TEMPORAL CHANGES IN VALIDITY AND THE IMPACT OF INTELLIGENCE AND PERSONALITY ON EXTRINSIC CAREER SUCCESS

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Abstract

We study the effect of intelligence and personality on career success by examining temporal changes in their validities, viewing increasing validity over time as indicative for the impact of an individual characteristic on gravitational processes and therefore on career success. The main finding of two studies is that the validity of intelligence clearly increases over time whereas the validity of personality tends to be stable. We also find that a pattern of increasing validity with regard to personality may result from lack of control for intelligence.

In recent years there has been a proliferation of research that ties personality characteristics to career success (e.g., Frese, Garst, & Fay, 2007; Gelissen & de Graaf, 2006; Mueller and Plug 2006; Judge, in press; Judge, Higgins, Thoresen & Barrick, 1999; Judge & Hurst, 2007, 2008). This research is associated with a shift in emphasis regarding the antecedents of career success, since earlier research emphasized the role of cognitive characteristics, primarily intelligence (e.g., Brown & Reynolds, 1975; Harrell & Harrell, 1945; Jensen, 1998; Siegel & Ghiselli, 1971; Stewart, 1947; Thorndike & Hagen, 1959. See Schmidt & Hunter, 2004 for a review, and Herrnstein & Murray, 1994 for a widely cited book in this area). The current paper provides another examination of the impact of personality on career success, by comparing the impact of important personality measures relevant to career success to the impact of intelligence. Our focus is on the objective, or extrinsic aspects of career success, as indicated by level of pay and occupational status (e.g., Heslin, 2005).

So far the impact of both personality characteristics and cognitive characteristics on career success has been studied within a *main-effect approach*, by examining the main effects, or validities, of these characteristics. The current paper proposes a new approach that can be called a *characteristic-time interaction approach*. The focus of this approach is on examining temporal changes in validities. As we explain below, these changes are associated with gravitational processes – the processes by which people gravitate over time towards jobs that are commensurate with their characteristics – and are examined by testing the interaction between characteristics and time, thus providing a novel way to assess the impact of individual characteristics, particularly personality characteristics, on career success.

Gravitation and the increasing validity argument

Except for one recent study (Judge & Hurst, 2008), not much attention has been given to the dynamic aspects of the relationship between personality and career success, that is to the *processes* by which personality characteristics lead to career success. On the other hand, researchers who have studied the relationship between intelligence and career success did examine the processes by which intelligence lead to career success, and argued that people gravitate towards jobs that are commensurate with their cognitive ability (McCormick, DeNisi, & Shaw, 1979; McCormick, Jeanneret & Mecham 1972; Wilk, Burris & Sackett, 1995; Wilk & Sackett, 1996). A basic contention of the current paper is that the logic that underlies

intelligence-induced gravitational processes applies to personality characteristics as well. If a personality characteristic is instrumental in career success, it should be expected that over the course of their career people will gravitate towards jobs that are commensurate with this characteristic.

In this paper we examine the validities of personality and intelligence in predicting career success by studying the gravitational processes associated with each of them. This approach is different from the traditional (main effect) approach used to examine the impact of these individual characteristics that relies on correlating (or regressing) measures of career success with (on) measures of intelligence and personality. Suppose that the validity of an individual characteristic, whether it is a personality characteristic or intelligence, is assessed at two points in time, t1 and t2, by correlating its measure with indicators of career success. We argue that to establish the effect of a certain characteristic on career success, its validity should increase with time. We call this the *increasing validity argument*. This argument is consistent with the gravitational hypothesis. If the dynamic processes that affect career success are gravitational, and if gravitational processes are indeed induced by a certain characteristic, the relationship between this characteristic and career success should be stronger after time has elapsed and allowed people to sort themselves into jobs commensurate with that characteristic. At t1, but not at t2, people did not yet gravitate to the job 'appropriate' for their characteristics and are more randomly distributed among jobs: therefore the correlations between their characteristics and their career success is lower.

Another way to illustrate this idea is based on the idea of career trajectory. Figure 1 describes the career trajectories of individuals high and low on a characteristic instrumental in career success. The gap in success of the two groups will be greater in t2 than in t1, because of the faster advance of the former group. The increase in gaps between t1 and t2 represents increasing validity.

Insert Figure 1 about here

Interestingly enough, the view that antecedents of career success should show a pattern of increasing validity stands in contrast to the intuition that shorter time gaps are associated with stronger predictive validity. However, whereas this intuition is relevant to the relationship between performance and its antecedents (see for example,

Hulin, Henry, & Noon, 1990), it may not be relevant to the relationship between career success and its antecedents. The reason is that whereas gravitational processes are not relevant to the way antecedents are related to performance (at least as studied in this literature), they are relevant to the way they are related to career success.

In sum, our discussion here suggests that in order to establish the effect of an individual characteristic on career success, the characteristic should not only exert a significant main effect on career success, but also needs to exhibit a pattern of increasing validity.

Personality, intelligence ability and extrinsic career success

Though a number of personality measurements were used in attempting to demonstrate the effect of personality on career success (see Ng, Eby, Sorensen & Feldman, 2005), the current work is based on the two measurements that are dominant in research about the effect of personality on career success: Core Self Evaluation (CSE, Judge, Locke & Durham, 1997) and the big-five personality dimensions (e.g., Goldberg, 1990).

CSE refers to mental premises that people hold about themselves and their functioning in the world. It reflects four lower order personality traits: self esteem, generalized self-efficacy, emotional stability, and locus of control (Judge, Erez, & Bono, 1998). Recent papers which studied the relationship between CSE and career success are: Judge & Hurst, 2007, 2008 and Judge, Hurst, Simon, in press.

Unlike CSE which assess a single (though fundamental) personality characteristic, the big-five represent an attempt for a comprehensive assessment of personality. It comprises of measures of five basic personality dimensions: Openness to experience, Conscientiousness, Extraversion, Agreeableness and Neuroticism. Recent papers which studied the relationship between the big-five and career success are Mueller and Plug (2006) and Judge et al. (1999).

Whereas there are a number of ways by which researchers operationalize / conceptualize personality in attempting to examine its effect on career success, there is agreement that estimates of the association between intelligence and career success, or for that matter any other relevant criteria, do not depend much on the operationalization of intelligence, as long as the measure is heavily g-loaded (Gottfredson, 1997; Lubinski & Humphreys, 1997). In the current paper we use two such measures, one in each study.

Finally, although the term career success is used to describe both objective and subjective aspects of an individual's career, in the current paper we focus on objective aspects of career success, primarily due to the lack of good measures of subjective career success in archival data that are necessary for the large-scale the longitudinal studies of the current paper. We use the two most popular indicators of objective career success, pay and occupational status (Greenhaus, 2003; Nicholson, 2000; Sullivan, 1999).

The exertion of appropriate controls

Two control issues need attention when demonstrating the effect of personality characteristics on career success. The first is the exertion of appropriate controls over characteristics that are correlated both with the focal personality characteristics and with career success, and particularly intelligence, as intelligence is associated both with career success (see above) and with measures of personality measures (Ackerman and Heggestad, 1997).

The second control issue relates to the temporal order between the measurement of the individual characteristics and the indicator of career success. To safe guard against the possibility of reverse causation, personality should be measured prior to the measurement of career success, the larger the time gap between the measurement, the stronger our confidence that reverse causation is not the reason for the relationship between the personality characteristic and career success.

These two control issues are not new, and in much of the research about personality and career success safeguards were taken against them. However, very few studies that take care of both of them are available. Especially noteworthy in the applied psychology literature is the lack of control for intelligence. Thus, for example, in their studies of the relationship between personality and career success, Judge et al. (2000), Judge & Hurst (2007; 2008) did not control for intelligence. The only study of which we are aware that controlled for both the temporal order and for intelligence is Judge, Higgins, Thoresen & Barrick's (1999). However, the sample size of this study was rather small (n=118), much smaller than sample sizes that are usually used in studying of the antecedents of career success. Thus one purpose of the current study is to assess whether omitting these two controls may have a substantial effect on the estimation of the impact of personality on career success.

Designs for assessing characteristics-time interaction

The increasing validity argument suggests that if a characteristic is instrumental to career success, it should interact with time: Its effect on career success should be stronger at later times than at earlier times. Such an interaction could be investigated either by examining the interaction between the characteristic and age in a cross sectional design, or by examining the interaction between the characteristic and time in a longitudinal design (panel data). Wilk et al. (1995) used these two designs for studying gravitation, although these authors did not use a framework in which the interaction between time and characteristics was examined.

In the longitudinal design, career success is measured at *multiple* time points. As a result, changes in career success of each individual can be assessed and related to individual characteristics. The cross sectional design, is based on variability in age among participants. If such variability exists, the increasing validity argument suggests that if a characteristic is valid for career success, its validity should be higher among older participants than among younger participants (see Wilk et. al. 1995).

STUDY 1: CSE, INTELLIGENCE AND CAREER SUCCESS

Method

Participants and procedure

The data were taken from the National Longitudinal Survey of Youth (NLSY), conducted with a probability sample of 12,686 persons (with an oversampling of Afro-Americans, Hispanics and economically disadvantaged whites) born between 1957 and 1964. Thus, the basic sampling was of a specific cohort, but some variability in age exists in the sample. This variability allows us to examine characteristic-time interaction in a cross sectional design. The interviews were administered annually, which allows us to examine this interaction in a longitudinal design.

The measure of intelligence was taken from the survey of 1980. Our measure of CSE was the same measure used by Judge & Hurst (2007, 2008), and was based on items collected in the surveys of 1979, 1980, 1987 and 1992. Information about participants' career success was taken from the 10 even numbered years between 1982 and 2000. We started at 1982 because this was the earliest year by which most of the participants started to be involved in the job market. Thus, our analyses examine the

career success of participants starting at the time when they were about 21.5 on average and end 18 years later, when they were 39.5.

The original sample included 12,686 participants. Due to funding constrains, 1,079 participants were dropped in 1984 and 1,643 in 1990. Natural sample attrition was about 10% a year. Thus the number of participants in each of the 10 years in which we conduct our study varies between about 9,400 in 1982 to 7,300 in 2000 (depending on missing values).

Measures

Core Self Evaluation. We used the Judge & Hurst (2007, 2008) measure of CSE, which was constructed from 12 items collected in the NLSY surveys. Two items, collected in the 1979 survey, were taken from Rotter's (1966) internal–external locus of control measure. Five items, collected in the 1980 survey, were taken from Rosenberg's (1961) self-esteem scale. Two items, collected in the 1987 survey, were taken from the Center for Epidemiological Studies Depression scale (Radloff, 1997). Three items, collected in the 1992 survey, were taken from the Pearlin Personal Mastery Measure (Pearlin, Lieberman, Menaghan, & Mullan, 1981), which assesses the degree to which individuals perceive themselves in control of forces that impact their lives (see Judge & Hurst, 2007, 2008 for a detailed description of the items)..

Since in some analyses we explore the role of the temporal order between the measurement of personality and the measurement of career success, we calculated two additional measures for CSE. One, early-CSE was based on the seven items that were measured *before* career success was measured (at 1982 for the first time), and the other, late-CSE was based on the five items which their measurements overlapped with the measurement of career success.

Intelligence. The measure for intelligence in this study was derived from participants' test scores in the Armed Forces Qualifying Test (AFQT). This test was administered to groups of five to ten participants of the NLSY during the period of June through October 1980. Respondents were compensated, and the overall completion rate was 94%. The intelligence score in the NLSY is the sum of the standardized scores of four tests: arithmetic reasoning, paragraph comprehension, word knowledge and mathematics knowledge, and is expressed as a percentile score from the general population.

Pay: In line with the labor economics literature (e.g., Belton & Kniesner, 1980; Polachek, & Siebert 1993), we used the logarithm of the hourly rate of pay as our measure for participants' pay.

Occupational status. At each interview participants described their occupation, and this description was converted into a 3-digit census occupational classification. These codes were used to obtain the Duncan socio-economic index, representing occupational prestige (Duncan, 1961). This index have been widely used in sociology research (e.g., Hauser & Warren, 1997).

Age, gender and family background: These variables were collected at the first year of the survey (1979) and were used as controls, though age served also in assessing the temporal changes in validity by examining its interaction with intelligence and CSE. Parents' education served as an indicator for family background. It was measured in terms of the highest grade completed by each of the parents. We used the mean of the two as an indicator for socio-economic background.

Analyses

Our focus is on examining temporal changes in validity of CSE and intelligence with regard to career success. To do that, at each time point, we regress our two measures of career success on the measures of personality and intelligence, as well as the control variables, and report the validity of personality and intelligence in terms of standardized regression coefficients.

To statistically examine characteristics-time interaction, we use an HLM framework. This framework could be viewed as consisting of two stages. At the first stage each individual's 10 yearly measures of career success are regressed on time. At the second stage the slopes and intercepts of these individual regressions are regressed on the characteristics to obtain an estimate for the characteristic-time interaction. The results could be presented in terms of the main effect of the within-individual variable (time), the main effects and interactions of the between-individual differences (level two variables), and the interactions between the individual differences and time (e.g., Kwok, Underhill, Berry, Luo, Elliott & Yoon, 2008). The effects that are relevant to testing hypotheses regarding increasing validity are the interactions between the two individual characteristics and age on the one hand (for the cross sectional design), and the interactions between the individual characteristics and time on the other (for the longitudinal design).

Finally, because of the large sample sizes in this study we used an alpha level of 0.0001. In fact, by and large, in all the analyses, effects that were not significant on this level were not significant on commonly used lower levels of significance as well.

Results

Descriptive statistics and inter-correlations are presented in Table 1. To simplify the presentation, only the first and last measures of career success appear in the table (i.e., the measures taken in 1982 and in 2000). The main results of this study are apparent in this table. There is a large increase in the correlation between intelligence and career success from 1982 to 2000 (from .16 to .41 for pay and from .31 to .43 for occupational success), but relatively small – though significant – increase in the respective correlations of CSE (from .15 to .30 and from .23 to .28, consistent with Judge & Hurst, 2008). In the analyses below we show that this latter increase disappears when appropriate controls are exerted.

Table 2 presents the HLM results. For the longitudinal design the relevant effects for testing temporal changes in validity are the interactions between the individual characteristics and time. For the cross-sectional design the relevant effects are the interactions between the individual characteristics and age.

Insert Tables 1 and 2 about here

Longitudinal design. To examine temporal changes in validity we regressed, for each of the 10 years of our study, our two measures of career success on intelligence, CSE, and the control variables (parents' education, gender and age). The standardized regression coefficients of intelligence and CSE for each of these years are given in Table 3. The data in this table show a pattern of increasing validity for intelligence. Both for pay and for occupational status there is a clear trend of increase in the effect of intelligence as a function of time. In the HLM analysis (Table 2) this is reflected in a significant interaction between intelligence and time for both pay and occupational status. For CSE the results were mixed. For occupational status the interaction between time and CSE was not significant ($p>0.4$), but for pay it was.

Insert Table 3 about here

Thus, from the perspective of the increasing validity argument, our longitudinal analysis provides a strong support for the validity of intelligence as an antecedent of career success. It is inconclusive, however, with regard to the validity of CSE, in that CSE showed stable validity with regard to occupational status, but increasing validity with regard to pay. We note, however, that even with regard to pay, the interaction between intelligence and time is much stronger than the interaction between CSE and time (in terms of R^2 the effect size of the former is more than 25 larger than the later). When we control for the temporal relationship between the measurement of CSE and the measurement of career success as reported below, the interaction between CSE and time is not significant.

Cross-sectional design: The HLM results (Table 2) reveal that the interaction of age and intelligence is significant both for pay and for occupational status, suggesting that the effect of intelligence on career success is stronger for older than for younger participants. As an example, these interactions are plotted in Figures 2a and 2b with pay and occupational status at 1982 as dependent variables. On the other hand, the interaction between CSE and age was not significant either for occupational status ($p>0.5$) or for pay ($p>0.2$). These results are consistent with a pattern of increasing validity for intelligence but not for CSE, thus supporting the validity of intelligence as an antecedent of career success, but not supporting the validity of CSE.

Insert Figure 2 about here

Main effects: The main effects of intelligence and CSE are apparent in Table 3 (they are not apparent in Table 2 because of the presence of significant interactions). The results in Table 3 indicate that CSE has a main effect on career success even after controlling for intelligence. In this sense, our results are not only consistent with previous results documenting the main effect of CSE on career success (Judge & Hurst, 2007, 2008), but also strengthen these results, because intelligence is controlled in our analysis. Note, however, that these results also suggest that the effect of intelligence is considerably stronger than the effect of CSE, at least after participants settled into their careers. Thus, for example, in 2000, the standardized coefficients of intelligence were between 2.5 (for pay) to 4 (for occupational status) times larger than the standardized coefficient of CSE .

CSE and career success: The importance of appropriate controls

In this section we demonstrate the importance of controlling for intelligence in assessing the impact of personality on career success as well as the importance of controlling for the temporal order between measurements of personality and of career success. We show that from the increasing validity perspective, spurious effects of personality may arise if these controls are not exerted.

We first show that, in contrast to the results reported in the previous section, when intelligence is not controlled for, CSE shows increasing validity with regard to occupational status. To do that we estimate the same occupational status HLM model of the previous section, omitting intelligence from the model. In contrast to the non-significant interactions between CSE and time and between CSE and age in the previous (controlled) analysis (see Table 2), in the current (non-controlled) analysis both interactions were significant ($p<0.0001$, $p<0.0002$, respectively), suggesting increasing validity with regard to CSE. Thus, spurious effects of increasing validity with regard to personality may arise if intelligence is not controlled for.

Secondly, we show that when the measurements of CSE and of career success overlap, CSE shows a pattern of increasing validity, which does not occur if it is measured *before* career success. To do that we conduct the HLM analysis of the previous section on pay using the *early* measure of CSE, rather than the full measure. In contrast to the significant interactions between CSE and time in the previous analysis (based on the full measure; see Table 2), the results of this analysis reveal no significant interaction between early CSE and time ($p>0.5$). Furthermore, when the HLM analysis on pay is conducted using the *late* measure of CSE, the interaction between CSE and time is significant ($p<0.0001$), similar to the interaction in Table 2. These results suggest that under the appropriate temporal order CSE does not appear to be an antecedent of career success, and that spurious effects of increasing validity may arise if the measurements of personality and career success overlap[1].

Discussion

The main finding of this study is that whereas intelligence exhibits a pattern of increasing validity, CSE does not. Thus, from the characteristic-time interaction perspective, intelligence, but not CSE, affects career success. From the main-effect perspective this is not the case, because CSE exerts a significant effect on career success, even after controlling for intelligence.

It is interesting to compare the results of this study to the results of Judge & Hurst's (2008) study who, on the basis of the same database used in our study, investigated the effect of CSE on career success in what is essentially a time-characteristic interaction approach. Although they neither framed their results in terms of gravitational processes nor in terms of temporal changes in validity, they found an interaction between CSE and time. However, Judge & Hurst (2008) did not control for intelligence in their analysis. In fact, when they controlled for education – which is strongly associated with intelligence (e.g., Herenstein & Murray, 1994) – the pattern of CSE's increasing validity declined substantially, perhaps even disappeared, which may suggest stable, rather than increasing, validity with regard to CSE when intelligence is controlled for.

STUDY 2: THE BIG-FIVE PERSONALITY DIMENSIONS, INTELLIGENCE AND CAREER SUCCESS

In this study we examine the same questions that were examined in Study 1 using a different sample, a different time period, a different conceptualization of personality, and a different measurement of intelligence.

Method

Participants and procedure

The data were taken from the Wisconsin Longitudinal Study (WLS) of 10,317 randomly sampled Wisconsin students in the 1957 graduating high school class. After being surveyed in 1957, participants were surveyed again in 1975 and 1992. The sample is broadly representative of white male and females who had completed at least 12 years of education (Swell, Hauser, Springer, & Hauser, 2006). Due to missing data our analyses included between 3,498 participants (in the pay models) and 5,610 (in the occupational status model).

Measures

The big-five personality dimensions: The five personality dimensions were measured in the 1992 survey by an abbreviated version of the BFI (John et al., 1999) that included 29 items, six for each dimension except for neuroticism, which was assessed by five items. Reliabilities were: Extroversion, 0.76; agreeableness, 0.71, conscientiousness, 0.66; neuroticism, 0.77; openness, 0.60.

Intelligence. Intelligence was measured in the 1957 survey by the Hnemon-Nelson Test of Mental Ability. The reliability of this test in the current data is not available, but other sources report test reliability ranging between 0.87 and 0.94 (Buros, 1959)

Pay: In 1972 pay was recorded in terms of the annual rate of pay and in 1992 in terms of the hourly rate of pay. Therefore, we first took the logarithm of these measures of pay and then standardized them to create similar-scales measures of pay.

Occupational status. Similar to Study 1, occupational status was derived from participants' descriptions of their occupations converted into a 3-digit census occupational classification, which was used to obtain the Duncan socio-economic index.

Age, gender and family background: These variables were collected in the first year of the survey (1957). Parents' education served as an indicator for family background and, similar to Study 1 was the mean of the highest grade completed by the parents.

Analyses

To examine temporal changes in validity we regress, at each of the two time points, the measures of career success on the five measures of the big-five, on the measure of intelligence and on the control variables, and report the validity of personality and intelligence in terms of standardized regression coefficients. For each of the two indicators of career success we test for time-characteristic interactions by a repeated measure General Linear Model in which the 1975 and 1992 measurements of career success are the repeated measures, and intelligence and the five measures of personality are the independent variables.

As in Study 1, because of the large sample size, we use an alpha level of 0.0001.

Results

Descriptive statistics and correlations between the independent and dependent variables are given in Table 4. The main results of this study are apparent in this table. Between 1975 and 1992 there is a large increase in the correlation between intelligence and pay, as well as in the correlation between openness and pay, but small changes in the correlations between the other four personality dimensions and pay.

For occupational status, both intelligence and the five personality dimensions show only small changes in these correlations.

Insert Table 4 about here

Characteristic-time interactions: Table 5 presents the standardized regression coefficients of our measure of intelligence and our measures of the big-five on pay and occupational status, and Table 6 presents the results of repeated measures General Linear Model. For pay, the results suggest a significant characteristic-time interaction for intelligence. They also suggest a significant interaction for openness to experience, but non-significant interactions for the other four personality dimensions. For occupational status the results do not show any significant characteristic-time interaction neither for intelligence nor for the big-five.

Insert Tables 5 and 6 about here

Main effects: Intelligence had a strong main effect on career success. Judging by the magnitude of the standardized coefficients, however, its effect on occupational status was stronger than its effect on pay. On the other hand, for personality the results were mixed. Consistent with previous findings regarding main effects of the big-five personality dimensions on career success (Judge et al., 1999; Mueller, & Plug, 2006) except for extraversion, the other four personality dimensions had significant main effects on pay. However, with regard to occupational status, the only dimension that affected career success was openness to experience.

Discussion

The results of Study 2 provide partial support for increasing validity with regard to intelligence. Intelligence exhibited increasing validity when career success was indicated by pay, but stable validity when it was indicated by occupational status. This difference between pay and occupational status suggests that, in contrast to Study 1, in the current study the effect of intelligence occurs more by movement to better positions within one's occupation than by occupational changes. The most likely reason for this relates to the nature of the dataset used in Study 2. The first measurement of career success in this dataset occurred when its participants were 35

years old, well into their careers, thus less likely to change occupations. At such a relatively late age career changes are more likely to occur as a result of movement within occupations than as a result of movement between occupations. Indeed, in Study 1 the age of the participants at the beginning of the survey was considerably younger (21.5 on average).

The personality dimensions that we examined did not show a pattern of increasing validity, neither with regard to pay nor with regard to occupational status, except for openness to experience, which showed increasing validity with regard to pay. This finding is consistent with the idea that measures of cognitive characteristics are the best predictors of career success, since openness to experience could be viewed as reflecting either typical (rather than maximal) intellectual performance (Gogg and Ackerman, 1992) or as a trait characteristic that is either directly (Digman, 1990), or indirectly (Costa, McCrae, & Holland, 1984; McCrae, 1996) related to intelligence[2].

Finally, we note that in this database, personality (but not intelligence) was measured after the measurements of career success were taken. Thus, unlike Study 1, in the current study we are not able to assess the effect of inappropriate temporal order between the measurement of personality and the measurement of career success on the results.

GENERAL DISCUSSION

In this paper we propose that temporal changes in validity should be considered in evaluating the impact of individual characteristics – both cognitive and personality characteristics – on career success. Not only that a characteristic (1) needs to be associated with career success (2) after appropriate controls are exerted and (3) precedence in time is established, but (4) it also needs to display a pattern of increasing validity. By and large, our data suggest that cognitive characteristics withstand this stricter test, but personality characteristics do not.

Consistent with previous studies that documented the effect of personality characteristics on career success, we also find significant *main effects* of personality on career success. In this sense, our results are not only consistent with these previous studies, but also strengthen them because we exert appropriate controls. Thus, although from a characteristic-time interaction perspective our results are not

consistent with the hypothesis that personality is an antecedent of career success, from the main effect perspective they are consistent with such a hypothesis.

If increasing validity indicates that a characteristic affects career success, does decreasing validity indicates that it does not? The answer to this question is positive if the processes by which individual characteristics affect career success are gravitational. Although it could be argued that even if an individual characteristic is instrumental in gravitation, a pattern of decreasing validity would appear because of instability in the characteristic (i.e., change over time), or unreliability over time, we contend that such an argument undermines the idea that personality is a stable individual characteristic that can be reliably measured and therefore has a predictive power over situations and time (but see Heller, Watson, Komar, Min & Perunovic, in press, for a different view).

Although our results indicate that personality characteristics did not exhibit a pattern of increasing validity, they also did not exhibit a pattern of decreasing validity, which would be expected if they did not have a role in career success: The validity of CSE, though relatively small, appeared to be stable over time, and so did the validity of the four non-cognitive personality dimensions. One explanation for these results is that the validity of these personality characteristics is affected both by the influence of personality on gravitational processes which increases validity over time, and by changes in the underlying characteristic or changes in its measurement, which decreases validity over time. Another explanation is that personality is associated with early career success, but not with later advancement in career success. This explanation is also consistent with the finding that when the effect of personality on career success is examined from the main effect approach, personality appears to affect career success, whereas when it is examined in the characteristic-time interaction approach it does not.

An alternative theoretical framework for explaining characteristics' effects on the dynamic of career success was suggested by Judge and Hurst (2008). They explain their results in terms of tournament mobility (Rosenbaum, 1979), suggesting that personality characteristics have an important effect on early career success and that early success has in turn a profound and enduring effect on later success. It seems to us, however, that gravitation is a more parsimonious theoretical framework because if early success is caused by individual characteristics, be it personality or intelligence,

then these characteristics are the fundamental cause of both early and late career success.

Finally, we should note that it is difficult to draw firm conclusions about the relative impact of intelligence vs. personality on career success based on the examination of a limited number of personality measures. One reason is that it is not clear what the most appropriate measures of personality relevant to assessing career success are. It is possible that measures of personality other than the ones used in the current paper are more relevant antecedents of career success. Our view, however, is that traditional personality measures that are based on the trait approach have limited power in predicting career success, because their power in predicting behavior at large is limited (Mischel, 1968; Peake & Mischel, 1984; Mischel & Shoda, 1995). That does not necessarily imply that personality is not an important antecedent of career success. The limitations of trait-based measures may arise from the complexity of career success, which may not lend itself to be captured by narrowly defined traits. Perhaps global assessment of personality that is specifically oriented towards the prediction of career success may fare better than traits' measures. In this sense the literature on the prediction of job performance which emphasizes – in addition to intelligence – non-cognitive measures specifically oriented for assessing performance, such as work samples, interviews, or sociometric evaluations (e.g., Schmidt, & Hunter, 1998) suggests that similar measures oriented for assessing career success may be better predictors than measures of traits.

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Footnotes

[1] Note that there are two more examinations that could be performed regarding the consequences of not exerting appropriate controls: Examining the consequences of not controlling for intelligence in the pay model and examining the consequences of not controlling for temporal order in the occupational status model. In these cases exerting the controls does not lead to different conclusions about the effects of CSE on career success.

[1] We note however that although with an alpha level of 0.0001, the time-characteristic interaction was not significant for none of the four non-cognitive dimensions, for two of these dimensions (neuroticism and agreeableness) this interaction was significant with an alpha level of 0.05. Whereas it is dubious whether for such a large database these interactions are meaningful, they perhaps suggest that a pattern of increasing validity could be obtained for powerful measures of personality. We further discuss this in the general discussion section.

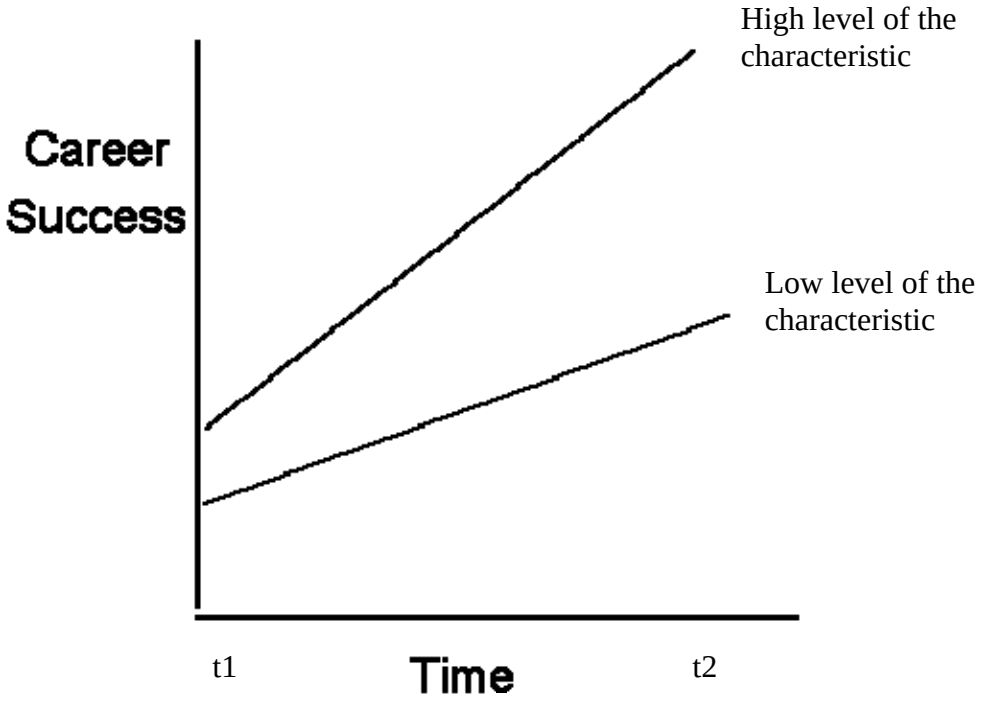

Figure 1: Increasing validity illustrated in terms of differences in career trajectory. The increase in gap in career successes between high and low characteristic's level is associated with increasing validity

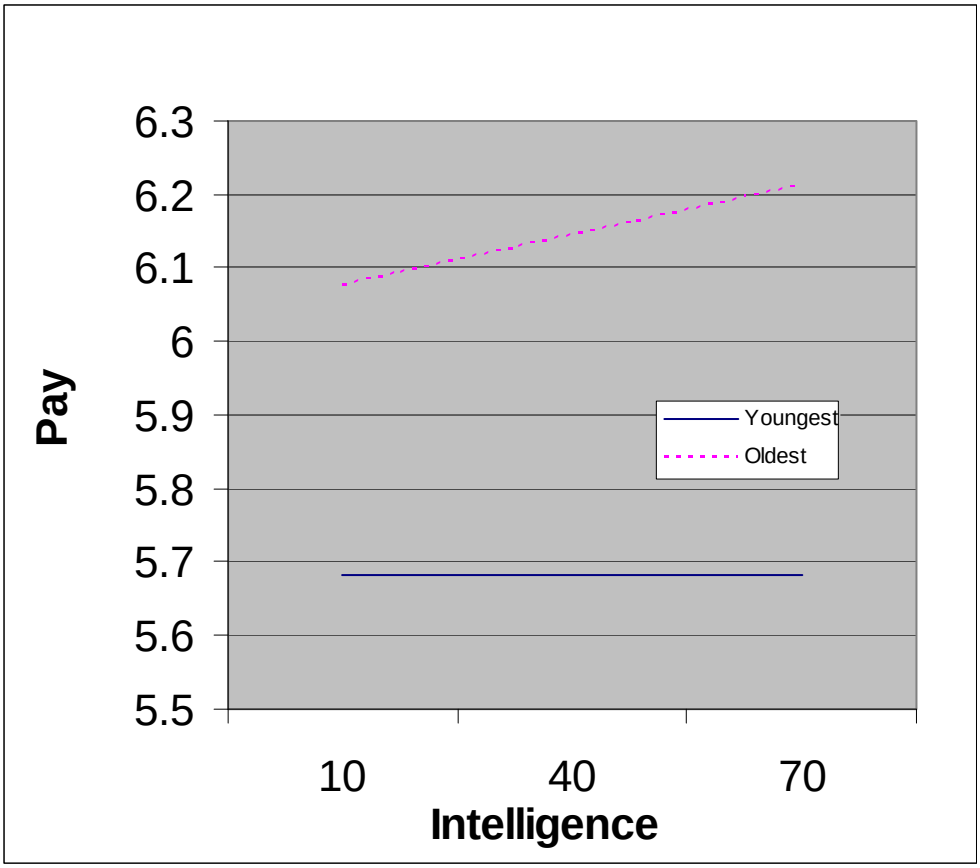

Figure 2a: The interaction between intelligence and age in determining pay in 1982. The logarithm of hourly rate of pay is plotted separately for the youngest and oldest participants in our sample.

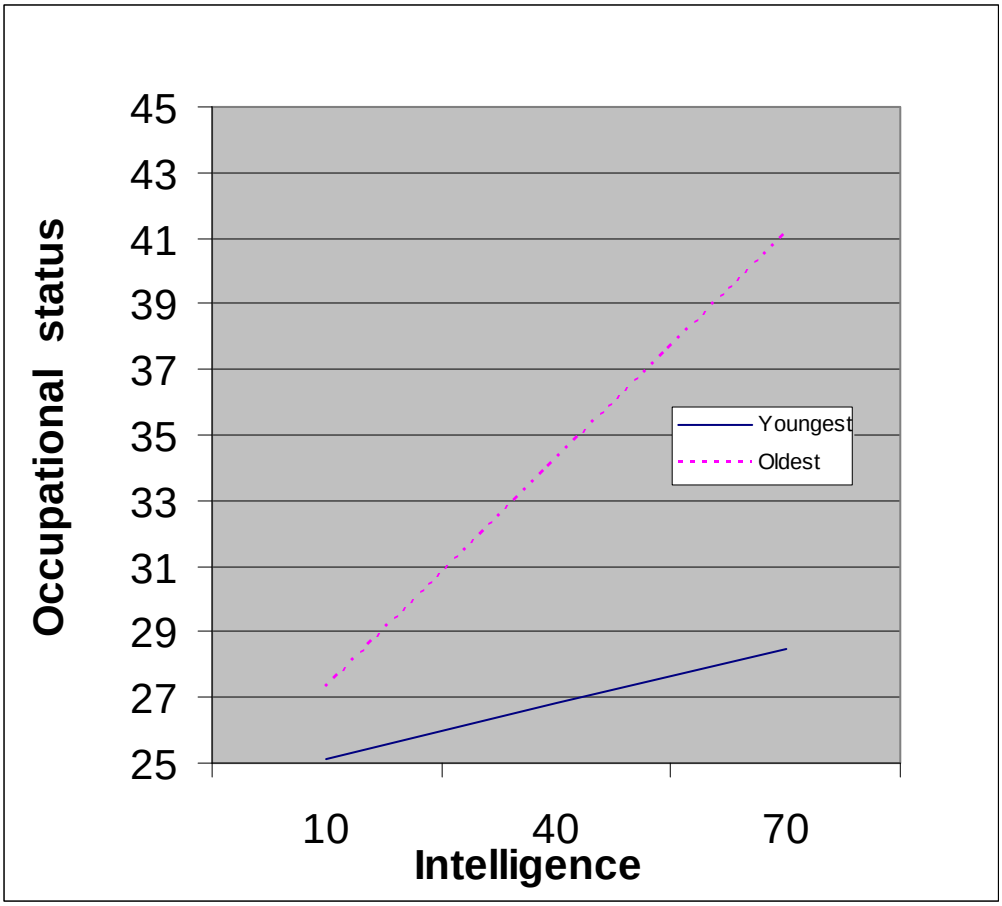

Figure 2b: The interaction between intelligence and age in determining occupational status in 1982. The Duncan index is plotted separately for the youngest and oldest participants in our sample.

Table 1
Descriptive statistics and intercorrelations of Study 1 variables

	M	SD	1	2	3	4	5	6	7	8
1. Log pay 1982	6.1	0.51	--							
2. Log pay 2000	7.2	0.68	.19	--						
3. Occupational status 1982	31.7	23.0	.15	.18	--					
4. Occupational status 2000	42.3	26.4	.03	.34	.25	--				
5. Intelligence	41.0	28.8	.16	.41	.31	.43	--			
6. CSE	3.2	0.41	.15	.30	.23	.28	.48	--		
7. Age at 1982	21.6	3.25	.32	.00	.19	.01	.21	.15	--	
8. Parents' education	10.8	3.27	.06	.24	.20	.27	.48	.30	.04	--
9. Gender	1.5	0.50	-.17	-.18	.26	.14	-.02	-.03	.01	-.02

Males were coded as 1, females as 2. Intelligence is expressed in percentiles.
Correlations above 0.04 are significant on the 0.0001 level.

Table 2
Intelligence and CSE as predictors of pay and occupational status

	Pay			Occupational status		
Parameter	B	SE	t ratio	B	SE	t ratio
Intercept	5.90	0.30	19.7*	4.87	11.29	0.4
Time	0.058	0.008	7.1*	0.37	0.27	1.4
Intelligence	-0.0060	0.0013	4.2*	-0.042	0.051	0.8
CSE	-0.018	0.10	0.2	3.02	3.75	0.8
Age	0.0045	0.014	0.3	-0.78	0.52	1.6
Parents' education	-0.0049	0.0012	4.0*	0.42	0.047	9.0*
Gender	-0.21	0.0070	30.1*	8.30	0.26	31.5*
Intelligence x Age	0.00034	0.00006	5.5*	0.011	0.002	4.8*
CSE x Age	0.0062	0.0045	1.4	0.12	0.17	0.7
Intelligence x Time	0.00076	0.00004	22.0*	0.017	0.001	14.5*
CSE x Time	0.012	0.0027	4.7*	0.077	0.089	0.9

* $p<0.0001$

Table 3
Standardized regression coefficients of regressing pay and occupational status on intelligence and CSE in Study 1

	Pay		Occupational status	
	Intelligence	CSE	Intelligence	CSE
1982	.059	.065	.196	.084
1984	.136	.060	.291	.098
1986	.239	.095	.353	.091
1988	.241	.056	.334	.110
1990	.208	.085	.405	.093
1992	.280	.097	.379	.111
1994	.308	.110	.396	.088
1996	.296	.154	.385	.107
1998	.315	.117	.386	.094
2000	.350	.134	.388	.097

All coefficients are significant on the $p<0.0001$ level.

Table 4: Descriptive statistics and correlations among dependent and independent variables in Study 2.

	M	SD	Pay 1975	Pay 1992	Occupational status 1975	Occupational status 1992
Intelligence	100.5	14.9	.09	.24	.38	.37
Extroversion	22.6	5.6	-.03	.04	.07	.09
Neuroticism	15.8	5.1	-.11	-.12	-.08	-.10
Conscientiousness	28.8	4.6	.03	.05	.07	.07
Agreeableness	28.1	4.8	-.12	-.09	.01	.02
Openness	21.5	5.2	.03	.17	.25	.26
Parents' education	9.8	3.0	.08	.16	.26	.23
Gender	1.5	0.5	-.66	-.36	-.12	.-.07

Males were coded as 1, females as 2. Intelligence is expressed as IQ quotient.
Correlations above 0.07 are significant on the 0.0001 level.

Table5: Standardized regression coefficients of regressing pay and occupational status on intelligence and CSE in Study 2

	Pay		Occupational status	
	1975	1992	1975	1992
Intelligence	.096*	.187*	.292*	.303*
Extroversion	.007	.009	.029	.014
Neuroticism	-.023	-.069*	-.014	.010
Conscientiousness	.049	.053	.022	.027
Agreeableness	-.048	-.088*	-.011	-.006
Openness	.024	.120*	.148*	.144*

* $p<0.0001$

Table 6
Summary table for repeated measures regression of pay and occupational status on CSE and intelligence in Study 2

		Pay		Occupational status	
Source	df	SS	F	SS	F
Between subjects					
Intelligence	1	116.6	148.3*	45521508	690.9*
Extroversion	1	0.4	0.5	224599	3.4
Neuroticism	1	12.8	16.3*	2490	0.0
Conscientiousness	1	14.4	18.3*	2815152	4.3
Agreeableness	1	25.1	31.9*	34933	0.5
Openness	1	25.6	32.6*	9810030	148.9*
Parents' education		18.2	23.2*	9613527	145.9*
Gender	1	1579.8	2009.9*	5352491	81.2*
Error	3489/5601	2741.6		368953956	
Within subjects					
Time	1	48.2	98.5*	1860682	97.1*
Intelligence x Time	1	11.3	23.2*	15939	0.8
Extroversion x Time	1	0.0	0.0	28820	1.5
Neuroticism x Time	1	3.1	6.3	78628	4.1
Conscientiousness x Time	1	0.0	0.0	3513	0.2
Agreeableness x Time	1	2.0	4.0	3522	0.2
Openness x Time	1	10.8	22.2*	1961	0.1
Parents' education x Time	1	7.4	15.1*	140042	7.3
Gender	1	225.4	461.4*	859494	50.1*
Error	3489	1706.6		107346400	

*- $p<0.0001$