1 solution. On the basis of the final L1 model, one can also estimate a pseudo-R2 statistic to determine the extent to which a model specifying higher order growth terms explains variance in the criterion variable for the entire sample by comparing residual variances for the relevant parameter estimates in the final model with the same estimates from a model specifying only random variation in the criterion measure (Bryk & Raudenbush, 1992; Hofmann, 1997; Snijders & Bosker, 1994). Step 5 involves accounting for between-person differences in intercepts—or mean sales performance
across the 4 quarters studied—using scores from predictor variables (e.g., Big Five traits, job tenure, as indicated by Hypotheses 3–7). Finally, Step 6 adds tests for cross-level interactions by estimating the extent to which individual-level predictors account for between-person differences in slope parameters (i.e., growth trajectories) for time–performance relationships (Hypotheses 8–10). Thus, Step 6 contains estimates for the final L2 model. Again, a pseudo-$R^2$ can be computed to determine the extent to which predictor variables account for between-person variance in L2 intercept and slope terms (Bryk & Raudenbush, 1992; Hofmann, 1997; Snijders & Bosker, 1994).

Results

Comparability of Maintenance and Transitional Samples

As discussed previously, we felt it critical to establish the rough equivalence of the maintenance and transitional samples in terms of the predictor variables of interest to our study (the Big Five traits, job tenure). Descriptive statistics and intercorrelations for all variables in both samples are shown in Table 1. As indicated by Table 1, the two groups appeared virtually identical with respect to the Big Five traits, and two-tailed $t$ tests for differences between means for the maintenance versus transitional samples revealed no differences at the .05 level of significance. Results did indicate a mean difference in job tenure between the two samples of 3.18 years, $t(145) = 2.04, p < .05$. However, the direction of this difference was such that tenure was higher in the maintenance than the transitional group. If anything, these results confirm the tendency of the maintenance sample to be employed in a steady-state job situation, although the average job tenure for the transitional sample (nearly 8 years) was still quite substantial.

Maintenance Sample

For the maintenance group (the upper diagonal of Table 1), rank-order performance appeared to be highly stable across the 4 quarters (Quarter 1–Quarter 4). Correlations ranged from .84 ($p < .01$) between Quarter 1 and Quarter 4 to .96 ($p < .01$) between Quarter 1 and Quarter 2. Thus, although these correlations do not show the degree of rank-order instability found in some previous longitudinal performance studies (e.g., Ployhart & Hakel, 1998), there is at least some evidence of a simple pattern of correlations. In addition, there is evidence of changes in performance across time in the sample as a whole, with pronounced increases in mean sales between Quarter 1 and Quarter 2, $r(98) = 10.86, p < .001$, and Quarter 3 and Quarter 4, $r(98) = 9.00, p < .001$. An examination of bivariate associations displayed in Table 1 reveals a consistent correlation between job tenure and sales, ranging from .23 ($p < .05$) for Quarter 4 to .33 ($p < .01$) at Quarter 1. As expected, conscientiousness predicted performance, with correlations ranging from .21 ($p < .05$) for Quarter 3 to .28 ($p < .01$) at Quarter 1. Extraversion was positively associated with performance at Quarter 1 ($r = .24, p < .05$) and Quarter 2 ($r = .23, p < .05$), but the relationships between extraversion and performance were marginal at Quarter 3 ($r = .18, p < .10$) and Quarter 4 ($r = .19, p < .10$). No other traits were significantly correlated with sales performance at any time period in the maintenance group.

RCM results for the maintenance sample are presented in Table 2. Results for Step 1 provide strong confirmation of reliable person effects on sales performance ($ICC1 = .83$). At Step 2, L1 results reveal a positive, linear trend in performance across the four time periods and thus support Hypothesis 1. However, a visual inspec-

### Table 1

<table>
<thead>
<tr>
<th>Variable</th>
<th>$M$</th>
<th>$SD$</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Job tenure (years)</td>
<td>11.11</td>
<td>9.45</td>
<td></td>
<td>.08</td>
<td>.06</td>
<td>.03</td>
<td>.07</td>
<td>.13</td>
<td>.33</td>
<td>.30</td>
<td>.28</td>
<td>.23</td>
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<tr>
<td>2. Emotional stability</td>
<td>68.71</td>
<td>13.16</td>
<td></td>
<td>.80</td>
<td>.49</td>
<td>.03</td>
<td>.27</td>
<td>.40</td>
<td>.13</td>
<td>.12</td>
<td>.10</td>
<td>.11</td>
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<td>3. Extraversion</td>
<td>66.85</td>
<td>15.43</td>
<td>.11</td>
<td>.87</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Openness to experience</td>
<td>70.63</td>
<td>10.83</td>
<td>.79</td>
<td>.09</td>
<td>.47</td>
<td>.36</td>
<td>.24</td>
<td>.23</td>
<td>.18</td>
<td>.19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Agreeableness</td>
<td>71.42</td>
<td>11.74</td>
<td>.00</td>
<td>.83</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>6. Conscientiousness</td>
<td>53.44</td>
<td>11.42</td>
<td>.69</td>
<td>.02</td>
<td>.14</td>
<td>.03</td>
<td>.07</td>
<td>.71</td>
<td>.88</td>
<td>.27</td>
<td>.28</td>
<td>.21</td>
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<tr>
<td>7. Sales (Quarter 1)</td>
<td>51.86</td>
<td>10.53</td>
<td>.16</td>
<td>.62</td>
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<td></td>
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<tr>
<td>8. Sales (Quarter 2)</td>
<td>67.67</td>
<td>10.73</td>
<td>.05</td>
<td>.72</td>
<td>.32</td>
<td>.04</td>
<td>.02</td>
<td>.05</td>
<td>.02</td>
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<tr>
<td>9. Sales (Quarter 3)</td>
<td>67.00</td>
<td>10.15</td>
<td>.31</td>
<td>.49</td>
<td>.03</td>
<td>.71</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>10. Sales (Quarter 4)</td>
<td>76.73</td>
<td>12.21</td>
<td>.13</td>
<td>.23</td>
<td>.25</td>
<td>.38</td>
<td>.14</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. Correlations for the maintenance sample are shown in upper portion of the diagonal. Correlations for the transitional sample are shown in lower portion of the diagonal. For means, standard deviations, and internal consistency (coefficients alpha) reliability estimates, the top number refers to the maintenance sample, and the bottom number refers to the transitional sample. Means and standard deviations for NEO–FFI scales are based on summed scores from a 9-point scale. Sales data for the maintenance sample represent raw sales volume. Sales data for the transitional sample represent percent market share. For maintenance sample, $p < .01$ at $| r | = .26; p < .05$ at $| r | = .21; p < .10$ at $| r | = .18$ for two-tailed tests. For the transitional sample, $p < .01$ at $| r | = .38; p < .05$ at $| r | = .31; p < .10$ at $| r | = .25$ for two-tailed tests.
Table 2  
Random Coefficient Models Predicting Quarterly Sales in Maintenance Stage Sample

<table>
<thead>
<tr>
<th>Model and parameter</th>
<th>Parameter estimate</th>
<th>SE</th>
<th>95% CI lower bound</th>
<th>95% CI upper bound</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final Level 1 model</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>1301.452</td>
<td>57.305</td>
<td>1189.134</td>
<td>1413.770</td>
<td>22.71***</td>
</tr>
<tr>
<td>Linear trend</td>
<td>2553.981</td>
<td>272.044</td>
<td>2020.775</td>
<td>3087.188</td>
<td>9.39***</td>
</tr>
<tr>
<td>Quadratic trend</td>
<td>-21.558</td>
<td>115.761</td>
<td>-248.449</td>
<td>205.332</td>
<td>-0.18</td>
</tr>
<tr>
<td>Cubic trend</td>
<td>1180.187</td>
<td>157.177</td>
<td>872.120</td>
<td>1488.253</td>
<td>7.51***</td>
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<tr>
<td>Final Level 2 model</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Job tenure (intercept)</td>
<td>16.129</td>
<td>5.787</td>
<td>4.787</td>
<td>27.471</td>
<td>2.79**</td>
</tr>
<tr>
<td>Emotional stability (intercept)</td>
<td>-2.719</td>
<td>4.924</td>
<td>-12.370</td>
<td>6.932</td>
<td>0.08</td>
</tr>
<tr>
<td>Extraversion (intercept)</td>
<td>12.418</td>
<td>6.339</td>
<td>-0.007</td>
<td>24.842</td>
<td>1.96f</td>
</tr>
<tr>
<td>Openness to experience (intercept)</td>
<td>-0.709</td>
<td>4.850</td>
<td>-10.215</td>
<td>8.797</td>
<td>-0.15</td>
</tr>
<tr>
<td>Agreeableness (intercept)</td>
<td>-9.245</td>
<td>5.806</td>
<td>-20.625</td>
<td>2.135</td>
<td>-1.59</td>
</tr>
<tr>
<td>Conscientiousness (intercept)</td>
<td>10.472</td>
<td>5.142</td>
<td>0.394</td>
<td>20.550</td>
<td>2.04*</td>
</tr>
<tr>
<td>Job Tenure × Linear (slope)</td>
<td>-19.385</td>
<td>30.004</td>
<td>-78.193</td>
<td>39.424</td>
<td>-0.64</td>
</tr>
<tr>
<td>Emotional Stability × Linear (slope)</td>
<td>2.048</td>
<td>25.532</td>
<td>-47.994</td>
<td>52.091</td>
<td>0.08</td>
</tr>
<tr>
<td>Extraversion × Linear (slope)</td>
<td>-9.427</td>
<td>32.869</td>
<td>-73.849</td>
<td>54.996</td>
<td>-0.28</td>
</tr>
<tr>
<td>Openness to Experience × Linear (slope)</td>
<td>11.465</td>
<td>25.147</td>
<td>-37.823</td>
<td>60.753</td>
<td>0.46</td>
</tr>
<tr>
<td>Agreeableness × Linear (slope)</td>
<td>-10.238</td>
<td>30.105</td>
<td>-69.242</td>
<td>48.767</td>
<td>-0.34</td>
</tr>
<tr>
<td>Conscientiousness × Linear (slope)</td>
<td>10.342</td>
<td>26.660</td>
<td>-41.912</td>
<td>62.596</td>
<td>0.39</td>
</tr>
<tr>
<td>Job tenure × Quadratic (slope)</td>
<td>-7.803</td>
<td>12.455</td>
<td>-32.214</td>
<td>16.608</td>
<td>-0.62</td>
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<tr>
<td>Emotional Stability × Quadratic (slope)</td>
<td>5.410</td>
<td>10.598</td>
<td>-15.362</td>
<td>26.183</td>
<td>0.51</td>
</tr>
<tr>
<td>Extraversion × Quadratic (slope)</td>
<td>-10.820</td>
<td>13.644</td>
<td>-37.562</td>
<td>15.922</td>
<td>-0.79</td>
</tr>
<tr>
<td>Openness to Experience × Quadratic (slope)</td>
<td>5.277</td>
<td>10.438</td>
<td>-15.182</td>
<td>25.737</td>
<td>0.51</td>
</tr>
<tr>
<td>Agreeableness × Quadratic (slope)</td>
<td>24.354</td>
<td>12.496</td>
<td>-0.139</td>
<td>48.847</td>
<td>1.95f</td>
</tr>
<tr>
<td>Conscientiousness × Quadratic (slope)</td>
<td>3.313</td>
<td>11.067</td>
<td>-18.377</td>
<td>25.004</td>
<td>0.30</td>
</tr>
<tr>
<td>Job tenure × Cubic (slope)</td>
<td>19.639</td>
<td>16.216</td>
<td>-12.145</td>
<td>51.422</td>
<td>1.21</td>
</tr>
<tr>
<td>Extraversion × Cubic (slope)</td>
<td>21.956</td>
<td>17.764</td>
<td>-12.862</td>
<td>56.774</td>
<td>1.24</td>
</tr>
<tr>
<td>Openness to Experience × Cubic (slope)</td>
<td>-4.252</td>
<td>13.591</td>
<td>-30.891</td>
<td>22.386</td>
<td>-0.31</td>
</tr>
<tr>
<td>Agreeableness × Cubic (slope)</td>
<td>4.660</td>
<td>16.270</td>
<td>-27.230</td>
<td>36.550</td>
<td>0.29</td>
</tr>
<tr>
<td>Conscientiousness × Cubic (slope)</td>
<td>35.602</td>
<td>14.409</td>
<td>7.361</td>
<td>63.844</td>
<td>2.47*</td>
</tr>
</tbody>
</table>

Note. For all Level 1 parameter estimates, df = 294; for parameters predicting intercept variation in Level 2 analyses, df = 92; for cross-level interaction parameters in Level 2 analyses, df = 276. For the sake of clarity, hypothesized effects are italicized. CI = confidence interval.

* p < .10. ** p < .05. *** p < .01. **** p < .001.

The upper diagonal of Table 3 displays correlations between parameters in Level 2 analyses, allowing between-person variation in the cubic slope parameter, which was significantly improved by allowing between-person variation in the quadratic slope parameter, \( \chi^2(9) = \chi^2(37.562) = 5.42, ns \), and was significantly improved by allowing between-person variation in the cubic slope parameter, \( \chi^2(9) = 5.42, ns \). Taken together, these results suggest considerable individual variability in overall performance levels and growth trajectories.

Next (in Step 4), we sought to determine if the fit of our maintenance sample model could be improved through modeling within-person error structures. The results fail to support the presence of autocorrelation, \( \chi^2(1) = 0.02, ns \), or heteroskedasticity, \( \chi^2(1) = 0.00, ns \), in the maintenance sample data; hence, subsequent models excluded these error term specifications. Final estimates for the final Level 1 model are shown in Table 2. Included are parameter estimates, estimated standard errors, 95% confidence intervals for estimated parameters, and corresponding t statistics. The upper diagonal of Table 3 displays correlations between parameters in Level 2 analyses, allowing between-person variation in the cubic slope parameter, which was significantly improved by allowing between-person variation in the quadratic slope parameter, \( \chi^2(9) = 5.42, ns \). Taken together, these results suggest considerable individual variability in overall performance levels and growth trajectories.

...
higher order growth terms. Of particular interest are positive relationships between mean sales and both linear (\(r = .34, p < .001\)) and cubic (\(r = .76, p < .001\)) sales growth. These results indicate that effective performers (in terms of mean sales across the 4-quarter period) were also likely to increase their performance between Quarter 1 and Quarter 2 and between Quarter 3 and Quarter 4. As shown in Table 4, the final L1 model accounted for 41% of the reliable within-person variance in sales performance across the 4-quarter period for this group.

Table 2 also shows the L2 solution for the maintenance sample. The first set of terms listed represents predictors of individual intercept terms, or in this case, predictors of mean level sales performance differences (Step 5; Hypotheses 3–4). Recall that all trait effects are conditional on job tenure. Clear support was found for Hypothesis 3 (conscientiousness and mean level performance), and marginal support (\(p < .10\)) for Hypothesis 4 (extraversion and mean level performance). Job tenure also was positively associated with individual performance intercepts. Tests for individual differences in growth parameters as a function of the traits and job tenure are captured in the cross-level interaction terms shown in Table 2. The full L2 model shows cross-level interaction terms for the linear, quadratic, and cubic trends in the data. Hypothesis 8 stated that conscientiousness should be positively related to continuous performance change in the maintenance sample, which is evidenced by a positive association between this trait and the linear growth term. Although this hypothesis was not strictly supported with respect to the linear term, conscientiousness was positively associated with the cubic term, providing some support for the general tendency of conscientiousness to predict positive job performance trends in the maintenance sample. The results also reveal a nonsignificant (\(p < .10\)) positive association between agreeableness and negative quadratic growth. However, the nonsignificance of the quadratic term (which was retained to preserve scaling) at L1, this result likely was a statistical artifact.

Table 4 shows the percentage of variance in between-person differences in both intercepts accounted for by the differences in levels of predictor variables. Predictor variables in the final L2 model accounted for 13% of the between-person variance in performance intercepts (mean performance differences) along with 10% of the between-person variance in cubic slopes, across the 4 quarters studied. Because of the lack of significant predictors of linear performance increases, as well as the lack of significant quadratic trend effects at L1, the model failed to account for significant variance in linear or quadratic growth.2

Given the unexpected finding concerning the relationship between conscientiousness and positive cubic growth, we sought to determine the exact form of this interaction. The complexity of the Conscientiousness \(\times\) Time interaction was revealed in Figure 1, which uses the final L2 model parameters to estimate predicted performance in each of the 4 quarters for persons high (one standard deviation above the sample mean) and low (one standard deviation below the sample mean) on conscientiousness, contrasted with predicted performance at each quarter for persons scoring at the sample mean on conscientiousness (Bliese & Ployhart, 2002). Values for job tenure and the remaining traits were held constant at their respective sample means in these contrasts. The effect of conscientiousness in predicting mean performance across time was reflected in the average performance difference between high- and low-conscientiousness persons across the 4 quarters, which is relatively constant once sample mean differences in predicted performance are taken into account. A closer examination of Figure 1 shows a slightly steeper slope for high conscientiousness persons between Quarter 1 and Quarter 2 than for their low conscientiousness counterparts, and the same pattern is observed between Quarter 3 and Quarter 4, capturing the significant association between conscientiousness and positive cubic growth.

**Transitional Sample**

Descriptive statistics and intercorrelations for all transitional sample variables are shown in the upper diagonal of Table 1. Again, we observed strong evidence for rank-order stability across the 4 quarters studied (Quarter 1–Quarter 4) in this sample, with correlations ranging from .89 (\(p < .001\); Quarter 1–Quarter 4) to .97 (\(p < .001\); Quarter 3–Quarter 4), and there was evidence of a slight simplex pattern to these associations. As shown in Table 1, there was strong evidence of mean performance increases between Quarter 1 and Quarter 2, \(t(47) = 16.13, p < .001\); Quarter 2 and Quarter 3, \(t(47) = 17.63, p < .001\); and Quarter 3 and Quarter 4, \(t(47) = 15.26, p < .001\). This dramatic pattern of performance growth reaffirmed our expectation that this sample truly was in a transitional period in contrast with the maintenance group. In a relative sense, sales performance increased by 134% in the transitional sample between Quarter 1 and Quarter 2 (compared with a 20% increase between the same two quarters for the maintenance group), increased by another 49% between Quarter 2 and Quarter 3 (in contrast to a slight performance decline of 3% in the main-

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2 In computing pseudo-\(R^2\) statistics, we actually encountered negative estimates for the linear and quadratic terms at L2, evidenced by the increase in variance for the linear term when the predictor variables were added (see Table 4). As suggested by Snijders and Bosker (1994, p. 343), this is a common occurrence in growth-based random coefficient models in which L1 predictors (linear and cubic growth functions in this case) are not expected to vary at L2. This suggestion is consistent with our result that no predictor variables were significantly (at \(p < .05\)) associated with individual differences in linear or quadratic growth in the maintenance sample. Given that pseudo-\(R^2\) values represent mere approximations in random coefficient models, we assumed an \(R^2\) value of .00 in these cases.
tenance sample), and finally, jumped by another 29% between Quarter 3 and Quarter 4 (the positive change over the same period for the maintenance employees was 17%).

Given the difference in the scaling of performance in the maintenance (raw sales counts) and transitional (percent market share) samples in the four periods of interest to our study, we sought to confirm a positive association between raw and adjusted sales figures in the latter group. Strong, positive correlations between raw and market share adjusted sales figures at each quarter would support our use of the latter as criteria in the transitional sample.

We obtained the necessary data from company records and found strong correlations between raw and market share adjusted sales figures at each quarter would support our use of the latter as criteria in the transitional sample. The mean correlation between raw and market share adjusted sales across these four periods was .77.

Regarding bivariate predictor–criterion relationships (see Table 1), extraversion failed to predict performance at the traditional .05 level of significance for any of the 4 quarters studied in the transitional group. Openness to experience predicted performance at Quarter 2 ($r = .30, p < .05$). Correlations between openness and performance were positive but nonsignificant at Quarter 1 ($r = .25$) and Quarter 3 ($r = .26$; both $p < .10$). Openness did not predict performance at Quarter 4 ($r = .17, n.s.$). Surprisingly, conscientiousness (Hypothesis 5) failed to predict performance in any of the 4 quarters studied. Although not hypothesized, agreeableness predicted performance in each of the 4 quarters, with correlations ranging from .33 ($p < .05$) at Quarter 4 to .38 ($p < .01$) at Quarter 1. The remaining Big Five traits, as well as job tenure, failed to predict performance at any measurement period in this sample.

RCM results for the transitional sample are presented in Table 5. At Step 1, we found ICC1 = .22. Consistent with Hypothesis 2, the L1 results show a positive linear trend in performance followed by a significant negative quadratic trend,
indicating a plateauing or deceleration of group-level performance (which still increases, but not at the same rate) between Quarter 2 and Quarter 3 (Step 2). These results may suggest a movement from a transitional to a maintenance stage at this period. As in the maintenance sample, we tested an L1 model 

Hypothesis 7 (openness to experience) received support 845

Also shown in Table 5 are parameter estimates for the L2 model in the transitional sample. Again, all effects for the traits are conditional on job tenure. Hypotheses 5–7 concerned the prediction of performance intercept differences (mean performance) from conscientiousness, extraversion, and openness to experience, respectively, with job tenure held constant. Only Hypothesis 7 (openness to experience) received support—individuals high in openness tended to have higher mean performance than did those low in openness. Although not hypothesized, agreeableness also was positively associated with mean level performance.

Hypothesis 9 concerned the effects of conscientiousness on negative quadratic performance growth (e.g., the plateauing effect—such that the performance of conscientious persons should be less likely to peak at some point during the study). As shown in Table 5, this hypothesis failed to receive support, as conscientiousness failed to predict any of the L2 parameters. Two traits clearly were associated with the linear term. Our
results indicate that agreeable salespeople were more likely and emotionally stable individuals were less likely to increase their sales in a positive linear fashion across the period of the study. Finally, openness to experience was negatively associated with negative quadratic growth, indicating that open salespeople were less likely to experience plateaued performance across the 4-quarter period of the study. Job tenure failed to predict both mean level performance and performance growth. As indicated by Table 6, predictor variables in the final L2 model accounted for 18% of the between-person variance in performance intercepts and 11% and 31% of the between-person variance in linear and quadratic slopes, respectively, across the 4 quarters studied for the transitional group.

Effects on performance at each quarter for agreeableness, emotional stability, and openness to experience in the transitional sample are shown in Figures 2, 3, and 4, respectively. For each trait, predicted performance of persons one standard deviation above and one standard deviation below the sample mean on the given trait are contrasted along with predicted performance at each quarter for persons scoring at the sample mean for each trait. Again, values for job tenure and the relevant other four traits are held constant at their respective sample means in these contrasts.

Figure 2 supports a persistent effect on mean level performance across the 4 quarters for agreeableness, corresponding to the significant association between agreeableness and the L2 intercept term in this sample. In addition, a close examination of Figure 2 shows a slightly steeper slope for persons high in agreeableness across the study period, reflecting the positive association between this trait and linear growth at L2. Identical effects are shown in Figure 3 for emotional stability, although this effect is in the opposite direction as one might expect, with low emotional stability (i.e., neuroticism) positively associated with mean performance differences and positive performance growth. Finally, Figure 4 reveals the complexity of the interaction between openness and time. Again, positive mean-level performance differences as a function of openness across the 4 quarters are immediately apparent. The increasing divergence between high- and low-openness salespeople across the 4 quarters represents the negative association between openness and negative quadratic growth. Although there is a slight decrease in the sample as a whole in the rate of performance growth between Quarter 1 and Quarter 4 (see the line corresponding to predicted sales at sample mean levels of openness), this effect is less pronounced for those high in openness to experience.

| Table 6 |
|------------------|------------------|
| **Variance Accounted for in Final Level 1 and Level 2 Models for Transitional Sample** |
| Model description | Observed variance | Percent variance accounted for in model (Pseudo $R^2$) |
| Level 1 | Unconditional on time trends | 11.07 | .88 |
| Level 1 | Conditional on linear and quadratic trends | 1.28 | |
| Level 2 intercept differences | Unconditional on Big Five traits and job tenure | 5.51 | |
| Level 2 intercept differences | Conditional on Big Five traits and job tenure | 4.53 | |
| Level 2 linear slope differences | Unconditional on Big Five traits and job tenure | 155.56 | |
| Level 2 linear slope differences | Conditional on Big Five traits and job tenure | 137.72 | |
| Level 2 quadratic slope differences | Unconditional on Big Five traits and job tenure | 10.09 | |
| Level 2 quadratic slope differences | Conditional on Big Five traits and job tenure | 6.94 | |
Discussion

Our study adds to a growing body of literature concerning the temporal nature of job performance. In addition, ours is the first study of which we are aware to advance explicit hypotheses concerning associations between personality factors and change in individual performance trajectories while accounting for job stage in a field setting. To date, the majority of research on personality–performance relations has correlated personality traits with performance measured at only one point in time. Some of our hypotheses concerning personality–performance relations in the context of performance change were supported, whereas others were not. Conversely, we obtained serendipitous findings with respect to the validity of agreeableness in predicting performance growth parameters in the transitional sample.

Most important, the same personality factors associated with success did not necessarily generalize across the maintenance and transitional job contexts. For example, conscientiousness and extraversion were positively associated with mean performance and performance change (for conscientiousness) in the maintenance sample but not in the transitional sample. The reason for this discrepancy is unclear. However, it has been argued that during the maintenance stage, employees do not necessarily face new challenges or novel stimuli on a regular basis (Murphy, 1989). Perhaps employees low on these traits may become complacent during this stage. In contrast, extraverts and conscientious persons are more likely to excel under these circumstances, as such persons have high energy levels, strive for achievement, and in the case of conscientiousness, are more likely to be duty-bound (Hogan & Ones, 1997). Thus, extraversion and conscientiousness should continue to predict job performance even when job-related tasks have become fairly routinized, as in the maintenance stage (Stewart, 1999). In fact, our results do point to conscientiousness as a positive force in performance change in the maintenance sample, as evidenced by the significant cubic trend. These traits may be less salient during transitional stages, in which individual differences in creativity, intellectual flexibility, problem solving, and adaptability are brought to the forefront.

Figure 3. Predicted sales in the transitional sample at each quarter as a function of emotional stability (ES).

Figure 4. Predicted sales in the transitional sample at each quarter as a function of openness to experience (OE).
Consistent with this view, openness was positively associated with both mean performance and performance trends in the transitional sample but unrelated to sales in the maintenance sample. Thus, openness may be a critical factor for performance when employees are required to adapt to change (as hypothesized) but less important for steady state performance. One might expect that the validity of openness to experience would wane with time in our transitional sample, signaling the movement to more of a maintenance stage for this group of employees. Bivariate analyses from our study suggest slightly weaker correlations between openness and later performance (e.g., Quarter 4). However, our RCM results tell a different story, as highly open salespeople had increased sales aggregated across the 4-quarter period as a whole and were less likely to experience plateaued performance at later periods.

An unexpected finding was the strong positive relationship between agreeableness and both mean performance and performance growth in the transitional sample. Agreeableness, although sometimes argued to interact with other personality traits such as conscientiousness in predicting performance (Witt, Burke, Barrick, & Mount, 2002), is rarely hypothesized to have a main effect on performance. However, in the transitional sample, we believe salesperson agreeableness may have resulted in a positive “foot in the door” effect. That is, agreeable salespeople may have achieved greater success in the transitional group as a function of their increased ability to gain access to potential customers as well as their ability to maintain positive relationships with these persons across time. What would lead to such an effect? One possible mediating mechanism is trust. A fundamental characteristic of agreeable persons is their trustworthiness, whereas disagreeable people are manipulative, cynical, and self-serving (Costa & McCrae, 1995). In addition, agreeableness has been shown to be a key component of employee integrity (Sackett & DeVore, 2001). As gatekeepers of information, it is critical that pharmaceutical sales representatives have trusting relationships with potential customers. In fact, a recent meta-analysis of the sales literature uncovered a significant positive association between customer trust perceptions and sales performance (Swan, Bowers, & Richardson, 1998). Thus, the quality of employee–customer interactions may have represented the driving force behind the validity of agreeableness in predicting transitional group performance and performance trends in our study. Consistent with such an interpretation, meta-analytic research has shown that agreeableness possesses validity comparable with that of conscientiousness for jobs focused on interpersonal interactions in which “getting along” is critical for performance (Hogan & Holland, 2003; Mount, Barrick, & Stewart, 1998).

More difficult to explain is the negative association between emotional stability and linear performance growth in the transitional sample. To the extent that emotional stability predicts performance, meta-analytic reviews have concluded that the association is positive (e.g., Judge & Bono, 2001; Salgado, 1997). This makes sense, in light of the fact that people with low emotional stability are described as depressed, insecure, and anxious (Costa & McCrae, 1995), traits that would hardly seem to facilitate effective job performance under any circumstances. One possible explanation for this counterintuitive finding comes from control and cybernetic theories of the stress process as applied to work (Carver & Scheier, 1990, 1998; Edwards, 1992). These theories posit that when confronted with stressful episodes, people take action (e.g., increase effort) to eliminate the unpleasant emotions associated with stress. As people low in emotional stability are more likely to appraise their job environments as threatening (Spector, Zapf, Chen, & Frese, 2000) and a transitional job period is full of novel challenges, some degree of neuroticism may actually be beneficial for performance under these conditions. However, researchers rarely advance such arguments, and this finding clearly needs replication before such an interpretation would seem credible.

Finally, because job tenure was not a central focus of this study, we did not hypothesize any directional associations between tenure and either mean level performance or performance trends in the maintenance and transitional samples. However, our results reveal a positive relationship between tenure and mean performance in the maintenance sample, indicating that employees who had worked in their jobs longer had higher sales. There was no association between tenure and sales in the transitional sample. These findings deserve comment. On one hand, to the extent that tenure would facilitate performance, one might expect that this effect would be stronger for incumbents in the transitional sample, as these persons may have similar (although not identical) experiences in their past work with the company to those encountered in their new positions. This effect would be reflected in a higher positive linear trend (i.e., higher initial performance) for highly tenured salespeople. On the other hand, consistent with Deadrick et al.’s (1997) findings, such an effect would be expected to dissipate with time. Neither assertion is supported by our data. The positive relationship between tenure and mean sales in the maintenance sample may simply reflect the within-sample variation in job knowledge as a result of experience in this group (Murphy, 1989). Although not the central focus of the current study, a critical research question in this context might involve estimation of the diminishing returns on performance across time (e.g., plateaued growth) of previous job tenure and experience as a function of job characteristics such as complexity or changing task environments (Schmidt, Hunter, Outerbridge, & Goff, 1988; Tesluk & Jacobs, 1998).

Several potential weaknesses of the current study deserve mention. First, it should be noted that in both the maintenance and transitional data, rank-order consistency in performance across time was somewhat higher than that frequently reported in other studies of this type (e.g., Deadrick et al., 1997; Hofmann et al., 1992, 1993; Ployhart & Hakel, 1998). Although the reason for this tendency in our own data is unclear, it is possible that individual performance in both samples was largely determined by temporarily stable factors outside the person’s control (e.g., market demographics, territory size), resulting in upwardly biased consistency estimates. The measurement of performance—even objective performance—is always potentially subject to confounds of this sort (Austin & Villanova, 1992; Muckler, 1992), and we do not necessarily see our samples as differing from typical sales samples in this regard. Such influences might place limits on the effects of individual difference factors as predictors of individual mean performance differences and performance trajectories across a specified time period. However, the magnitude of bivariate personality-performance relationships we observed in our study was comparable to those frequently reported in the literature (e.g., Barrick & Mount, 1991; Hurtz & Donovan, 2000), although our conclusions about which traits possess validity under maintenance
versus transitional job conditions differed somewhat from findings typically generated by studies correlating personality traits with static job performance measures, as well as several major meta-analyses of personality trait validity (e.g., Barrick & Mount, 1991; Barrick et al., 2001; Hurtz & Donovan, 2000). Future validity generalization research may want to consider job stage as a moderator of personality-performance relationships by comparing the validity of traits in high- versus low-tenured employees. The often disappointing meta-analytic results obtained for the validity of traits such as agreeableness and openness to experience may simply be the result of the tendency of previous meta-analytic authors to collapse across job stage variables in estimating the validity of these traits.

A second potential shortcoming of our study concerns our use of broadband measures of the Big Five traits—particularly in light of the null effects for conscientiousness in predicting performance and performance growth parameters in the transitional sample. In recent years, attention has returned to the longstanding bandwidth-fidelity debate within industrial–organizational psychology as it relates to the relative validity of broad versus narrow traits in the prediction of job performance. Several researchers have argued that narrow traits offer the most promise (e.g., Ashton, 1998), others have suggested that broad traits are preferable (Ones & Viswesvaran, 1996), and still others have pointed out that the choice of broad versus narrow measures should be determined by the nature of the criteria that one is trying to predict (Hogan & Holland, 2003; Hogan & Roberts, 1996; R. J. Schneider, Hough, & Dunnette, 1996). In the context of our study, it is possible that some facets of conscientiousness (e.g., order, duty, achievement, competence) may be relevant for transitional job performance, whereas others are less relevant (or perhaps negatively related). If so, the use of a measure of conscientiousness combining items from these various facets—yet not allowing for comprehensive assessment of any of the facets individually—would cause these competing influences to cancel out, producing an overall null effect for conscientiousness. In fact, several recent studies have suggested differences in the nature and direction of facet-level associations within Big Five constructs for the prediction of criteria such as escalation of commitment in decision-making situations (Moon, 2001; Moon, Hollenbeck, Humphrey, & Maue, 2003), absenteeism (Judge, Martocchio, & Thoresen, 1997), and most critical to our study, job performance (Stewart, 1999). Likewise, we found fairly modest effects for the broad traits in predicting some of the higher order growth trend terms (e.g., linear growth in maintenance and transitional samples) relative to our ability to predict mean performance levels. It is possible that the higher order growth trend terms contain specific factor variance uniquely associated with the facet level (but not the broad-based) components of the Big Five traits. Future research might attempt to replicate our results using measures allowing for more fine grained assessments of Big Five traits at the facet level to tease out these potentially complex influences in predicting job performance in a temporal context while still allowing for broad-based assessment by summing facet-level scores for each Big Five trait.

A third issue revolves around salespeople in the transitional sample. One may question whether the changes experienced by these individuals were qualitatively comparable to those described by Murphy (1989). For example, although these persons experienced a shift in priorities, were required to learn new technical information, and had to seek out a new client base, they ultimately remained working for the same employer in the same industry. It is difficult to definitively say whether our designation of this group of employees as a transitional sample diminished the internal validity of our study (Cook & Campbell, 1979), and we acknowledge this possibility. However, if the transitional stage in the current study were truly not transitional in nature, we probably would not have observed the strong positive linear and negative quadratic trends in group mean performance (signaling a potential transitional to maintenance stage shift) as well as the tendency of different personality factors (e.g., openness to experience, agreeableness) to be associated with success in this situation vis-a-vis the maintenance context. If anything, we believe that our results may be on the conservative side, given the nature of our transitional sample. That is, maintenance versus transitional differences in performance trends—and predictors of these trends—might have been more pronounced had we used a start-up sample as our transitional group. Future studies could avert this problem through the use of transitional samples comprising persons with no prior experience in a given industry or occupation or at least the use of subjective perceptual measures of job stage status on which maintenance and (ostensibly) transitional samples could be contrasted to verify the status of the latter.

Finally, we did not measure general mental ability (g) in the current study to test its relationship to individual performance growth. Thus, it was not possible to test the relative importance of g versus personality dispositions and job tenure in the prediction of performance across time. However, we do not feel that this omission invalidates our results. Meta-analytic research has shown that, because g is relatively orthogonal to the Big Five dimensions, g and personality uniquely add to the prediction of job performance in most occupations (Schmidt & Hunter, 1998). In addition—and in contradiction to previous research in this area—Vinchur et al. (1998) found that g was uncorrelated with objective sales data in their meta-analysis of the predictors of sales success. Thus, it is unlikely that the omission of g from our study substantively affected parameter estimates for the Big Five traits in the prediction of performance. However, future research might incorporate both g and personality traits in the prediction of temporal changes in job performance for employees at maintenance and transitional job stages. In spite of these potential shortcomings, we feel that our use of real field data, as well as our use of the Big Five taxonomy to generate and test theoretically salient personality–performance and performance trajectory relationships, somewhat ameliorates these concerns.

The practical implications of our results for organizations deserve some comment. Numerous management theorists have observed that the nature of jobs is changing, such that in the future, workers will need to continuously increase their skill base to experience workplace success (Howard, 1995; Patterson, 2001). Likewise, our economy is becoming increasingly service oriented (V. Schneider, Chung, & Yusko, 1993), and the focus on service is particularly salient for people in sales jobs. Given these changing aspects of the workplace environment, organizations may want to consider traits that relate to adaptability (openness) and service

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3 We thank an anonymous reviewer for bringing to our attention this possibility.
(most likely, agreeableness) in addition to factors such as conscientiousness and general mental ability when making hiring decisions. Furthermore, organizations may want to take these characteristics into account when nominating employees for transitional job situations. Other researchers have advanced similar arguments with respect to identifying employees most capable of coping with the demands of changes such as organizational restructuring and downsizing (Judge et al., 1999; expatriate work assignments (Ones & Viswesvaran, 1997, 1999), and the implementation of new technologies (Hesketh & Neal, 1999). Although the changes experienced by our transitional sample may not have approached the scope of those listed here, it is interesting to note that the same traits hypothesized to affect performance for these types of changes (in particular, openness) predicted sales effectiveness in our transitional sample.

Another practical consideration stemming from our results concerns the practice of banding in a personnel selection context. Simply stated, banding is a procedure that treats predictor test scores within a range of potential scores (i.e., a score band) as equivalent, given a previously specified level of measurement precision in the predictor (Cascio, Outtz, Zedeck, & Goldberg, 1991). Some researchers have advocated this method as a means of reducing adverse impact against minority groups in a selection context (e.g., Cascio et al., 1991), whereas others (e.g., Schmidt, 1991) have questioned the logic underlying this method. Sophisticated models have been developed that take into account the effects of unreliability in predictor tests in the process of determining score bands (e.g., Murphy, 1994; Murphy, Osten, & Myors, 1995). However, researchers have largely overlooked the issue of change in criterion scores (i.e., dynamic criteria) in the context of the practice of banding (for an exception, see Aguinis, Cortina, & Goldberg, 1998). Incorporating performance change into banding models may prove problematic. Schmidt and colleagues (in Campion et al., 2001, pp. 163–164) presented a scenario in which accounting for unreliability in job performance measures resulted in score bands including 97% of all predicted performance scores—hence negating the utility of banding in such a scenario. Clearly, more research is needed that incorporates a criterion-based perspective and acknowledges both group- and individual-level changes in job performance. One possible solution involves treating temporal change in criterion scores as systematic (rather than random measurement error) and setting bands around predicted performance scores that incorporate expected performance growth. Of course, it should be noted that there is no clear-cut evidence of sizable group differences on measures of broad (e.g., the Big Five) personality traits (Hough, Oswald, & Ployhart, 2001), which would suggest that adverse impact may not be a significant problem for selection based on measures of these constructs.

Finally, our design provides some basis for confidence in the long-term validity—and consequently, the utility—of selection systems based on personality traits, a point that has been debated in the literature (Henry & Hulin, 1987, 1989; Schmidt et al., 1988). The validity of personality traits for predicting sales performance did not systematically decrease across the 1-year time interval for our study in either of the two samples. Although research has supported the deterioration of the validity of cognitive ability across time (Keil & Cortina, 2001), our results indicate cause for cautious optimism with respect to this question for personality traits. Rather than suggesting that the validity for traits deteriorates with time, our results point to the conclusion that changes in performance at relatively distal time periods (i.e., performance growth trajectories) can actually be predicted with some degree of accuracy from personality traits such as conscientiousness, openness to experience, and agreeableness, depending on the nature of the sample of job incumbents in question. That is, traits may constitute substantively important determinants of changes in job performance patterns with increased job experience. Thus, one conclusion one might draw from our study is that the initial gains to organizations for selection based on personality traits are not epiphenomenal but that they persist (and may even increase) with increased time on the job. In addition, even small gains in individual performance across time as a function of these individual differences would be expected to translate into large economic gains in the aggregate within an entire sales force or organization. Of course, a 1-year time frame simply may not have been long enough for us to observe a decline in validity for traits similar to those often observed for cognitive ability (Keil & Cortina, 2001).

Clearly, a number of questions about the relationships between personality traits and job performance trajectories remain to be addressed by future researchers in other occupational settings and contexts. Although the field has witnessed important theoretical and empirical advances concerning relationships between ability constructs and performance in a temporal context (e.g., Ackerman, 1988, 1992; Hulin et al., 1990; Keil & Cortina, 2001; Murphy, 1989; Schmidt et al., 1988), similar theories focusing on volitional variables such as personality traits have been lacking. In addition to replicating the current study in other field contexts with more sophisticated research designs, experimental laboratory research could test more complex temporal aspects of personality–performance relationships using a task-based skill-acquisition framework. In fact, the evolution and evaluation of testable theories involving personality–performance relationships in the context of temporal and career stage variables may represent the next important step for personality research in applied settings. We hope that our study provides a useful starting point for additional research in this tradition.

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