Conscientiousness and Procrastination Predict Academic Coursework Marks Rather

Than Examination Performance

Peter E. Morris

Lancaster University and University of Northampton, UK

Catherine O. Fritz

University of Northampton, UK

Peter E. Morris, Department of Psychology, Lancaster University, UK, and Psychology

Division, University of Northampton, UK.

Catherine O. Fritz, Psychology Division, University of Northampton, UK.

Correspondence concerning this article should be addressed to Peter E. Morris,

Psychology, School of Social Sciences, Park Campus, Boughton Green Road, Northampton,

NN2 7AL, United Kingdom.

Telephone +44 (0)1604 240983

E-mail: p.morris@lancaster.ac.uk

Abstract

Past research has reported a consistent but small relationship (e.g. $r = .23$) between conscientiousness and university academic performance. However, in almost all cases the nature of the academic work has not been divided into the major elements of coursework and examination performance. We examined the relationships between conscientiousness and procrastination and the coursework and examination performance of psychology students in their second and third year modules. Both conscientiousness ($r = .45$) and procrastination ($r = -.39$) were significant predictors of overall coursework marks and significantly predicted coursework marks for all but one of the individual modules. Correlations with examination marks were smaller and less consistent. Regression analysis showed that conscientiousness was the more dominant predictor than procrastination. These results extend the literature relating conscientiousness to academic performance, demonstrating that the relationship is stronger with coursework than with exams.

Keywords: Academic performance, conscientiousness, procrastination, coursework, exams.

Conscientiousness and Procrastination Predict Academic Coursework Marks

Rather Than Examination Performance

1. Introduction

The relationship between personality and academic performance has interested many researchers (see Furnham, Nuygards & Chamorro-Premuzic, 2013, and Poropat, 2009 for reviews). We set out to extend this research, hypothesizing that the performance of university psychology students in their coursework would be better predicted by conscientiousness and procrastination than would their performance in their examinations.

Conscientiousness has consistently been the leading personality predictor of academic performance (e.g. Furnham, et al. 2013; Poropat, 2009). Poropat (2009) carried out a meta-analysis of studies of the five-factor model of personality (Costa & McCrae, 1992; Goldberg, Johnson, Eber, Hogan, Ashton, Cloninger, & Gough, 2006) and those factors' prediction of academic performance. Poropat's review drew upon 80 research reports and aggregated sample sizes that ranged from 58,522 for correlations with agreeableness to 70,926 for correlations with conscientiousness. He found correlations with academic performance, estimated from these very large samples, of .19 for conscientiousness, .10 for openness, .07 for agreeableness, .01 for stability and -.01 for extraversion. For his tertiary education sub-sample of 32,887 participants, Poropat found a sample weighted correlation corrected for scale reliability of .23 between conscientiousness and academic performance. Conscientiousness was as successful a predictor as was intelligence for tertiary level academic performance (Poropat, 2009). In a similar meta-analysis of the Eysenck Personality Questionnaire (EPQ), Poropat (2011) found correlations with academic performance of -.06 with psychoticism (attributed to the correlation between psychoticism and conscientiousness), of -.06 with neuroticism, and .02 with extraversion. The main outcome of Poropat's meta-

analyses was to highlight the importance of conscientiousness as the leading personality dimension for predicting academic performance.

Various researchers have explored aspects of conscientiousness in some detail. For example, MacCann, Duckworth and Roberts (2009) have examined empirically various facets of conscientiousness. Biederman, Nguyen, and Sebren (2008) ~~have looked at~~studied how time-on-task mediates the conscientiousness-performance relationship; Lubbers, Van Der Werf, Kuyper and Hendriks (2010) explored how "homework behavior" mediates the relationship of conscientiousness and academic performance by secondary school children; and Reiter-Palmon, Illies, and Kobe-Cross (2009) have argued that conscientiousness is not always a good predictor of performance, especially creative performance. However, Friedman & Kern (2014) comment on the wide-ranging benefits of conscientiousness, concluding that the conscientious "stay healthier, thrive and live longer" (~~ ~~p. 731~~.~~).

Most studies of academic performance have used overall Grade Point Averages (GPA) as the measure of academic achievement and have not differentiated between coursework performance and examination assessment. However, the personal self-management required for completing coursework assignments that are often spread across an academic year and involve essay writing and other effortful and time-consuming commitment, may, plausibly, rely more on conscientiousness than does preparation for examinations at the end of a year or semester. A similar argument has been made by Duckworth, Quinn and Tsukayama (2012) on the roles of IQ and self-control in predicting standardized achievement test scores and report card grades of school children. Their research found that intelligence predicted performance on standardized tests but that the ongoing level of student performance, as recorded in their report cards, was best predicted by measures of self-control that will be related to conscientiousness.

Examination and coursework performance were addressed separately by Furnham, et al. (2013); they analyzed the relationship between these separate measures of academic performance and the big five personality variables. They recruited a sample of 1,013 university students from four British universities across four faculties (arts/humanities, social science, life/biological sciences and mathematical sciences). For conscientiousness, they found significant correlations of .15 and .13 with coursework and examination grades respectively, suggesting that the relationship between conscientiousness and coursework performance may be only very slightly stronger than with exam performance.

There are, however, aspects of the Furnham et al. (2013) study that suggest that further investigation would be worthwhile. Furnham et al. combined together many different disciplines, and the nature of coursework differs between disciplines. Discipline specific research may be justified. Also, Furnham et al. used self-reports of academic performance. Kuncel, Crede, and Thomas (2005), concluded from their meta-analytic review of research involving self-reports of grades that such grades are less construct valid than many scholars believe and should be used with caution. It would, therefore, be desirable to have the actual results for analysis, particularly because it is reasonable to suppose that students who are more conscientious will be more accurate in their reports than less conscientious students. Finally, Furnham et al. used only three self-report questions when assessing each of the personality dimensions, and the coefficient alphas for agreeableness (.54) and for conscientiousness (.61) were lower than the .7 that is usually recommended as the acceptable threshold for psychometric tests internal reliability, with .8 or higher being preferred (e.g. Carmines & Zeller, 1994; Maltby, Day & Macaskill, 2010). Because the alpha for the exams (.64) and the coursework (.60) measures were also low the possible correlations between the measures and the personality dimensions will have been attenuated by their relatively low reliabilities (Carmines & Zeller, 1994; Spearman, 1904).

Coursework, at least in British Psychology degrees, often involves a literature search for the assigned topic to produce an essay, literature review, critical review or other analysis related to that topic; this written work is often between 2,000 and 3,000 words long. For research methods and some other modules, coursework may require designing, conducting and/or analysing a small study as well as reporting it following APA guidelines. For statistics and other modules, coursework may involve answering questions about the content, in a take-home test, an online test or a short test during class time. Coursework may be due at several points during the academic year, but is often due near the end of each term. Coursework assignments are designed to be most effectively addressed through incremental work over time. This work must be done during term time, when classes are regularly scheduled. The dissertation or research thesis is a special piece of coursework, usually up to 8,000 or 10,000 words, reporting the student's own empirical research during their final year, supported by a comprehensive literature review. The dissertation typically has few, if any, class meetings, relying on the student to work independently and to seek guidance from their supervisor as needed throughout the year.

Exams, on the other hand, in British Psychology degrees, are usually scheduled to take place at the end of the academic year, usually after the Easter break, when classes have ended. Students usually have 1-3 weeks for exam preparation after the term starts before their first exam is scheduled and exams are usually spread out so that students have at least a day or two between exams for further preparation. Exams are held under very controlled, supervised conditions. Each exam may take 2 hours or more and often requires students to choose two or more exam questions (usually not previously available) to answer at length in a well-developed essay; these may be accompanied by short answer and/or multiple choice questions.

Procrastination as a personality dimension correlates with conscientiousness and was, for example, treated as a facet of conscientiousness by MacCann et al. (2009). Steel (2007), in his meta-analysis of procrastination, combined 20 studies reporting correlations between procrastination and conscientiousness, finding a correlation of -.62, with a sample size of 4,012. The size of this correlation suggests that although procrastination and conscientiousness are related, they are not identical constructs. Procrastination was, therefore, included in the present study with the prediction that students scoring high on procrastination would have poorer academic performance, and that procrastination would have a stronger relationship with coursework than with examination performance.

We used the student version of Lay's (1986) procrastination test. Ferrari (1992) proposed that there were three types of procrastination with Lay's General Procrastination Scale assessing primarily arousal procrastination, but Steel (2010) has suggested that the Lay test may have three factors with only one being procrastination propertested this idea with both a meta-analysis and a factor-analytic study and found no empirical support for a three-factor approach to understanding procrastination. Nevertheless, we considered possibility of multiple factors, soHowever, in a preliminary analysis of the Lay test we factor analysed data from 371 student respondents, collapsed across three years' of classes. The scree plot for this analysis indicated one very strong factor with little hint of further factors, so we used the full test in the main study. Unfortunately, the academic data for the students in the first two years was not available to be added to the present sample.

Commented [COF1]: ??? I'm lost here . . .

Our predictions were that both conscientiousness and procrastination would be related to students' overall academic performance. However, because conscientiousness and procrastination would be stronger discriminators of performance over the longer coursework preparation periods we specifically predicted stronger correlations with coursework performance than with examination performance. Under the shorter, more intense stress of

preparation for an imminent examination, most students would engage in appropriate preparation and any influence of conscientiousness and procrastination would be weaker. We also examined whether there was a substantial relationship between procrastination and coursework performance when conscientiousness was statistically controlled, or whether predictions based solely upon conscientiousness tests would be sufficient, and we compared the general dominance weights of conscientiousness and procrastination using the technique recommended by LeBreton, Hargis, Griepentrog, Oswald, and Ployhart (2007).

2. Method

2.1 Participants

One hundred and seven second-year major Psychology students completed the International Personality Item Pool (IPIP, Goldberg et al., 2006) measure during their first workshop on the Personality & Individual Differences module; some weeks later the 71 of these who attended the class completed the procrastination scale. The second year and third year modules that made up the degree for the Psychology single major students were analyzed after the completion of the students' degrees in the following year. For 95 students we had data for both the IPIP and academic performance measures, with scores on the procrastination scale for 67 of those students. All students were sent a personal email asking for permission to use their data anonymously and promising to exclude the results of any student who so requested. No student asked for their data to be excluded.

2.2 Measures

The personality measures consisted of the student version of the procrastination scale (Lay, 1986) composed of twenty questions rated on a six-point scale, and the 50 item IPIP scales (Goldberg et al., 2006) that include ten, five-point rating questions to assess each of the five personality dimensions of conscientiousness, agreeableness, stability, openness and extraversion.

The academic measures were the coursework marks and examination marks for most of the second and third year Psychology modules that contributed to the degree, obtained from departmental records. The second year modules that were included were Cognitive Psychology, Brain and Behavior, Social Psychology, Research Methods, Developmental Psychology, Personality & Individual Differences, and Statistics. The third year modules included were Advanced Cognitive Psychology, Advanced Human Neuropsychology, Advanced Social Psychology, Advanced Developmental Psychology, Historical & Conceptual Issues, and the research project Dissertation (contributing only a coursework mark). Students also studied two optional modules chosen from a set of alternatives, but these were excluded from the analysis because of the variability of student numbers on each. Because not all students took every module, the measures of performance were the mean coursework, examination, and final marks for the modules taken.

3. Results

3.1 Description of the data

We begin with a description of the measures and data, followed by reporting the relationships between conscientiousness and procrastination with overall final academic performance, before turning to the main focus of the paper, examining the relationships between conscientiousness, procrastination, coursework, and examination performance.

For the examination marks across the modules Cronbach's alpha was .89; for the coursework marks alpha was .86; for the final marks for the modules alpha was .93. For the five IPIP personality measures ($N = 95$) the alphas were: agreeableness .83, conscientiousness .86, extraversion .86, openness .80, and stability .85. For the procrastination scale ($N = 67$) alpha was .88. Data for all six scales were examined for skew, kurtosis, and outliers. All scales except agreeableness, which was negatively skewed, were reasonably normal in their distributions. Means, 95% CIs and standard deviations for the six

scales were: agreeableness, $M = 41.76$ [40.73, 42.79], $SD = 5.06$; conscientiousness, $M = 32.60$ [31.14, 34.06], $SD = 7.17$; extraversion, $M = 32.21$ [30.75, 33.67], $SD = 7.15$, openness; $M = 35.22$ [34.07, 36.37], $SD = 5.63$; stability, $M = 27.93$ [26.47, 29.38], $SD = 5.63$; and procrastination, $M = 61.75$ [58.58, 64.91], $SD = 12.97$. For the IPIP scales the possible range of scores was 10-50; for procrastination it was 20-120.

Correlations were examined with respect to their confidence intervals (CI; e.g., Altman, Machin, Bryant & Gardner, 2000; Cumming, 2012) rather than t tests. We used one- and two-tailed 95% CIs, as appropriate, to describe the distribution of likely population correlations and to mimic the results of null hypothesis significance testing at the .05 level of alpha (Cumming, 2012; Steiger, 2004). Consideration of the likely distribution of the effect size (r in this case) provides more information than does null hypothesis significance testing alone, leading to inferences that are better informed than those focussed merely on its point estimate (e.g., Cumming). The following analyses examine the relationship of all six personality variables with mean final marks to allow comparison with previous research and then focusses on relating conscientiousness and procrastination to coursework marks and to exam marks.

Marks were assigned on a reasonably standard, British, 100-point scale where 70+ represented A grades, 60-69 represented B grades, 50-59 represented C grades, 40-49 represented D grades and grades below 40 indicated work that failed. Lancaster University regulations required that the mean mark for a module should, normally, fall between 55 and 65.

Mean final marks, mean coursework marks, mean exam marks, and individual module coursework and exam marks were examined for skew, kurtosis and outliers. Most marks were normally distributed. Low outliers were identified and removed from the coursework data for the Year 2 Research Methods (1 outlier) and Individual Differences (1 outlier) modules.

Negative skew was observed in coursework for Year 2 Individual Differences and Statistics and exam marks for Year 2 Statistics; positive skew was observed for coursework marks from Year 2 Cognitive Psychology. Data for these four datasets were transformed[i] (Tabachnik & Fidell, 2014); all subsequent analyses were run for both the transformed data and the raw data. The differences between correlations for raw and transformed data were very small, all less than .02, and varied in direction, so the correlations with the untransformed data are reported in the interests of clearer interpretation. Leptokurtosis was observed in several sets of marks, but no adjustments were made to those data because sample sizes were typically near 100, the point where the underestimation of variability disappears (Tabachnik & Fidell, p.114). Descriptive statistics for all coursework and exam marks are provided in Table 1. Mean final marks for the 98 students' data under consideration were normally distributed with a mean of 61.44 (a low B), 95% CI [60.31, 62.56] and a standard deviation of 5.59.

Table 1.
Descriptive Statistics for the Coursework and Examination Marks Used in the Analyses.

Module	Coursework			95% CI		Exams			95% CI	
	N	Mean	SD	LL	UL	N	Mean	SD	LL	UL
2nd year										
Cognitive Psychology	98	61.09	8.44	59.40,	62.78	97	59.47	9.93	57.47,	61.48
Brain & Behavior	98	56.97	12.15	54.54,	59.41	98	61.24	11.20	59.00,	63.49
Social Psychology	98	59.29	9.29	57.43,	61.16	98	56.66	8.69	54.92,	58.40
Research Methods	97	61.43	5.38	60.35,	62.51	98	58.55	11.33	56.28,	60.82
Developmental Psych	98	60.41	9.01	58.60,	62.21	98	56.47	8.88	54.69,	58.25
Individual differences	97	79.45	7.44	77.95,	80.95	98	59.33	6.06	58.11,	60.54
Statistics	98	65.70	14.68	62.75,	68.64	98	59.35	15.04	56.33,	62.36
3rd year										
Advanced Cognitive	98	66.11	7.81	64.55,	67.68	89	62.35	5.00	61.30,	63.40
Neuropsychology	58	62.47	10.32	59.75,	65.18	98	63.56	5.92	62.37,	64.74
Advanced Social	97	62.98	9.32	61.10,	64.86	98	61.92	6.31	60.66,	63.19
Advanced Development	96	61.70	6.38	60.41,	62.99	97	62.42	7.67	60.87,	63.96
Historical & Conceptual	97	59.39	8.04	57.77,	61.01	98	57.82	5.40	56.73,	58.90
Dissertation	98	63.58	6.52	62.27,	64.89					
Overall										
Mean marks	98	63.10	5.81	61.93,	64.27	98	59.18	6.15	57.95,	60.42

Note. N = sample size, *SD* = standard deviation, CI = confidence interval, LL = lower limit, UL = upper limit

3.2 Correlations with mean final marks

Correlations with mean final marks were examined to test whether the usual pattern – conscientiousness as the best predictor of academic achievement – appeared in these data. If it did not appear, then our data would not enable us to determine whether the source of that correlation was primarily in the coursework. The Pearson correlations for the five personality factors with the mean final marks and their associated 95% CIs (in order of correlation magnitude) were: conscientiousness .25, [.05, .43]; openness .10, [-.10, .30]; agreeableness .07, [-.13, .27]; extraversion .06, [-.14, .26]; and stability .00, [-.20, .20]. The correlation between mean final marks and procrastination was -.31, [-.51, -.08]; For both procrastination and conscientiousness, the correlations are significantly different from zero at the .05 level; in addition, we can see that the likely values for the population correlations in both cases varies from quite weak (-.08 and .05) to reasonably strong (-.51 and .43), with by far the greatest likelihood being nearer the samples' moderate correlations. For openness, agreeableness, extraversion and stability, zero falls within the CIs so they are not statistically significant. Note that even if their population correlations were actually at the extreme upper end of their 95% CIs, no more than 4 to 9% of the variance would be accounted for by any of these variables. Our subsequent analyses ~~will~~ focus<u>ed</u> on conscientiousness and procrastination, and ~~will~~ <u>did</u> not address the other personality variables. The correlation between conscientiousness and procrastination was -.56, one tailed 95% CI [-1.00, -.40] which was significant, as expected. Around 31% [14% to 50%] of variance is shared by the two measures, so a substantial amount of variability is unique to each.

3.3 Correlations with coursework and exam marks

The primary hypothesis of this paper was that conscientiousness and procrastination would each have a stronger relationship with coursework than with examination marks. For each student, a coursework mean and an exam mean were obtained by averaging the appropriate marks across all of their modules. As expected, the correlation between

coursework and exam marks was quite strong: $r = .80$, one-tailed 95% CI [.73, 1.00]. Figure 1 illustrates the correlations between conscientiousness and means for both types of marks (lower part of the graph) and between procrastination and means for both types of marks (top of the graph); these data are also provided in the last line of Table 2. For both conscientiousness and procrastination, the correlations with coursework were stronger than the correlations with exams. By clearly illustrating the likely distribution for the population correlation, the cat's eyes (Cumming, 2012) provide a very useful guide to interpreting the data; the population correlations are both clearly stronger for coursework than for exams.

        As we had predicted, the differences between coursework and exam correlations were both statistically significant. We used Zou's (2007) approach to calculating confidence intervals for differences between overlapping correlations. In the case of conscientiousness, the difference was .27, one-tailed 95% CI [.17, 1.00]; for procrastination, the difference was -.15, [-1.00, -.03]. The size of the difference becomes more evident when considering the r^2
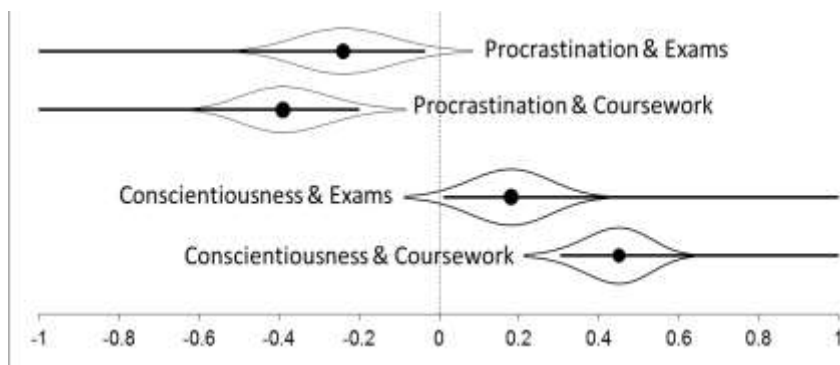

Figure 1. Pearson's correlations between personality variables and academic achievement variables. Correlations involving procrastination are based on 64 students; those with conscientiousness include 95 students. Correlations are described by a point estimate (*r*), the one-sided 95% confidence interval (the error bar, Cumming, 2012, p.109-113) to mimic a one-tailed test and the 99% confidence intervals (the "cat's eyes" developed by Cumming). The cat's eyes illustrate the distribution of likely values for the parameter. Note that for both conscientiousness and procrastination, correlations with coursework are stronger than those with exams.

values for each correlation. Conscientiousness accounts for 3% of the variance in exam marks but a substantial 20% of the variance in coursework marks – more than 6 times as much. Procrastination accounts for 6% of the variance in exam marks and 15% of the variance in courswork marks – 2.5 times as much.

> **Commented [COF2]:** Just a thought – surely

Tables 2 and 3 list correlations between the personality variables and marks from each individual module. Cat's eye graphs for the module-level correlations are available as supplementary online material accompanying this paper.

~~For conscientiousness, in every module the correlation with coursework was descriptively stronger than that with the exam mark. The correlations with coursework were all positive, ranging from .18 to .44, and all were significantly greater than zero (one-tailed tests). Correlations between conscientiousness and exams, however, presented a less consistent pattern: correlations varied from -.11 to .22, with only four of the individual correlations being significantly greater than zero (one-tailed tests).~~

Table 2
Pearson's Correlations for Conscientiousness with Coursework and Exams for the 13 Modules Studied.

Module	Coursework			Exams		
	Pearson's r	one-tailed CL	Sample size	Pearson's r	one-tailed CL	Sample size
2nd year						
Cognitive Psychology	.26*	.09	95	.22*	.05	94
Brain & Behavior	.32*	.16	95	.16	-.01	95
Social Psychology	.20*	.03	95	.18*	.01	95
Research Methods	.40*	.25	94	.14	-.03	95
Developmental Psychology	.29*	.13	95	.16	-.01	95
Individual differences	.29*	.13	94	.13	-.04	95
Statistics	.32*	.16	95	.22*	.05	95
3rd year						
Advanced Cognitive	.26*	.09	95	-.06	-.24	87
Neuropsychology	.37*	.16	55	-.11	-.27	95
Advanced Social	.27*	.10	94	.19*	.02	95
Advanced Developmental	.21*	.04	93	.08	-.09	94
Historical & Conceptual Issues	.18*	.01	94	.04	-.13	95
Dissertation	.23*	.06	95			
Overall						

| Mean marks | .45* | .30 | 95 | .18* | .01 | 95 |

Note. CL = confidence limit. For one-tailed CIs, only the limit related to the predicted direction is relevant; the other direction is not limited (Cumming, 2012; Steiger, 2004). Because positive correlations were predicted, only lower limits are relevant.
*$p < .05$, one tailed

For conscientiousness, in every module the correlation with coursework was descriptively stronger than that with the exam mark. The correlations with coursework were all positive, ranging from .18 to .44, and all were significantly greater than zero (one-tailed tests). Correlations between conscientiousness and exams, however, presented a less consistent pattern: correlations varied from -.11 to .22, with only four of the individual correlations being significantly greater than zero (one-tailed tests).

Correlations between procrastination and academic achievement are negative because higher procrastination scores indicate a greater tendency to procrastinate which is related to lower marks. The pattern observed in the procrastination correlations (see Table 3) was similar to that for conscientiousness, displaying a consistent relationship with coursework and a somewhat weaker and more varied relationship with exams. The smaller sample size for procrastination scores provided less precision in the estimated correlations and so reduced power. Correlations with coursework varied from -.10 to -.51; these correlations were statistically significant for 12 of the 13 modules. Correlations with exams varied from -.01 to -.29; these correlations were generally weaker and were statistically significant for only 6 of the 12 modules.

Table 3
Pearson's Correlations for Procrastination with Coursework and Exams for the 13 Modules Studied.

Module	Coursework			Exams		
	Pearson's *r*	one-tailed CL	Sample size	Pearson's *r*	one-tailed CL	Sample size
2nd year						
Cognitive Psychology	-.23*	-.03	67	-.23*	-.03	66
Brain & Behavior	-.33*	-.14	67	-.25*	-.05	67
Social Psychology	-.23*	-.03	67	-.22*	-.02	67
Research Methods	-.28*	-.08	66	-.01	.19	67
Developmental Psychology	-.10	.10	67	-.14	.06	67
Individual differences	-.30*	-.10	66	-.26*	-.06	67

Statistics	-.34*	-.15	67	-.29*	-.09	67
3rd year						
Advanced Cognitive	-.27*	-.07	67	-.17	.05	59
Neuropsychology	-.51*	-.29	43	-.07	.13	67
Advanced Social	-.26*	-.06	66	-.29*	-.09	67
Advanced Developmental	-.30*	-.10	66	-.19	.01	67
Historical & Conceptual Issues	-.29*	-.09	66	-.08	.12	67
Dissertation	-.26*	-.06	67			
Overall						
Mean marks	-.39*	-.20	67	-.24*	-.04	67

Note. CL = confidence limit. For one-tailed CIs, only the limit related to the predicted direction is relevant; the other direction is not limited (Cumming, 2012; Steiger, 2004). Because negative correlations were predicted, only upper limits are relevant.

*p < .05, one tailed

Correlations for conscientiousness and procrastination with coursework were clearly, consistently stronger than with exams. This pattern is evident in the individual modules as shown in Tables 2 and 3 and is most compelling with the summary coursework and summary exam data, illustrated in Figure 1.

We examined whether procrastination made a significant contribution to prediction of coursework performance beyond that of conscientiousness by carrying out a multiple regression with both conscientiousness and procrastination as predictors of mean coursework. The standardized (beta) regression weight for conscientiousness (β_c) was significant (β_c = .47, 95% CI [.19, .65]) but the beta for procrastination (β_p) was not significant (β_p = -.13, 95% CI [-.35, .12]). For this regression we calculated the general dominance weights for conscientiousness and procrastination using the procedure recommended by LeBreton et al. (2007). The weights were .22 for conscientiousness and .08 for procrastination. Rescaling the dominance weights, by dividing by the R^2 of .31 and converting to percentages, the dominance weights were 73% for conscientiousness and 27% for procrastination.

4. Discussion

As has been found in previous research, conscientiousness and procrastination correlate with academic performance (e.g. Poropat, 2009; Steel, 2007). However, the main finding of our research was that both conscientiousness and procrastination were much

stronger predictors of coursework marks than of examination marks. Overall, the correlations for conscientiousness and procrastination with the total coursework marks were .45 and -.39 respectively, which indicates that, at least for the types of coursework likely to be carried out by university psychology students in the UK, conscientiousness and procrastination are quite good predictors of coursework performance. These correlations are much higher than the correlations of around .2 that have been reported previously (e.g. Poropat, 2009) for conscientiousness and overall academic performance. Note that our correlations for conscientiousness and procrastination with the overall academic performance, at .25 and -.31, were similar to those reported previously. It is only when the assessment is broken down into coursework and examinations that the relationship between conscientiousness, procrastination and academic performance is clarified: It is located more strongly in the coursework contributions than in the exam contributions. Our findings were consistent with those of Duckworth et al. (2012) for IQ and self-control in school students' assessment. Duckworth et al. comment that a compelling argument can be made for providing feedback about, and encouraging, self-controlled behaviour by students, and we strongly agree.

One of the consequences of our ability to analyze the coursework and examination performance for each module separately is that we could observe that the greater correlations with both conscientiousness and procrastination occur for almost all of the modules, providing a sort of internal replication. For every module, the correlation between conscientiousness and coursework marks was greater than that for conscientiousness and exam marks, and the pattern for procrastination was almost as strong. For the coursework and conscientiousness correlations, all 13 modules were significantly greater than zero, while for the coursework and procrastination correlations 12 of the 13 were significant. Relationships with exam marks were typically weaker and somewhat inconsistent. The module by module analysis demonstrates that the relationships of conscientiousness and procrastination with

coursework and examinations is general across the degree and not confined to particular aspects of the course.

Our results differ somewhat from those of Furnham et al. (2013) who found a correlation of only .15 between conscientiousness and coursework performance. However, as we explained in the Introduction, there are many differences between the two studies. Ours was concerned only with the performance of university students within one discipline: psychology, but Furnham et al.'s data combined many undergraduate disciplines with potentially quite different types of coursework. Thus, it appears that these relationships may vary by discipline due to differing course demands and/or student demographics. We had the actual marks of the students in all of their modules, while Furnham et al. had to reliedy on self-reports by their participants. Those reports are likely to be less accurate than our data (Kuncel et al., 2005). Furthermore, Furnham et al.'s participants were, apparently, self-initiated volunteers so that there may have been some degree of self-selection and, perhaps, avoidance by the poorer students. Finally, Furnham et al. used personality measures that were less reliable than is normally desired in psychometric studies, and this lower reliability will have attenuated the correlations between their variables.

When we compared the contributions of conscientiousness and procrastination in the prediction of the coursework marks we found a significant beta weight for conscientiousness but not for procrastination. The rescaled dominance weights for conscientiousness was 73% compared to the weight of 27% for procrastination. Conscientiousness seemsis the dominant variable, at least for this these data, to be the dominant variable.

The contributions of conscientiousness and procrastination to coursework performance probably arises from the need for self-motivation involved in the preparation of much coursework material such as essays and dissertations (Duckworth et al., 2012). We assume that the weaker influence of procrastination and conscientiousness on examination

performance results from most students managing to motivate their revision in the relatively short-term period leading up to examinations – a time when most students become very focussed and concerned to prepare well. This is consistent with the demonstrated short-term effectiveness of cramming for examinations (e.g., McIntyre & Munson, 2008).

We have not attempted to speculate in this short report upon the specific aspects of conscientiousness and procrastination, such as those explored by MacCann et al. (2009) and Steel (2007, 2010), that may be contributing particularly to the relationships that we describe. Our aim has been to demonstrate the importance of conscientiousness in terms of undergraduate coursework success, at least for psychology students. It may be that specific efforts to improve conscientiousness and address procrastination would be worth incorporating into degree programs to help students circumvent these potential constraints on their academic success (cf. Duckworth et al. 2012). Perhaps making students aware that procrastination and lack of conscientiousness have a substantial detrimental effect on their degree performance could help their motivation. Although it can seem obvious that this would be so, it is possible that making the problem clear to students may help them to become more metacognitively aware, leading them to alter their natural behaviors and/or set up systems of reminders, thereby improving their marks. The same students who have problems with procrastination and conscientiousness with coursework appear to work well under pressure of an imminent exam, so with sufficient awareness and motivation, they should be able to develop habits such as setting interim deadlines that lead to behavior more characteristic of conscientious students.

References

Altman, D. G., Machin, D., Bryant, T. N., & Gardner, M. J. (Eds.) (2000). *Statistics with confidence: Confidence intervals and statistical guidelines* (2nd ed.). London: British Medical Journal Books.

Biderman, M. D., Nguyen, N. T., & Sebren, J. (2008). Time-on-task mediates the conscientiousness-performance relationship. *Personality and Individual Differences*, *44*, 887-897. doi: 10.1016/j.paid.2007.10.022.

Brinthaupt, T. M., & Shin, C. M. (2001). The relationship of academic cramming to flow experience. *College Student Journal, 35*, 457-471.

Carmines, E. G., & Zeller, R. A. (1994). Reliability and validity assessment. In M. S. Lewis-Beck (Ed.) *Basic measurement: International handbooks of quantitative applications in social sciences, Vol. 4*. (pp. 1-58). London: Sage.

Costa, P. T., & McCrae, R. R. (1992). *NEO-PI-R: Professional manual*. Odessa, FL: PAR.

Cumming, G. (2012). *Understanding the new statistics: Effect sizes, confidence intervals, and meta-analysis*. New York; Routledge.

Duckworth, A. L., Quinn, P. D., & Tsukayama, E. (2012). What no child left behind leaves behind: The roles of IQ and self-control in predicting standardized achievement test scores and report card grades. Journal of Educational Psychology, 104, 439-451. doi: 10.1037/a0026280.

Ferrari, J. R. (1992). Psychometric validation of two procrastination inventories for adults: Arousal and avoidance measures. *Journal of Psychopathology and Behavioral Assessment, 14*, 97–110. doi: 10.1007/BF00965170

Friedman, H. S., & Kern, M. L. (2014). Personality, well-being and health. In S. T. Fiske, D. L. Schater, & S. E. Taylor (Eds.), *Annual Review of Psychology* (pp. 719-742), Palo Alto, CA: Annual Reviews. doi: 10.1146/annurev-psych-010213-115123

Furnham, A., Nuygards, S., & Chamorro-Premuzic, T. (2013). Personality, assessment
methods and academic performance. *Instructional Science, 41*, 975-987. doi:
10.1007/s11251-012-9259-9.

Goldberg, L. R., Johnson, J. A., Eber, H. W., Hogan, R., Ashton, M. C., Cloninger, C. R., &
Gough, H. C. (2006). The International Personality Item Pool and the future of public-
domain personality measures. *Journal of Research in Personality, 40*, 84-96. doi:
10.1016/j.jrp.2005.08.007

Kuncel, N. R., Crede, M., & Thomas, L. L. (2005). The Validity of Self-Reported Grade
Point Averages, Class Ranks, and Test Scores: A Meta-Analysis and Review of the
Literature. *Review of Educational Research, 75*, 63-82. doi:
10.3102/00346543075001063.

Lay, C. H. (1986). At last, my research article on procrastination. *Journal of Research in
Personality*, *20*, 474-495. doi: 10.1016/0092-6566(86)90127-3

LeBreton, J. M., Hargis, M. B., Griepentrog, B., Oswald, F. L., & Ployhart, R. E. (2007). A
multidimensional approach for evaluating variables in organizational research and
practice. Personnel Psychology, 60, 475-498. DOI: 10.1111/j.1744-
6570.2007.00080.x

Lubbers, M. J., Van Der Werf, M. P. C., Kuyper, H., & Hendriks, A. A. J. (2010). Does
homework behavior mediate the relationship between personality and academic
performance? *Learning and Individual Differences, 20*, 203-208. doi:
10.1016/j.lindif.2010.01.005.

Maltby, J., Day, L. & Macaskill, A. (2010). *Personality, individual differences and
intelligence*. 2nd ed. Harlow: Pearson Prentice.

MacCann, C., Duckworth, A. L., & Roberts, R. D. (2009). Empirical identification of the major facets of conscientiousness. *Learning and Individual Differences, 19*, 451-458. doi: 10.1016/j.lindif.2009.03.007

McIntyre, S. H., & Munson, J. M. (2008). Exploring cramming: Student behaviors, beliefs, and learning retention in the Principles of Marketing course. *Journal of Marketing Education, 30*, 226-243. doi: 10.1177/0273475308321819.

Miles, J., & Shevlin, M. (2001). *Applying regression & correlation: A guide for students and researchers.* Sage: London.

Poropat, A. E. (2009). A meta-analysis of the five-factor model of personality and academic performance. *Psychological Bulletin, 135*, 322-338. doi:10.1037/a0014996.

Poropat, A. E. (2011) The Eysenckian personality factors and their correlations with academic performance. *British Journal of Educational Psychology, 81*, 41-58. doi:10.1348/000709910X497671.

Reiter-Palmon, R., Illies, J. J., & Kobe-Cross, L. M. (2009). Conscientiousness is not always a good predictor of performance: The case of creativity. *The International Journal of Creativity & Problem Solving. 19*, 27-45.

Seo, E. H. (2012). Cramming, active procrastination, and academic achievement. *Social Behavior and Personality, 40*, 1333-1340. doi: 10.2224/sbp.2012.40.8.1333

Spearman, C. (1904). The proof and measurement of association between two things. *American Journal of Psychology, 15*, 72-101. doi: 10.2307/1422689

Steel, P. (2007). The nature of procrastination: A meta-analytic and theoretical review of quintessential self-regulatory failure. *Psychological Bulletin, 133*, 65-94. doi: 10.1037/0033-2909.133.1.65.

Steel, P. (2010). Arousal, avoidant and decisional procrastinators: Do they exist? *Personality and Individual Differences*, *48*, 926-934. doi:10.1016/j.paid.2010.02.025.

Steiger, J. H. (2004). Beyond the *F* test: Effect size confidence intervals and tests of close fit in the analysis of variance and contrast analysis. *Psychological Methods, 9*, 164-182. doi: 10.1037/1082-989X.9.2.164

Tabachnick, B. G., & Fidell, L. S. (2014). *Using multivariate statistics* (6th ed.). Pearson: Harlow.

Zou, G. Y. (2007). Toward using confidence intervals to compare correlations. *Psychological Methods, 12*, 399-413. doi: 10.1037/1082-989X.12.4.399

Acknowledgements

Endnotes

[i] For negative skew, data were reversed (100-value), the square root taken and then reversed again (10-value) to restore the direction of the data. For positive skew the square root was taken. In all cases the transformations produced reasonably normal distributions.

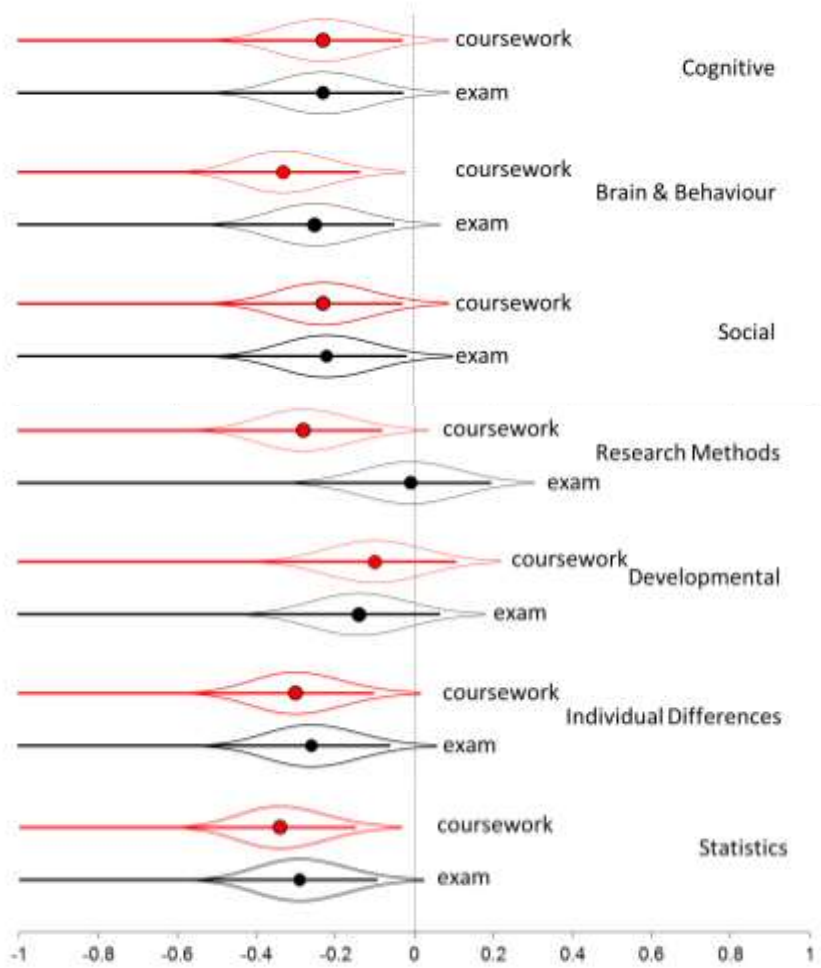**Correlations between conscientiousness and each type of academic assessment for each module**
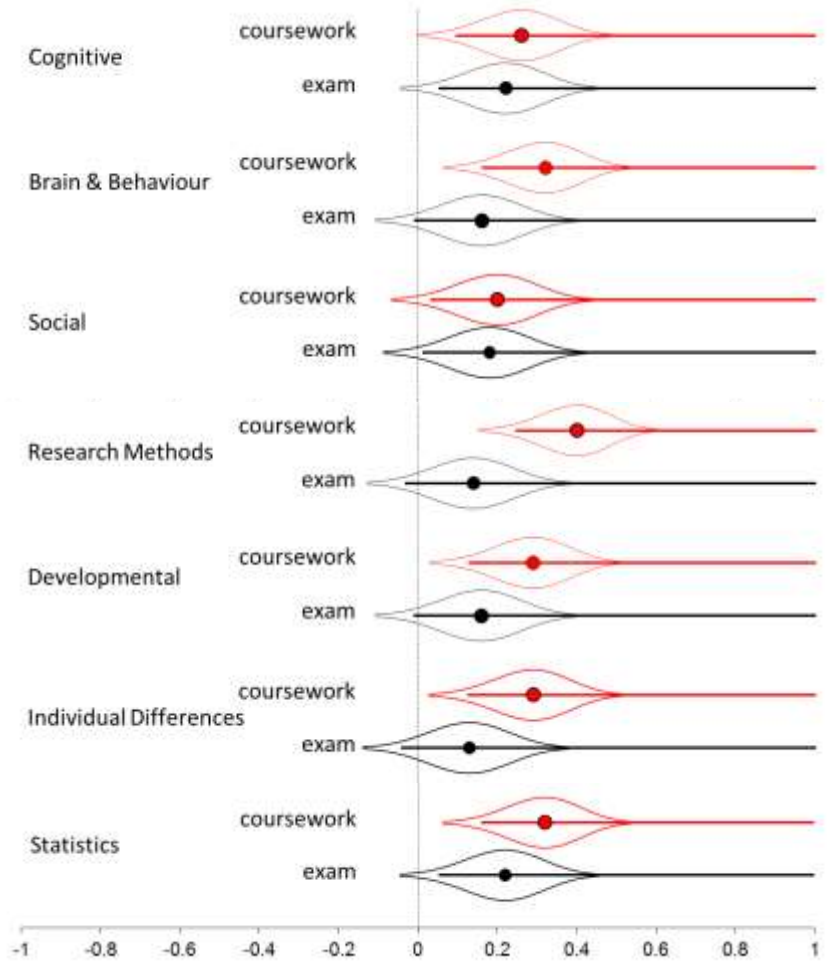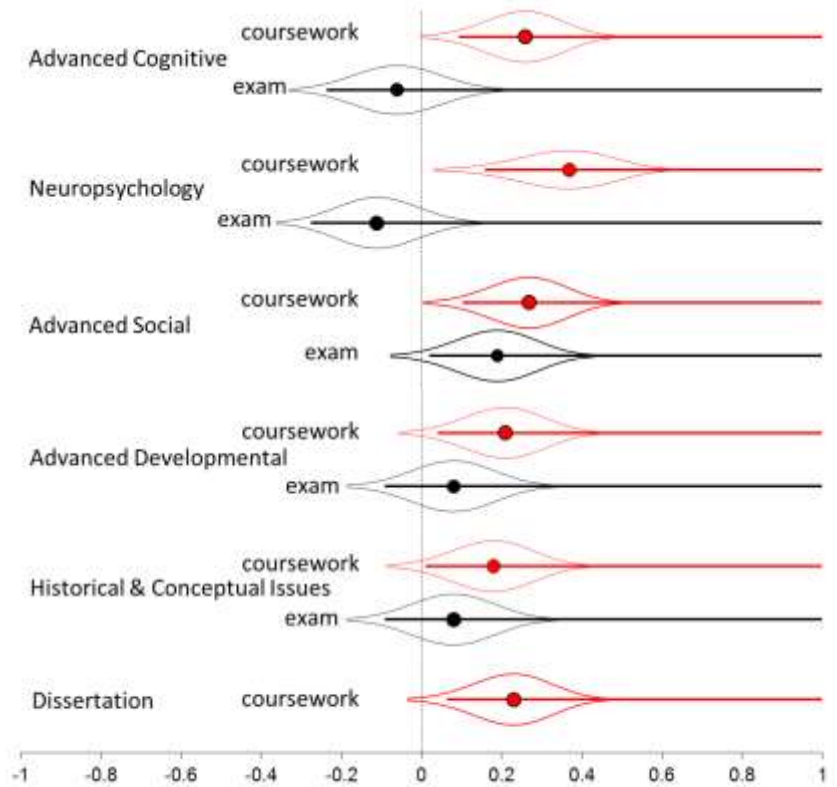
Correlations between procrastination and each type of academic assessment for each module