

Time on task mediates the conscientiousness – performance relationship

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Poster

TITLE

Time-on-task mediates the conscientiousness – performance relationship

ABSTRACT

The relationship between conscientiousness, time-on-task, and academic performance was investigated. Weak relationships were found when simple summated conscientiousness scores were analyzed. When factor scores partialling out common method bias were analyzed, conscientiousness was found to predict performance, and time on task fully mediated the conscientiousness – performance relationship.

PRESS PARAGRAPH

Recent research has shown that conscientiousness is a valid predictor of performance in many tasks including academic and training performance. This study investigated time-on-task as a possible reason for the better performance of high conscientiousness people. When the effects of common method bias were removed from conscientiousness scores, it was found that people high in conscientiousness spent more time studying than those low in conscientiousness and that greater study time was associated with higher performance in an undergraduate college class. This finding suggests that conscientiousness is related to performance through its relationship to study habits.

In spite of the large amount of research investigating personality-performance relationships, particularly the conscientiousness-performance relationship, in the words of Barrick, Stewart, & Piotrowski (2002), “very little research has examined the mechanisms through which personality traits influence performance.” Although four mediating mechanisms have been proposed for the conscientiousness-performance relationship including self-efficacy (e.g., autonomous goal setting and goal commitment (Barrick, Mount, & Strauss, 1993; Gerhardt, Peterson, and Rode, 2006; Klein & Lee, 2006), performance expectancy (Gellatly, 1996), accomplishment striving via striving for job performance (Barrick, Stewart, & Piotrowski, 2002), and selective optimization with compensation (Bajor & Baltes, 2003); an emerging consensus in the literature is that there might be other motivational and self-regulatory mechanisms that explain the processes by which personality influences various job-related outcomes. The purpose of this research is to investigate another possible mechanism through which conscientiousness might operate to influence performance – time spent on the task at hand.

Conscientiousness “may be the most important trait-motivation variable in the work domain” (Barrick, Mount, and Strauss, 1993; p. 721). Indeed, previous research has consistently shown conscientiousness as a trait with moderate validity coefficients for a wide variety of occupational groups (e.g., Hurtz & Donovan, 2000; Mount, & Barrick, 1998). Conscientiousness has been found to be valid when used alone (Barrick & Mount, 1991) and to provide incremental validity when used with other predictors, such as cognitive ability (Schmidt & Hunter, 1998). Conscientiousness has also been found to be associated with performance in academic settings (e.g., Chamorro-Premuzic & Furnham 2003; Conard, 2004; Wolfe & Johnson, 1995). Since training in organizations is often analogous to classroom education, and sometimes is identical to it, the conscientiousness-performance relationship in academic settings is of relevance to organizations. In particular, those factors that lead to better training performance should be expected to be important for better job performance after training. For these reasons, the research reported here is a study of the relationship of conscientiousness to performance in an academic setting.

#### Proposed Model

Our proposed model (see Figure 2, Panel A) includes a path from conscientiousness to time on task and a path from time on task to academic performance. We rely on Bandura’s (1991) social cognitive theory of self-regulation as a framework for our conceptualization of the path from conscientiousness to time on task. According to Bandura (1991), individuals are motivated by a self-regulatory mechanism, which includes, *inter alia*, the judgment of one’s behavior in relation to personal standards and situational constraints. Thus, individuals who are conscientious are likely to engage in behaviors and judge their own behavior as well as that of others on the basis of their achievement levels. In the academic performance context, it is our argument that the self-regulation process induced by conscientiousness will influence individuals’ proactive behavior of time spent studying,. An examination of the facets of conscientiousness as represented in the NEO, the most prominent measure of the Big Five (Costa & McCrea, 1992a), shows that time on task would seem to be a manifestation of three of those facets - dutifulness, achievement striving, and self-discipline. In particular, the phrases “paying debts promptly”, “following through”, “avoiding missing work”, “feeling driven”,

“striving”, “not wasting time”, “being productive”, and “finishing project”, found in the items for these facets all suggest that persons who indicate that such phrases accurately describe themselves will spend more time on a task than those who do not.

Viewed under the light of social cognitive theory (Bandura; 1991), students’ use of study time is assumed to be an indicator of time management, an important predictor of academic performance. Previous research has found effective time management to be related to academic performance (Zimmerman, Bandura, & Martinez-Pons, 1992). Further, Gettinger and White (1979) found students’ study time to be incrementally predictive of standardized test performance over IQ. Thus we expect that study time will be positively related to course performance.

Given the above expectations, it is logical to expect that time-on-task, operationalized here as study time will at least partially mediate the conscientiousness – performance relationship.

## METHOD

### *Measures.*

*Conscientiousness.* The 50-item questionnaire assessing the Big Five dimensions available at [www.ipip.org](http://www.ipip.org) was used to measure conscientiousness (Goldberg, 1999). Items were rated on how accurately they represented the respondent using a seven-point scale ranging from 1 (completely inaccurate) to 7 (completely accurate). All 50 items were administered though only the conscientiousness items were scored. Coefficient alpha for the conscientiousness scale was .79.

A second measure consisting of factor scores from a confirmatory factor analysis of the Big Five items was also investigated. It is discussed below.

*Study time.* Study time was measured using a scale developed for this research consisting of 18 questions related to study and test-taking habits, and a question asking for the number of hours spent studying for the first test.

The study time variable was created based on an exploratory factor analysis of responses to the 18 items and the logarithm of the number of hour spent studying. Based on a scree test, three factors accounting for 40% of the variance were retained. Twelve items had largest loadings on the first factor. Two other factors, one indicated by items referring to study habits not related to time and the other indicated by items related to test-taking behavior were excluded from consideration. Two items were excluded from the first factor because their loadings were less than .4. A third was dropped because its loading on another factor was nearly as high as its loading on the first factor, leaving nine items to define the study-time scale. The items and their factor loadings are presented in Figure 1. Coefficient alpha for the study-time scale was .79.

*Performance.* Performance was measured as the score on the first test of the semester given in an introductory psychology course. The test consisted of multiple choice questions with an essay component. No estimate of reliability was available for the test.

*Control variables.* Scores on the Wonderlic Personnel Test (WPT: Wonderlic, 2005) were included as controls for general mental ability. This variable was included to assess incremental validity in the mediation analyses described below.

### *Participants.*

Participants were 188 undergraduates students enrolled in an introductory psychology course at a southeastern university. Extra credit was given for participation. Two participants were lost due to failure to complete the Wonderlic tests; two more were lost

due to large numbers of missing responses on the Big Five questionnaire; 18 failed to take the midterm test, and 39 refused to provide study time information or failed to respond to an email requesting study time information. Exclusions for one or more of the above reasons left the sample size for tests of mediation at 135. The mean age was 19.5 (sd = 2.9); 52 were male; 82 indicated they were Caucasian, 41 African American, five Asian/Pacific Islander and the remaining seven indicated they were Hispanic, Native American, or Other. Eleven participants omitted one item when filling out the Big Five questionnaire. These participants were retained and individual items were imputed as the average of the remaining nine items on the scale for which the item was missing, rounded to the nearest integer. Since many participants were not lost until after taking the Big Five questionnaire, sample size for analyses involving only the Big Five data was 184.

*Procedure.*

Participants were administered the Big Five questionnaire followed by the WPT in the first three weeks of the fall semester. After completing the WPT participants were asked if they would like to continue in the study for additional extra credit points. On the day of the first test in the semester, those participants who agreed were emailed the study habits questionnaire and instructed to respond to the items on the email and then return it to the experimenter. All study habits emails were returned before students saw reports of their scores on the test. This procedure provided insurance that the independent variable (conscientiousness) was measured prior to the potential mediator (study time) which preceded participant knowledge of the criterion (test) results (Cook & Campbell, 1979; Miller, Triana, Reutzler, & Certo, 2006).

RESULTS.

Since conscientiousness has been found to be valid both as an individual predictor and to provide incremental validity over cognitive ability, two parallel mediation analyses were conducted. In the first, cognitive ability was not partialled out in any of the steps of the mediation analyses. In the second, WPT scores were partialled in all the analyses.

Correlations, means and standard deviations of all variables are presented in Table 1. We followed the causal step approach in testing for mediation proposed by Baron and Kenny (1986). We used both a regression based approach and a bootstrap approach using the path diagram presented in Figure 1 (Bollen & Stine, 1990). The bootstrap analyses were conducted without partialling WPT scores using Amos Verson 6.0 (Arbuckle, 2005). The first step examined the relationship between the independent variable – conscientiousness in the present analysis – and the dependent variable – test scores. This was done by regressing test scores onto conscientiousness, then onto both conscientiousness and WPT scores and by bootstrap analyses of the conscientiousness-test relationship. The results of the regression analyses are presented in Table 2. Figure 2 Panel B presents 95% confidence intervals from the bootstrap analyses. Inspection of the table reveals that test scores were not related to conscientiousness in either the simple regression ( $r=.09$ ,  $p > .05$ ) or the multiple regression ( $\beta=.08$ ,  $p > .05$ ). In Figure 2, the 95% confidence interval for the conscientiousness-test relationship includes zero.

Recently it has been argued that a significant independent-dependent variable relationship is not needed if there is a priori belief that the effect size is small or if the mediator may serve as suppressor of the independent-dependent variable relationship (Shrout & Bolger, 2002). Since validity coefficients reported for conscientiousness have typically been about 0.2 (e.g., Barrick & Mount, 1991; Hertz & Donovan, 2000), we

decided to proceed to the second step of the mediation testing process. The second condition requires that the mediator – study time in this analysis - be correlated with the independent variable. For this step study time was regressed onto conscientiousness and then onto both conscientiousness and WPT scores. The relationships were not significantly different from zero in either analysis ( $r=.14$ ,  $p > .05$  and  $\beta=.13$ ,  $p > .05$  respectively). In the bootstrap analyses the confidence interval for the relationship of study time to conscientiousness included zero.

As a set, these analyses suggested that a case for study time as a mediator of the relationship of conscientiousness to test scores was weak. Not only was conscientiousness not related to test scores but the conscientiousness scores were not related to the study time variable either simply or controlling for WPT scores. For completeness, the last tests of mediation - the regressions of test scores onto conscientiousness and time-on-task - were performed. As would be expected, conscientiousness was not a significant predictor of test scores in these analyses. However, test scores were related to study time ( $\beta=.39$ ,  $p < .001$ ) and to both study time ( $\beta=.31$ ,  $p < .001$ ) and the WPT ( $\beta=.39$ ,  $p < .001$ ) in the second analysis. Furthermore the lower limit of the confidence interval for Path *b* in the diagram was .221, all indicating that test scores were positively related to study time.

One explanation for the finding of no relationship between variables believed to be correlated is lack of power. Assuming the population correlation of conscientiousness to performance is .2, the power of the test of the conscientiousness-performance relationship was .65, somewhat smaller than the .80 that is the typical recommendation. So lack of power is one potential explanation for the failure to find the significant relationships expected.

Since the small correlations all involved the conscientiousness variable, we considered another explanation for the failure to find significant relationships - contamination due to the present of error variance in the conscientiousness measure. In this case, we suspected contamination due to common method bias. There is considerable evidence that self-report measures such as the Big Five may be affected by the presence of such bias (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). If that bias is unrelated to the personality dimension, the relationships involving contaminated measures of that dimension to other variables may be suppressed relative to what purer measures of the dimension would have been. To examine the possibility that the measure of conscientiousness used here might have been contaminated by method variance, a confirmatory factor analysis was conducted of the 50 Big Five questionnaire items using MPLUS Version 4.0 (Muthén & Muthén, 2006). In the CFA, the ten questionnaire items defining each dimension loaded on the appropriate Big Five dimension. In addition, all 50 items were required to load on a sixth factor, i.e., the method factor. The CFA model is presented in Figure 3. This type of factor analysis is analogous to that labeled 3A in Table 5 in Podsakoff, et. al. (2003, p. 896).

Two CFAs were conducted – one with the method factor and one without. Because of the instability of analyses of this type (e.g., Lance, Noble, & Scullen, 2002), the factor analyses were performed on the data of all 184 persons who completed the Big Five questionnaire. A chi-square difference test suggested that inclusion of the method factor resulted in a significant improvement in model fit ( $\chi^2(50)=298.05$ ,  $p < .001$ ). In order to use the results of the CFA for the mediation analyses for which there were fewer

participants than for the factor analysis, factor scores were computed for the conscientiousness factor. The factor determinacy of the factor scores was .86, indicating that the factor scores were representative of the factor from the CFA (Grice, 2001). In a fashion analogous to what has long been used in testing consumer attitudes in market research (e.g., Wilson, Mathews, and Harvey, 1975; Harrell & Bennett, 1974), 135 factor scores were added to the data file containing the WPT, study time, and test scores used for the analyses reported above.

The regression tests for mediation of the conscientiousness factor scores are reported in Table 3. Results of the unpartialled bootstrap analyses are presented in Panel C of Figure 2. First the dependent variable of test performance was regressed onto the conscientiousness factor scores. As shown in Table 3, conscientiousness factor scores were significantly related to test performance ( $r = .20$ ,  $p < .05$ ); as they were when WPT scores were partialled out ( $\beta = .16$ ,  $p < .05$ ). The 95% confidence interval for path  $c$  in Figure 2 excluded zero. This suggests that the overall relationship of conscientiousness to test performance was positive.

In the second test, study time was regressed onto the conscientiousness factor scores. The relationship between the two variables was significant ( $r = .20$ ,  $p < .05$ ) as was the same relationship partialling out WPT scores ( $\beta = .19$ ,  $p < .05$ ). In Figure 2, the lower limit of the confidence interval for path  $a$  was greater than zero suggesting that study time was related to conscientiousness.

Finally, test performance was regressed onto both conscientiousness factor scores and study time. Test scores were significantly related to study time in both the analysis without WPT ( $\beta = .37$ ,  $p < .001$ ), and the analysis partialling WPT ( $\beta = .29$ ,  $p < .001$ ). However, test scores were not significantly related to conscientiousness factor scores in either analysis ( $\beta = .13$ ;  $p > .05$  and  $\beta = .11$ ,  $p > .05$  respectively). Similar results were found in the bootstrap analysis in which the 95% confidence interval for path  $b$  from conscientiousness to study time was larger than zero, but included zero for the direct effect path  $c'$  from conscientiousness to test scores, suggesting complete mediation.

Sobel's (1982) test to determine whether a mediator carries the influence of an independent variable to a dependent variable was conducted for both conscientiousness scores. For the summated score, Sobel's Z-statistic was not significantly different from zero ( $Z = 1.54$ ,  $p > .05$ ), but for the factor scores, the Z-statistic was different from zero ( $Z = 2.12$ ;  $p < .05$ ). The lower limit of the confidence intervals for indirect effects from the bootstrap analyses excluded zero for both measures, indicating nonzero indirect effects for both measures.

## DISCUSSION

This study tested the hypothesis that time on task mediates the relationship between conscientiousness and academic performance. Our initial findings using summated conscientiousness scale scores suggested that there was no significant relationship of conscientiousness to performance and no relationship of conscientiousness to its purported mediator. However, investigation of the possibility that the conscientiousness scores were contaminated by method variance proved enlightening. In contrast to the results using the summated scale, conscientiousness factor scores were related to performance and to the mediating variable, providing evidence that time-on-task represented by self-reported study time did mediate the relationship between conscientiousness and test performance. The case for complete mediation was somewhat

weaker. Although the direct conscientiousness to performance link,  $c'$ , in Figure 2 was not significantly different from zero in the regression analyses, inspection of the confidence interval for path  $c'$  in Figure 2 Panel C suggests that with a larger sample size, the confidence interval would probably have not included zero. Such a possibility does not contradict the finding of mediation here, since the time-on-task mediator was chosen based on only three of the six facets of conscientiousness. It is certainly possible that conscientiousness is broad enough to encompass paths to performance other than through time on task.

This study contributes to two sets of findings and provides the first look at a third. First, it adds to the body of literature suggesting that conscientiousness has both simple and incremental validity for prediction of academic and similar performance. The effect sizes for simple validity and incremental validity were about what has been found in meta-analyses of validity of conscientiousness. Given the similarity of training in organizations to traditional educational settings, we expect results of the study to generalize to training in organizational settings.

Second, this study adds to literature suggesting that method variance can have an effect on conclusions regarding relationships involving substantive variables. In this instance, method variance appeared to be a noisy contaminant, suppressing the relationship between conscientiousness and other variables. In other settings it is certainly possible that method effects would actually augment observed relationships, making them stronger than would be relationships among variables with method effects removed (e.g., Williams and Brown, 1994).

Finally, this study provides a first look at a potential mediator of the conscientiousness-performance relationship. The analyses suggest that those emotional or cognitive states associated with being high in conscientiousness have their immediate impact on time spent on the task at hand. This study provides further support for Bandura's (1991) social cognitive theory, which views study time use as a source of self-regulation that contributes to performance. Our results suggest that students should be taught to improve self-regulation of study time. This is, of course, in line with what most academicians already know: more time spent studying leads to better grades.

At the present time, we have no hypotheses concerning the source of the method variance observed here. Previous studies have associated method variance with acquiescent response styles (e.g., Watson, 1992) and negative affectivity of respondents (e.g., Burke, Brief, and George, 1993). Podsakoff, et. al. (2003) listed several situations in which method variance could be expected. The results of this study suggest that the list provided there should be considered by researchers using participant report data and that the analysis of participant report data should not be viewed as complete until the possibility of distortion due to method variance has been investigated. To that end, several lines of research have routinely incorporated such tests (e.g., Carlson & Kacmar, 2000; Conger, Kanungo, & Menon, 2000; Elangovan & Xie, 1999; Fecteau, Dobbins, Russell, Ladd, & Kudisch, 1995).

#### *Limitations.*

The research presented here was nonexperimental and therefore is subject to the limitations in demonstrating causality and causal mediation discussed by Stone-Romero & Rosopa (2005). Although we do not see how conscientiousness could be manipulated, it is conceivable that opportunity for study time could be. The effect of such a

manipulation on the pattern of correlations would provide additional evidence regarding the validity of the conclusions of this study.

As mentioned earlier, one explanation for the absence of relationships of conscientiousness to both study time and test scores was the small sample size. With a larger sample size there may have been no need to partial method effects from the relationship being tested to show mediation. Of course, we feel that the result of the investigation spurred by the inconclusive results of the first analysis was certainly enlightening.

Objective measures of time on task are needed to ensure that the conscientiousness-study time relationship found here wasn't due in part to both being self report measures. Although study time responses were taken prior to report of test scores, they were solicited after the test was taken. So it is possible that they were influenced to some extent by respondents' subject impressions of their test performance.

*Conclusion.*

The data presented here provides one mechanism for the efficacy of conscientiousness in the prediction of performance. It also adds to the pool of results suggesting that common method variance is a factor that must be taken into account in psychological research involving participant reports. It is hoped that this research and the findings reported here will spur further study of mechanisms through which personality operates and of method variance and its effect on relationships between psychological variables.

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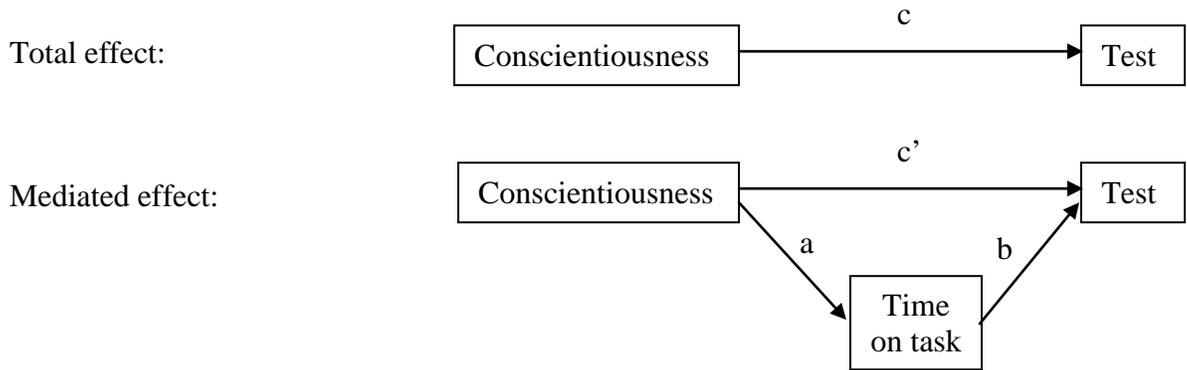
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Figure 1. Time-on-task questionnaire as seen by respondents. Outlined items (outlines not seen by participants) were used for the study time variable.

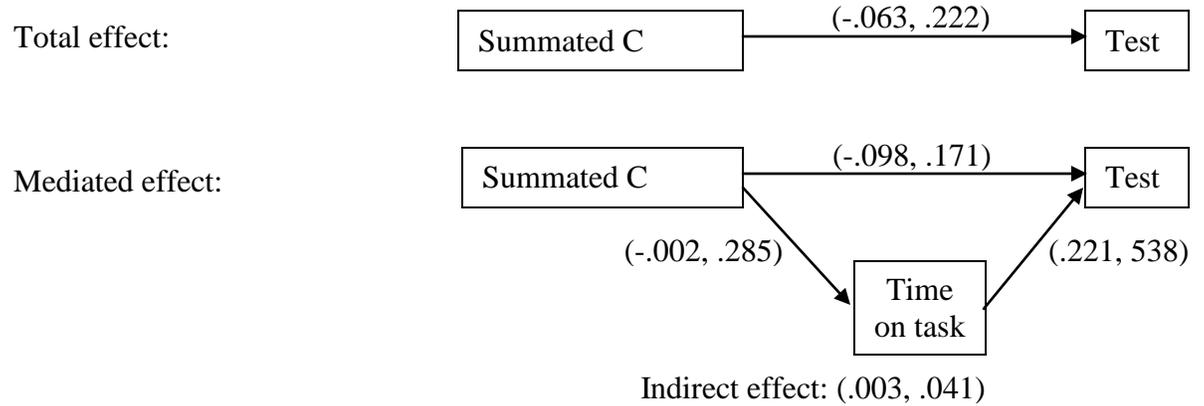
	Loading on 1 <sup>st</sup> factor
<p><b>Directions: Please put an X by one of these answers that describes your behavior when preparing for Test1.</b></p> <p><b>1. On how many different days did you study for Test 1? (Put an X by ONE answer.)</b>  <input type="checkbox"/> 0-1  <input type="checkbox"/> 2-3  <input type="checkbox"/> 4-5  <input type="checkbox"/> 6-7  <input type="checkbox"/> 8 or more</p>	.60
<p><b>2. For Test 1, I read: (put an X by ONE answer)</b>  <input type="checkbox"/> All of the assigned chapters  <input type="checkbox"/> Most of the assigned chapters  <input type="checkbox"/> Some of the assigned chapters  <input type="checkbox"/> A few of the assigned chapters  <input type="checkbox"/> None of the assigned chapters</p>	.50
<p><b>3. For test 1, I completed: (put an X by ONE answer)</b>  <input type="checkbox"/> All of the workbook exercises  <input type="checkbox"/> Most of the workbook exercises  <input type="checkbox"/> Some of the workbook exercises  <input type="checkbox"/> A few of the workbook exercises  <input type="checkbox"/> None of the workbook exercises</p>	.50
<p><b>Directions: For each of the following, use this scale to state how often you engaged in the Behavior reference FORT TEST #1:            1=Never 2=Occasionally 3-Sometimes 4-Often 5=Quite often</b></p>	
<p>4. I used notecards to help study for the test _____            5. I studied with a friend or group for the test _____            6. I rewrote/typed my notes for the test _____            7. I made up practice questions for the test _____</p>	
<p><b>8. I prepared answers for the essay questions in the syllabus _____</b></p>	.43
<p><b>9. I overlearned parts of the material for the test _____</b></p>	
<p><b>10. I studied prior to the night before the test _____</b></p>	.61
<p><b>11. I googled something that would be on the test _____</b></p>	
<p><b>12. I studied my notes _____</b></p>	.46
<p><b>13. I thought about the test while driving, eating, or walking to class _____</b></p>	
<p><b>14. I reviewed the material repeatedly _____</b></p>	.70
<p><b>15. I created a study schedule (e.g., today read two chapters, tomorrow prepare answers to essay questions, etc) _____</b></p>	.48
<p><b>16. I visited Dr. Watson's Blackboard site _____</b></p>	
<p><b>Directions: Please put an X by one of these answers that describes your behavior when taking Test 1.</b></p>	
<p><b>17. Reading directions:</b>  <input type="checkbox"/> Read them very carefully  <input type="checkbox"/> Read them carefully  <input type="checkbox"/> Read them  <input type="checkbox"/> Read them briefly  <input type="checkbox"/> Did not read them</p>	
<p><b>18. Reading questions:</b>  <input type="checkbox"/> Read them very carefully  <input type="checkbox"/> Read them  <input type="checkbox"/> Read them briefly  <input type="checkbox"/> Did not read them</p>	
<p><b>19. Double-checking answers:</b>  <input type="checkbox"/> Checked every answer  <input type="checkbox"/> Checked most answers  <input type="checkbox"/> Checked some answers  <input type="checkbox"/> Checked a few answers  <input type="checkbox"/> Did not check any answers</p>	
<p><b>20. Please indicate how many hours you spent studying for Test 1: _____</b></p>	.62

Figure 2. Path Diagram of mediation model. Panel A shows the model with symbols commonly used to label the paths. Panel B presents confidence intervals from bootstrap analysis of summated conscientiousness scores. Panel C presents confidence intervals from bootstrap analysis of conscientiousness factor scores.

Panel A



Panel B



Panel C

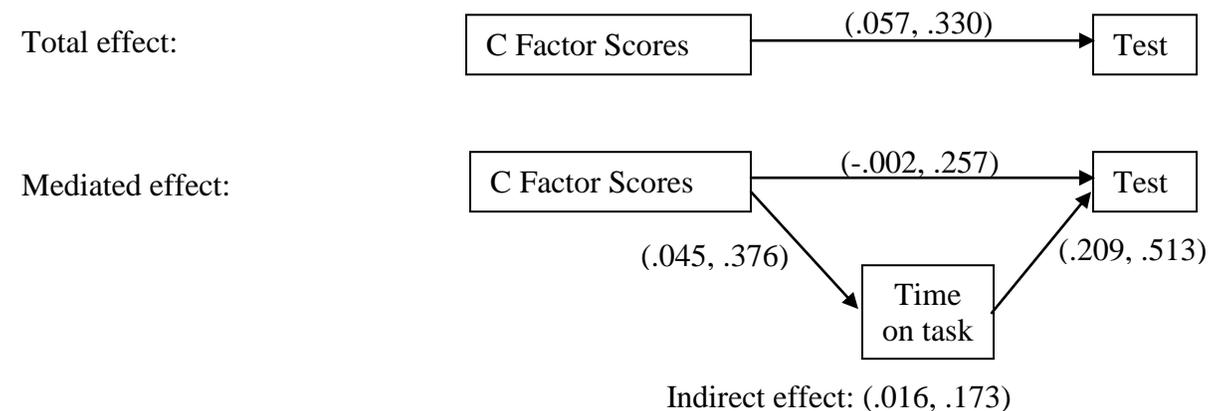


Figure 3. Path diagram of confirmatory factor analysis of Big Five items with a sixth, Method, latent variable. Residual latent variables are not shown. Observed variables are individual items from the 50-item IPIP Big Five questionnaire. Latent variables are Extroversion, Agreeableness, Conscientiousness, Stability, Intellect/Imagination and Method labeled E, A, C, S, I, and M respectively. Model Chi-square with 1115 df was 2253.012 ( $p < .001$ ). RMSEA was .074. The chi-square difference test comparing the model with a model without M was  $\chi^2(50)=298.05$ ,  $p < .001$ .

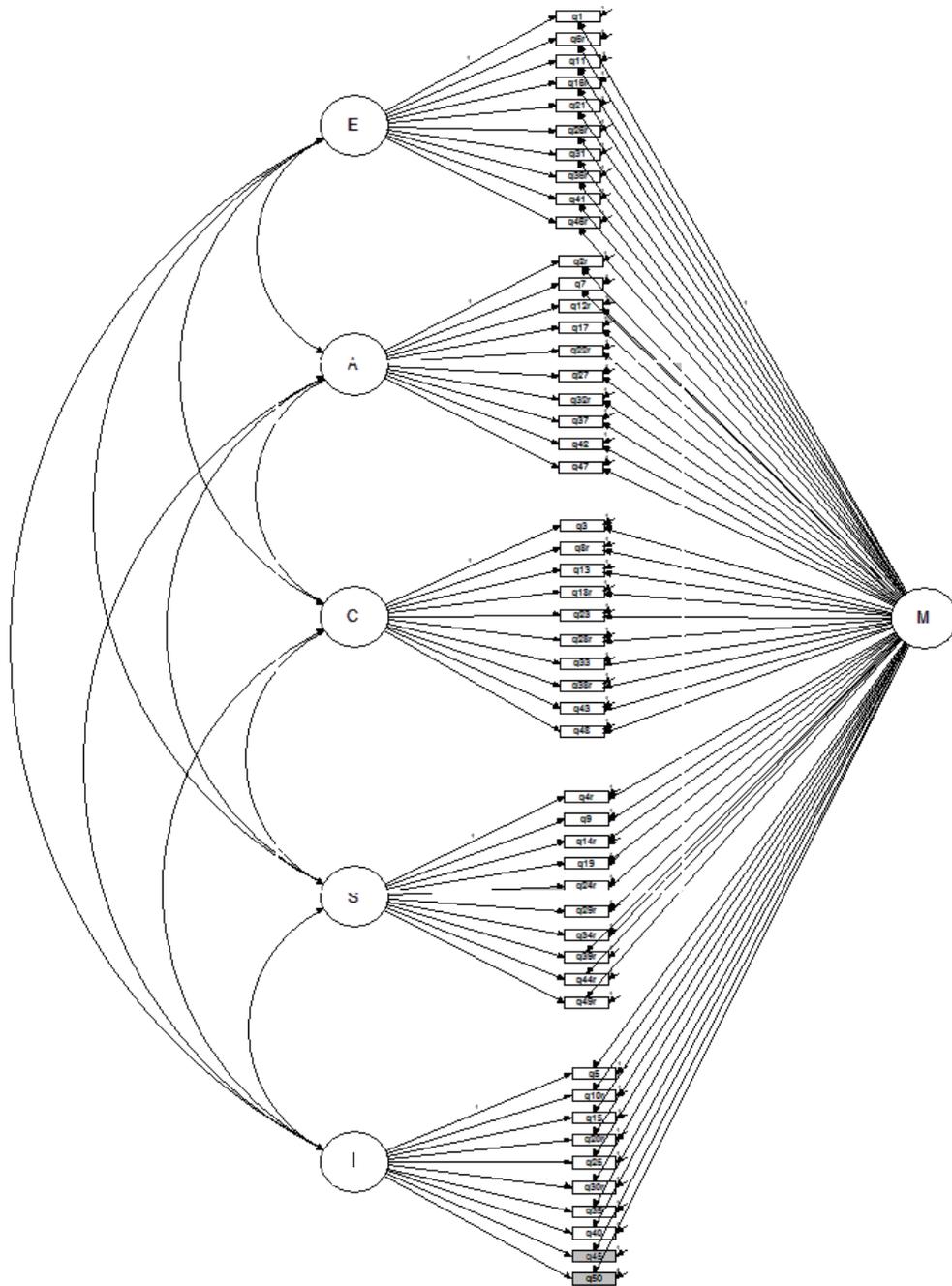


Table 1. Correlations of measures. Values in parentheses are reliability estimates, or in the case of the factor scores, factor determinacy. No reliability information was available for the test. All correlations based on sample size of 135.

	1	2	3	4
1: Summated Conscientiousness	(.79)			
2: Conscientiousness Factor Scores	.76 <sup>c</sup>	(.86)		
3: Study Time	.14	.20 <sup>a</sup>	(.79)	
4: Wonderlic	.02	.08	.21 <sup>a</sup>	(.80)
5: Test	.09	.20 <sup>a</sup>	.39 <sup>c</sup>	.45 <sup>c</sup>

<sup>a</sup>  $p < .05$

<sup>b</sup>  $p < .01$

<sup>c</sup>  $p < .001$

Table 2. Results of Mediation Tests: Summated Conscientiousness Scores

## Step 1: Test of relationship of criterion to independent variable

<u>C alone</u>	<u>Variable</u>	<u>Standardized Coefficient</u>	<u>t</u>	<u><math>\Delta R^2</math></u>	<u><math>R^2</math></u>
	Summated C	.086	1.00	.01	.01
<u>C + WPT</u>					
	Summated C	.075	0.97	.01	
	WPT	.450	5.81 <sup>c</sup>	.20	.21

## Step 2: Test of relationship of mediator to independent variable

<u>C alone</u>	<u>Variable</u>	<u>Standardized Coefficient</u>	<u>t</u>	<u><math>\Delta R^2</math></u>	<u><math>R^2</math></u>
	Summated C	.14	1.63	.02	.02
<u>C + WPT</u>					
	Summated C	.13	1.59	.02	
	WPT	.21	2.45 <sup>a</sup>	.04	.06

## Step 3: Test of relationship of criterion to mediator controlling for independent variable

<u>C + Time</u>	<u>Variable</u>	<u>Standardized Coefficient</u>	<u>t</u>	<u><math>\Delta R^2</math></u>	<u><math>R^2</math></u>
	Summated C	.03	0.40	.00	
	Time-on-task	.39	4.81 <sup>c</sup>	.15	.16
<u>C+Time+ WPT</u>					
	Summated C	.03	0.46	.00	
	Time-on-task	.31	4.06 <sup>c</sup>	.09	
	WPT	.39	5.16 <sup>c</sup>	.14	.30

Sobel's statistic testing indirect effect: 1.54

<sup>a</sup> p < .05    <sup>b</sup> p < .01    <sup>c</sup> p < .001

Table 3. Results of Mediation Tests: Conscientiousness Factor Scores

## Step 1: Test of relationship of criterion to independent variable

<u>C alone</u>	<u>Variable</u>	<u>Standardized Coefficient</u>	<u>t</u>	<u><math>\Delta R^2</math></u>	<u><math>R^2</math></u>
	C Factor Score	.20	2.36 <sup>a</sup>	.04	.04
<u>C + WPT</u>					
	C Factor Score	.165	2.16 <sup>a</sup>	.03	
	WPT	.438	5.72 <sup>c</sup>	.19	.23

## Step 2: Test of relationship of mediator to independent variable

<u>C alone</u>	<u>Variable</u>	<u>Standardized Coefficient</u>	<u>t</u>	<u><math>\Delta R^2</math></u>	<u><math>R^2</math></u>
	C Factor Scores	.20	2.40 <sup>a</sup>	.04	.04
<u>C + WPT</u>					
	C Factor Scores	.19	2.25 <sup>a</sup>	.04	
	WPT	.20	2.33 <sup>a</sup>	.04	.08

## Step 3: Test of relationship of criterion to mediator controlling for independent variable

<u>C + Time</u>	<u>Variable</u>	<u>Standardized Coefficient</u>	<u>t</u>	<u><math>\Delta R^2</math></u>	<u><math>R^2</math></u>
	C Factor Scores	.13	1.55	.02	
	Time-on-task	.37	4.53 <sup>c</sup>	.13	.17
<u>C+Time+ WPT</u>					
	C Factor Scores	.11	1.49	.01	
	Time-on-task	.29	3.83 <sup>c</sup>	.08	
	WPT	.38	5.13 <sup>c</sup>	.14	.31

Sobel's statistic testing indirect effect: 2.12<sup>a</sup><sup>a</sup> p < .05    <sup>b</sup> p < .01    <sup>c</sup> p < .001