What factors predict students' final-year dissertation grades? The results from two small pilot studies

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Abstract

Two small pilot studies were conducted to identify factors that might be used to predict students' performance on their final-year dissertation project. Over the course of these two studies several significant correlations were observed that suggested the characteristics of the student (i.e., conscientiousness, procrastination & grade expectations) and behaviour of their project supervisor (i.e., years of experience & task-oriented supervisory style) were significantly associated with the mark achieved for their dissertation project. In Study 2 it was also found that self-reported procrastination and student's own grade expectations might be used to predict the mark achieved for their final-year research project. The use of small, self-selected student samples and the timing of questionnaire administration mean that these findings are insufficient to recommend the routine use of these questionnaire measures to identify those at-risk of under-achieving. However, the results from these two pilot studies highlight several variables that might be used in future studies to predict student outcomes on their final-year dissertation.

Keywords: Dissertation; Undergraduate; Research project; Grade expectations; Procrastination;

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In the final year of many undergraduate courses students are asked to conduct an independent research project. These projects often require students to identify a novel research question, devise an appropriate research design to test this, gain ethical approval, recruit participants, collect and analyse data, and produce a written report of this process; skills that many undergraduates will have rarely (if ever) practiced beforehand. Given this inexperience as independent researchers it is therefore understandable that many students find this new and unfamiliar process difficult. The present investigation aimed to identify those factors that significantly predict students' performance on their undergraduate research projects

Although it is widely accepted that intelligence is an important predictor of academic achievement (see Mackintosh, 1998; Neisser et al., 1996; Sternberg, Grigorenko & Bundy, 2001 for overviews), there is a growing body of evidence to suggest that a number of non-intellectual factors (e.g., personality, motivation, self-efficacy) might also play a significant role in academic success. These variables are often more malleable than an individual's intellectual abilities, and might therefore represent a more effective target for future teaching innovations. The two investigations reported here were therefore intended as brief pilot studies to explore the relationships between non-intellectual factors and academic performance. These relationships (if found) were intended to offer the basis for a larger empirical study to identify individuals who may be at-risk of under-achieving and are e hoped to inform future educational interventions to support all students to perform to their best.

Investigations concerned with the predictors of academic performance have, in most cases, employed a narrow range of criteria to measure academic attainment: examination performance; course grades; SAT scores; and the grade point average.

With a few exceptions (Chamorro-Premuzic & Furnham, 2003a, Kappe & van der Flier, 2010, 2012, Sheard, 2009), the undergraduate thesis has been overlooked as a measure of academic performance. This omission is notable given that the final-year project often contributes significantly to a student's final grade, and is regarded by many as one of the defining elements of an undergraduate degree. A written thesis also offers a way to assess student learning after several months of supervised work, which is arguably a more useful indicator of a student's ability than their performance during a a high-stakes two-hour written exam.

The two pilot studies reported here were intended to address this gap in the literature and sought to identify factors that might be used to predict the grade that students' received for their final-year undergraduate research project. In Study 1, students' self-reported conscientiousness, grit and procrastination were investigated (together with the grade achieved on an earlier research methods course) to assess their impact on the grade received for their final year dissertation. In Study 2, the range of factors under investigation was broadened to take into account the students' approach to learning, their time management skills and their own grade expectations for their final-year project. In addition to this, Study 2 also assessed the experience, beliefs and supervisory style of project supervisors to determine the role played (if any) in the performance of his / her student supervisees.

Study 1 – Conscientiousness, grit, & procrastination

Of the 'Big Five' personality traits (Digman, 1990; McCrae & Costa, 1997), conscientiousness (i.e., the tendency to be organised, self-disciplined & hardworking) has been consistently identified as the best predictor of academic success (see O'Connor & Paunonen, 2007 for a review). A positive relationship between

conscientiousness and academic performance has been found with students of all ages (Busato, Prins, Elshout & Hamaker, 2000; Heaven, Mak, Barry & Ciarrochi, 2002; Wiggins, Blackburn & Hackman, 1969; Wolfe & Johnson, 1995). Moreover, a recent meta-analysis has suggested that these correlations were largely independent of intelligence (Poropat, 2009). Study 1 investigated whether conscientious students performed better on their final-year research project than their less conscientious counterparts.

Procrastination is known to be a problem that is particularly prevalent among university students (Ellis & Knaus, 1977; Zarick & Stonebraker, 2009). Research has shown procrastination is associated with poor academic performance (see Steel, 2007 for a meta-analysis). When working on their research project, students are expected to take a more self-directed, autonomous approach to their learning. With this in mind, students who tend to procrastinate were expected to perform worse on their research project than those do not.

Academic achievement often requires students to maintain high levels of effort and interest over long periods of time, and to continue working despite boredom, challenges or adversity. This idea that, aside from their intellectual abilities, an individual's persistence and a passion for long-term goals might account for their level of achievement is not a new one (e.g., Ryans, 1938, 1939; Wang, 1932; Webb, 1915), but it has only recently been formally defined and studied as 'grit' (see Duckworth, Peterson, Matthews & Kelly, 2007).

Psychological grit has been shown to be a significant predictor of academic success (Duckworth et al, 2007; Duckworth & Quinn, 2009; Strayhorn, 2014), and in some cases there is evidence to suggest that perseverance and effort might be better than intelligence and conscientiousness in predicting educational outcomes (Duckworth et al, 2007; Duckworth & Quinn, 2009). Study 1 therefore investigated whether

'grittier' undergraduates were more likely to achieve a better grade for their final-year research project than less gritty students.

Method

Participants

Email invitations to participate in a "Module evaluation study" were sent to 77 third-year psychology undergraduates students soon after submitting their dissertation report for assessment. Twenty eight students (21 females, 7 males) agreed to participate in the study and consented to the use of their grades for analysis. Participants' mean age was 22.58 years ($SD = 4.14$).

Measures

Academic performance

Academic performance was measured by the mark given to students' final-year dissertation project (on a 0-100% scale, where 40% is a pass & a mark of 70% and above is a 1st class grade). Students worked on their project over a six month period, under the supervision of a member of the teaching staff. Dissertation reports were double marked by the student's supervisor and a second member of staff (and later moderated by an external examiner) using a fixed spot-marking scheme[1] on a 0-100% scale. A mark of 70% or above (74, 80, 85, 90, 95 or 100) is a first (A); a mark between 60-69% (62, 65 or 68) is an upper second or '2.1' (B); a mark between 50-59% (52, 55 or 58) is a lower second or '2.2' (C); a mark between 40-49% (42, 45 or 48) is a third (D); a mark between 30-39% (35) is a borderline fail; and a mark below 30% (0, 5, 15 or 25) is a fail.

Past educational achievements are known to be among the most reliable predictors of current academic performance (e.g., Chapman, 1996; Smith & Naylor, 2001). Accordingly, the grade achieved on a compulsory second-year, research methods and statistics course was obtained from students' online records; this grade was considered the most relevant indicator of their prior research skills and understanding of statistical analysis2.

Student questionnaire

Students were asked to complete an online questionnaire that was used to assess their self-reported conscientiousness, procrastination, and grit. Specifically, this questionnaire required students to complete three different scales: (1) a 20-item measure of conscientiousness (IPIP; Goldberg et al., 2006); (2) a 20-item general procrastination scale (Lay, 1986); and (3) a 12-item grit scale (Duckworth et al, 2007). In all cases, the three scales were found to be internally consistent (α = .90, .90 & 72).

Results

Preliminary analyses

Of the 77 students who submitted a dissertation report for assessment, 28 students volunteered to take part in the study. Given this low response rate (36.36%), it seemed sensible to check if there were significant differences between those who did and did not complete the online questionnaire. Comparing anonymised grades it was found that students who took part in the study achieved a significantly better grade for their dissertation project (M = 69.07; SD = 7.51) than those did not (M = 63.69; SD = 7.88), *t* (75) = 2.93; *p* = .005. A Pearson's *r* correlation was also used to establish the relationship (if any) between students' grade achieved on their second-year research

methods and statistics course and the grade achieved for their final-year psychology project. No significant correlation was found ($r = .25$, N $= 28$, $p = .19$).

Main analysis

Several Pearson's *r* correlations were conducted to explore the relationships between the grade participants' received for their dissertation project and the other three factors under investigation. Table 1 provides a summary of these correlations.

- Table 1 about here -

Partial correlations were then conducted to control for the effects of participants' gender, age and their and their second-year research methods and statistics mark. After controlling for participants' gender and age, all of the previously significant correlations remained significant. However, second-order correlations showed that the relationship between conscientiousness and dissertation grades was no longer found to be significant ($p = .055$), after controlling for participants' gender, age and the mark received on a second-year research methods and statistics course.

A hierarchical multiple regression was then conducted to test the extent to which the investigated variables might predict the grade that a participant received for their final-year U24199 project. Participants' age, gender and their second-year research methods and statistics grade were used as predictors in the first stage of the hierarchical regression ($R^2 = .15$, $F(3, 24) = 1.41$, $p = .27$). Following this, participants' conscientiousness, procrastination and grit scores were all added to the second stage of the regression model ($R^2 = .25$, $F(6, 21) = 1.15$, $p = .37$). In both cases, the two stages of the hierarchical regression were not significant. In the light of these non-significant findings an exploratory stepwise multiple regression was conducted. Again, this

stepwise approach found that none of the investigated variables significantly predicted

of the grade students that received for their dissertation project.

Two stepwise binary logistic regressions were then used to test whether it would

be possible to predict whether or not participants' achieved: (1) a 'good grade' for their

dissertation project (i.e., an upper second or a first class grade); and (2) a first class

grade (i.e., a mark of 70% or above) for their dissertation project. In each case,

participants' dissertation marks were transformed into a dichotomous variable (e.g., did

the student achieve a 'good' / first class grade for their dissertation? – Yes/No) and

participants' sex, age, second-year research methods and statistics grade,

conscientiousness, procrastination and grit were used as predictor variables. This

stepwise approach found that none of the investigated variables significantly predicted

which students received a 'good grade 'or which students received a first class grade for

their dissertation project.

Discussion

The findings of Study 1 support the idea that conscientious students are more likely to

perform better academically than their less conscientious counterparts. Specifically,

participants' self-reported conscientiousness was found to correlate positively with the

grade they received for their final-year undergraduate research project. This finding is

in keeping with previous research that suggests conscientiousness (e.g., Poropat, 2009)

is a reliable predictor of a student's academic performance. Interestingly the findings of

Study 1 also indicate that self-reported procrastination and grit were not significantly

related to grade students' received for their final year dissertation project. What's more,

the apparent association between conscientiousness and participants' U24199 grade was

no longer found to be significant when the effects of participants' gender, age and their second-year research methods and statistics grade were all controlled for.

Whilst these non-significant findings are inconsistent with previous research, it must be noted that the small sample under investigation in this pilot study (N = 28) meant that the analyses were almost certainly underpowered, increasing the likelihood of type 2 errors. In addition to this, the sample recruited was not representative of the psychology undergraduates who submitted a final-year report at the time of Study 1. An anonymous comparison of grades showed that those who took part in the study achieved significantly better marks for their research project than those did not. Studying this small, underpowered and self-selected sample of high achieving students was far from ideal, Study 2 attempted to address this sampling bias by offering a financial incentive to encourage a larger cohort of students to take part.

Study 2 – Follow-up study

In Study 1 it was found that conscientiousness was positively linked to the grade a sample of students received for their final-year undergraduate thesis. Whilst this correlation was expected, none of the non-intellectual variables investigated in Study 1 were found to significantly predict students' dissertation grade. This failure was perhaps not altogether surprising given the small sample recruited and limited number of variables investigated. However, in reality, the academic performance of a student is likely to be the result of several factors, ranging from specific study skills, their own grade expectations for an assignment, to broader beliefs about their approach to education and themselves as successful learners. For this reason, Study 2 aimed to re-examine the possible predictors of academic success by investigating a broader range of non-intellectual factors than was previously examined in Study 1.

Previous attempts to identify the factors that significantly predict undergraduate performance on the final-year dissertation project have all focussed exclusively on the personality characteristics of the students' themselves (Chamorro-Premuzic & Furnham, 2003b, Kappe & van der Flier, 2010, 2012, Sheard, 2009). This student-centred approach is somewhat limited and ignores the fact that the dissertation is unique among all the learning experiences students will have at university. Unlike other forms of assessment, students will spend an extended period of time (usually six months) working on their dissertation project under the supervision of academic staff. Given this regular and extended interaction, it is perhaps not unreasonable to expect the behaviour of a dissertation supervisor might have some impact on student outcomes.

Within each academic department, some staff members will (inevitably) be more experienced than others; this experience may prove a significant advantage for those students under his / her supervision. Some supervisors may adopt an informal, friendly and unstructured approach to project supervision, whilst others might prefer to employ a more formal, detached and task-oriented supervisory style (Friedlander & Ward, 1984). What's more, staff members may differ in terms of the responsibility they assume for student outcomes (e.g., Guskey, 1981; Lauermann & Karabenick, 2013). To assess the impact of supervisory practices on students' final dissertation grade, Study 2 asked dissertation supervisors to complete a brief questionnaire concerned with their level of supervisory experience, their approach to project supervision and their beliefs concerning responsibility for student outcomes. In Study 2, students' satisfaction with their project supervisor was also investigated (as an indirect indicator of the perceived quality of the supervisor–student relationship) to assess its impact on their final dissertation grade.

Method

Participants

Soon after submitting their dissertation reports for assessment, email invitations were sent to 105 third-year psychology undergraduate students. Students were told that if they completed the online questionnaire they would be entered into a draw to win a £50 Amazon voucher. Thirty six students (32 females, 4 males) agreed to participate in the study and consented to the use of their grades for analysis. Participants' mean age was 22.25 years ($SD = 4.05$). Of the 36 participants who started the online questionnaire, only 31 completed all elements of the student questionnaire.

Seventeen members of teaching staff were supervising dissertation projects at the time of Study 2, each of which was sent an email invitation to take part in Study 2. Eight supervisors (5 females, 3 males) agreed to participate in the study and completed the online supervisor questionnaire (i.e., response rate = 47.06%)[3]. These eight individuals were the project supervisors for 15 of the 36 students who took part in Study 2.

Measures

Student questionnaire

In addition to the measures used in Study 1 (i.e., conscientiousness, procrastination &grit), students were asked to complete four scales relating to their approach to studying and their grade expectations: (1) a 11-item self-efficacy for self-regulated learning scale (Zimmerman, Bandura & Martinez-Pons, 1992); (2) a 20-item Study Process Questionnaire (R-SPQ-2F, Biggs, Kember & Leung, 2001); (3) a 14-item time-management questionnaire (Trueman & Hartley, 1996); and (4) a single item measure

of students' grade expectations (consistent with the spot marking scheme teaching staff used to assess students' projects). All of the scales used were found to be internally consistent (α = .79 -.97).

Supervisor questionnaire

Dissertation supervisors were asked to indicate the number of years they have been supervising undergraduate research projects and to complete the Supervisory Styles Inventory (SSI) (Friedlander & Ward, 1984). The 33-item measure assumes that a supervisor's approach can be understood along three distinct dimensions: (1) *Attractive* (i.e., high scores indicate a collegial approach to supervision (e.g., warm, friendly & supportive), α = .48); (2) *Interpersonally sensitive* (i.e., high scores indicate a relationship-oriented approach to supervision (e.g., perceptive, committed & therapeutic), α = .84); and (3) *Task oriented* (i.e., high scores indicate a task-focussed approach to supervision (e.g., structured, goal oriented, practical), α = .66).

Finally, supervisors were asked to two questions to assess their beliefs concerning responsibility for student achievement: (1) "If one of your supervisees receives a good grade for their dissertation project it is because the student had the ability to do well?" (0%-100%); and (2) "If one of your supervisees receives a good grade for their dissertation project it is because of the supervision you offered him / her?" (0%-100%)[4].

Results

Preliminary analyses

Of the 105 students who submitted a U24199 project report for assessment, 36 students volunteered to take part in the study. Given this low response rate (34.29%), it seemed

sensible to check if there were significant differences between those who did and did not complete the online questionnaire. Comparing anonymised dissertation grades, it was found that students who completed the online questionnaire achieved a significantly better grade for their psychology project (M = 65.39; SD = 7.13) than those who chose not to take part in Study 2 (M = 61.96; SD = 8.34) (t (103) = 2.10; p = .04). A significant positive correlation (r = .41, N = 36, p = .01) was also found between the grade students' achieved on their research methods and statistics course completed the year before and the grade achieved for their dissertation.

Main analysis

Pearson's r correlations were carried out to test the relationships between the grade participants' received for their final-year dissertation project and scores on any of the scales completed by students and their project supervisors. Table 2 provides a summary of these correlations[5].

- Table 2 about here -

Partial correlations were then conducted to control for the effects of participants' gender, age and their second-year research methods and statistics mark. Table 2 shows that, after controlling for participants' gender, age and their mark received on a previous research methods and statistics course, the correlations found between dissertation grades and both self-reported procrastination and students' own grade expectations remained significant. In contrast, the positive correlation between dissertation grades and self-efficacy for self-regulated learning was no longer found to be significant.

The correlation found between a student's dissertation grade and the supervisory experience of their project supervisor remained significant after controlling for participants' gender, age and the mark received on their research methods and statistics course the year before. The same second-order partial correlations also showed that (for the first time) students' dissertation grade was positively related to the extent to which their supervisor reported employing a 'task-oriented' supervisory style.

A hierarchical multiple regression was then conducted to test the extent to which the investigated variables might predict the grade that a participant received for their final-year dissertation project. Data from the supervisor questionnaire was excluded from the hierarchical multiple regression because of the low response rate from U24199 project supervisors. Participants' gender, age and their second-year research methods and statistics course mark were used as predictors in the first stage of the hierarchical regression ($R^2 = .21$, $F (3, 27) = 2.42$, $p = .09$). Following this, the psychological variables under investigation (e.g., conscientiousness, grit, deep approach to learning & dissertation grade expectations) were added to the second stage of the regression model ($R^2 = .54$, $F (12, 18) = 1.76$, $p = .13$). Self-efficacy for self-regulated learning was excluded from this regression model because of concerns about multicollinearity with other predictors[6]. In both cases, the regression models were not found to be significant.

Given the small participant sample and the non-significant findings of the hierarchical multiple regression, an exploratory stepwise multiple regression was conducted. This stepwise model showed that participants' grade expectations for their dissertation ($\beta = .54$) explained 27% of variance (adjusted r^2) in their dissertation grades, $R^2 = .54$, $F (1, 29) = 11.93$, $p < .01$.

Two stepwise binary logistic regressions were then used to test whether it would be possible to predict whether or not participants' achieved: (1) a 'good grade' for their dissertation project (i.e., an upper second or a first class grade); and (2) a first class

grade (i.e., a mark of 70% or above) for their dissertation project. In each case,

participants' dissertation marks were transformed into a dichotomous variable (e.g., did

the student achieve a 'good' / first class grade for their dissertation? – Yes/No) and

participants' sex, age, second-year research methods and statistics grade together with

the other nine psychological variables under investigation were used as predictor

variables[7].

The first stepwise model showed that procrastination (Exp(B) =.81, CI = (.68,

.97), p = .02) and grit (Exp(B) =.01, CI = (.00, .97), p = .049) significantly predicted

whether or not students received a 'good grade' (χ^2 (2, N = 31) = 10.30, p = .01).

However, given the stepwise approach, the wide confidence intervals and the borderline

p-value it seems unlikely that grit would be a reliable predictor beyond the confines of

this small sample of students. In contrast, the second stepwise model showed that

student's grade expectations (Exp(B) = 1.56, CI = (1.06, 2.31), p = .03) significantly

predicted whether or not they received a first class grade for their dissertation project

(χ^2 (1, N = 31) = 11.26, p < .01).

Discussion

The findings of Study 2 indicate that it might be possible to predict the grade that

students' receive for their final-year undergraduate research project using only a

handful of non-intellectual factors. Partial correlations found that self-reported

procrastination and student's own grade expectations were both significantly associated

with the mark achieved for their research project. Students with high procrastination

scores tended to perform worse on their undergraduate research project than those with

lower scores. Whilst those students who expected to receive a high grade for their final-

year project were more likely to perform better than those who did not. The importance of these two factors was further supported by subsequent regression analyses.

Students' grade expectations were found to be the only significant predictor of the final grades received and whether or not they received a first class grade for their dissertation. Likewise, self-reported procrastination was found to significantly predict whether or not students received a 'good grade' (i.e., an upper second or a first class grade) for their dissertation project. In both cases, these finding are in keeping with previous research that suggests the grades we expect of ourselves (Richardson, Abraham & Bond, 2012) and procrastination (Steel, 2007) are reliable predictors of academic performance at university. Together these findings indicate that it might be possible to predict those students who are likely to struggle with their final-year research projects (i.e., those with high procrastination scores) and those most likely to excel (i.e., those with high grade expectations); these factors therefore seem obvious candidates for any future investigations on this topic.

Study 2 also found evidence to suggest the behaviour of their project supervisor might have a significant impact on the quality of the dissertation produced by their supervisees. Students working under the supervision of a more experienced member of academic staff tended to outperform those supervised by less experienced supervisors. What's more, students supervised by a project supervisor who reported employing a 'task-oriented' supervisory style were found more likely to achieve a higher grade for their final-year research project than those supervised by less task-oriented supervisors. However, it must be noted that correlations were found using data obtained from a small number of supervisors ($N = 8$) who were supervising dissertation projects at the time of Study 2. These correlations should therefore be regarded with caution and will require further investigation before any firm conclusions are drawn about the impact of project supervisors upon their students.

General discussion

The two pilot studies reported here offer new and interesting insights to the non-intellectual factors that might be used to predict students' performance on their final-year dissertation projects. In Study 1, conscientiousness was positively associated with the mark that students achieved for their dissertation project, however this correlation was no longer found to be significant when the effects of gender, age and the grade achieved on an earlier research methods course were all controlled for. In contrast, Study 2 found that it was possible to predict the mark that student's achieved for their dissertation using a 20-item measure of procrastination and a single question concerned with the mark that they expected to receive for their research project. These findings raise the prospect of perhaps routinely administering simple questionnaire measures like these at the beginning of their dissertation projects to identify those students most likely to struggle with this aspect of their course.

Apart from highlighting candidates for future investigations concerned with academic outcomes at university, the findings of Study 2 may also have implications for the development of more effective teaching practices and interventions. For example, teacher beliefs and expectations have long been known to have significant impact on student achievement (e.g., Rosenthal & Jacobson, 1968). Perhaps dissertation supervisors should consider adopting teaching practices that encourage high expectations among all of their supervisees (regardless of their past achievements at university). The present findings suggest that raising a student's own expectations is likely to improve academic outcomes and may increase the likelihood of receiving a first class grade for their dissertation.

Although seemingly ubiquitous (Ellis & Knaus, 1977; Solomon & Rothblum, 1984; Zarick & Stonebraker, 2009), academic procrastination among university students is not inevitable and a variety of interventions have been found to significantly reduce procrastination. These interventions range from brief cognitive-behavioural programmes (e.g., Ozer, Demir & Ferrari, 2013, Rozental, Forsell, Svensson, Andersson, & Carlbring, 2015); time management training (Hafner, Oberst & Stock, 2014); training to enhance emotion regulation (Eckert, Ebert, Lehr, Sieland, & Berking, 2016); to imposing restrictions on working time (Hocker, Engberding, Haferkamp & Rist, 2012). However, educators might also consider modifying the course design and assessment strategies used for the final-year dissertation project in ways that are likely to reduce student procrastination. For example, rather than just focusing on the final *product* (i.e., the written report), elements of the dissertation *process* (e.g., research proposal, interim report, oral presentation) might also be assessed.

Study 2 also found evidence to suggest that the behaviour of their project supervisor might have a significant impact on the quality of the dissertation produced by their project students. Students working under the supervision of a more experienced member of staff were found more likely to receive higher marks those supervised by less experienced supervisors. What's more, students supervised by a project supervisor who reported employing a 'task-oriented' supervisory style tended to perform better than those supervised by less task-oriented supervisors. These findings raise a number of interesting questions and may have implications for how academic departments and staff supervise their final-year dissertation students. For example, do more experienced members of staff supervise students differently to their less experienced counterparts? If so, what can those new to project supervision learn from them? Should we encourage / train all supervisors to adopt a more impersonal, highly structured, task-oriented supervisory style? If so, should supervisors supervise all of their students in the same

way or should project supervision be tailored to suits the individual needs of each student?

Although these findings are thought-provoking, the two pilot studies reported here are certainly not without their limitations. First, the samples recruited in each case were small (N = 28 & 36) and the statistical analyses undertaken were almost certainly underpowered as a consequence of this. Second, students in both pilot studies were not representative of all the psychology undergraduates who submitted a final-year dissertation report. In both cases, it was found (upon reviewing anonymised grades) that those students who took part achieved significantly better marks for both their research project than those who chose not to. These significant differences are indicative of a clear response bias.

High achieving students were perhaps more willing to volunteer when invited to take part in a project that concerned their undergraduate research project, whereas those struggling with their dissertation may have been less comfortable with this. Studying these small, self-selected samples of high achieving students is far from ideal and is likely to have skewed the present findings to some extent. In Study 2, a financial incentive was hoped to improve responses rates, encouraging a larger and more representative cohort of students to take part, but this did not prove to be the case. Future investigations on this topic should learn from these two pilot studies and take steps to mitigate against this apparent sampling bias.

Aside from sampling, the main limitation of the two pilot studies reported here was the timing of questionnaire administration. Students were asked to complete an online questionnaire shortly after submitting their dissertation projects for marking; it is therefore conceivable that the associations observed in both studies were the result of participants reflecting on their own performance and feedback received over the previous six months[8]. To address this issue, prospective studies will be needed to

explore whether or not similar links are found when questionnaires are administered at

the beginning of the student's final-year rather than after at the end.

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1 The use of a fixed marking scheme meant that marks awarded in each degree classification (e.g., an upper second or '2.1') can only be given on one of a predetermined series of marks (e.g., 62, 65 or 68)).

2 Students taking the U24137 course are required to design, and conduct an investigation on a topic of their own choosing. The overall U24137 grade is assessed by both a brief written project report (i.e. 2,000 words) and a multiple-choice exam concerned with the statistical analysis of raw data.

3 Of the eight supervisors who started the online questionnaire, only 6 completed all elements of the supervisor questionnaire.

4 In each case, the supervisor's responses to this questionnaire were matched with the questionnaire responses of each of their U24199 project students.

5 The full matrix table of all the possible zero-order correlations was not included here in-order to present the results with greater clarity, but this table will be made available on request to the corresponding author.

6 Scores on the self-efficacy for self-regulated learning scale were found to be highly correlated with measures of conscientiousness ($r = .83$), confidence in long-term planning ($r = .82$), grit ($r = .80$) and procrastination ($r = -.77$).

7 Again self-efficacy for self-regulated learning was excluded from these two stepwise binary logistic regressions because of concerns about multicollinearity.

8 For example, it is possible that students who performed well throughout the course of their dissertation were more likely to regard themselves as more conscientious or to hold higher grade expectations, rather than conscientiousness or high grade expectations leading them to perform well.

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Table 1.

Summary of the correlational coefficients between students' dissertation grade, conscientiousness, procrastination and grit

	Conscientiousness	Procrastination	Grit
Zero order correlations (N = 28)			
Dissertation grade	.34*	-.12	.24
Conscientiousness		-.72**	.74**
Procrastination			-.63**
Grit			
1st order correlations (df = 24)			
Dissertation grade	.33*	-.09	.21
Conscientiousness		-.65**	.69**
Procrastination			-.55**
Grit			
2nd order correlations (df = 23)			
Dissertation grade	.33	-.17	.18
Conscientiousness		-.69**	.68**
Procrastination			-.62**
Grit			

*$p < .05$; ** $p < .01$.

Table 2.

Summary of the correlational coefficients between students' dissertation grade and non-intellectual factors

	Student questionnaire										Supervisor questionnaire (N = 13)					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Zero order correlations (N = 31)[ab]																
Dissertation grade	.26	.19	-.44*	.25	-.18	.38*	.24	.22	.54**	.10	.60*	.17	-.38	.40	.19	-.31
1st order correlations (df = 27)[c]																
Dissertation grade	.21	.18	-.44*	.16	-.15	.24	.21	.24	.48**	.13	.58*	.24	-.40	.49	.26	-.32
2nd order correlations (df = 26)[d]																
Dissertation grade	.17	.23	-.43*	.23	-.16	.28	.23	.30	.49**	.07	.66**	.17	-.57	.87**	.21	-.61

*$p < .05$; ** $p < .01$

[a] Zero order correlation between dissertation grade and years of self-efficacy for self-regulated learning (N = 36)

[b] Zero order correlation between dissertation grade and years of supervisory experience (N = 15)

[c] 1st order correlations between dissertation grade and supervisor questionnaire data (df = 9), with exception of years of supervisory experience (df = 11)

[d] 2nd order correlations between dissertation grade and supervisor questionnaire data (df = 8), with exception of years of supervisory experience (df = 10)

Note:
1 = Conscientiousness; 2 = Grit; 3 = Procrastination; 4 = Deep approach to learning; 5 = Surface approach to learning; 6 = Self-efficacy for self-regulated learning; 7 = Daily planning; 8 = Confidence in long-term planning; 9 = Student grade expectations; 10 = Student satisfaction with dissertation project supervision; 11 = Years of supervisory experience; 12 = Attractive supervisory style; 13 = Interpersonally sensitive supervisory style; 14 = Task oriented supervisory style; 15 = Supervisor's belief that the student (0%-100%) is responsible if their student receives a good grade for their dissertation project; 16 = Supervisor's belief that the supervisor (0%-100%) is responsible if student receives a good grade for their dissertation project;