COGNITIVE AND NON-COGNITIVE PREDICTORS OF ACADEMIC PERFORMANCE IN PSYCHOLOGY STUDENTS: HOW USEFUL ARE THESE FOR IDENTIFYING POTENTIAL TO SUCCEED AT UNIVERSITY?

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Cognitive and non-cognitive predictors of academic performance in Psychology students : how useful are these for identifying potential to succeed at University?

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The recent Government initiative to increase access to Higher Education has produced much interest in predictors of University performance. A-levels, traditionally the major source of information relied upon by admissions staff, have proved to be weak predictors of future academic success. The current study explored predictors of academic success in Psychology undergraduates at Aston University, and confirmed that previous academic performance only explains a small amount of variance in grades achieved. The effect was particularly modest for initial low achievers: for this group, a deep learning approach was more predictive. Non-cognitive constructs (Conscientiousness, strategic approach to learning) were also more useful predictors for initial high achievers. In general, the deep and strategic approaches to learning yielded useful predictive information, along with the Big Five traits Conscientiousness and Openness, though for the latter, the second order traits were more informative. These results suggest that non-cognitive measures may be useful predictors of potential to succeed at University. Non-cognitive constructs are, however, generally assessed via self-report measures, which are subject to response distortion or 'faking.' The extent to which students could fake their responses on personality (NEO-FFI) and learning style (ASSIST) questionnaires was also explored It was found that students could 'fake' in line with a general stereotype for an ideal student, the latter characterized by low scores on Neuroticism, and high scores on all other Big 5 traits, although Openness was resistant to faking. Fakers also scored higher on deep and strategic approaches to learning. A repeated measures study confirmed previous suggestions that there are individual differences in faking ability, and that fakers tend to rise to the top of a mixed sample. The decay in predictive validity when participants fake has implications for the application of non-cognitive measures in academic settings, although Conscientiousness retained its predictive effect regardless of instructional set.

KEYWORDS: ACADEMIC PREDICTORS; PERSONALITY; APPROACHES TO LEARNING; FAKING.

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CHAPTER 1
PREDICTORS OF ACADEMIC PERFORMANCE: BACKGROUND AND AIMS

1.1 Contextual Background

The last decade has seen an increased interest in predictors of academic performance, with much debate on whether conventional measures of academic achievement are the best predictors of future performance at University and beyond. The publication of the controversial American book 'The Bell Curve ' (Herrnstein & Murray, 1994), in which the authors envisaged a society increasingly stratified by cognitive ability, coincided with the publication of a meta-analytical review of academic predictors in the UK, which concluded that A-level results were only moderately associated with subsequent performance at University (Peers & Johnston 1994). More recently, individual cases such as that of Laura Spence, the state educated pupil who failed to gain admission to Oxford despite achieving exemplary GCSE and A-level results, have captured public interest in issues such as intelligence, aptitude testing, and socio-economic factors affecting University entrance. These issues provided much of the impetus for the Sutton report, which looked at the possible application of the American Scholastic Aptitude Test (SAT) for University admissions in the UK (McDonald, Newton, & Whetton, 2001a). Other key projects, most notably the Government White paper (Clarke, 2003) and The Fair Enough report (Sinclair, 2003) have identified the need for more open discussion of the role of post 16 examination attainments in HE admissions.

The Government's White Paper, *The Future of Higher Education*, (Clarke, 2003) demonstrated a distinct commitment to Widening Participation. Two of the key issues were those of University application and admissions: HEI's were advised to take steps to encourage a broader range of applications, especially those from non-traditional backgrounds. Further to this, Universities wishing to charge higher tuition fees would be required to demonstrate good practice in their admissions procedure. Thus in additional to

ethical considerations, there are financial incentives for Universities to embrace Widening Participation issues.

The Fair Enough report aimed to improve the offer decisions made by Higher Education institutions by allowing the admissions process to be informed by objective criteria related to academic success. In terms of Widening Participation, the project aimed to identify and facilitate access for those whose potential to succeed might otherwise be missed. The report could be criticized for drawing conclusions based on results from only six HEI's. Also, the criteria identified were not truly objective: many of the results were gathered on the basis of tutor observations and opinions, which were not easily quantifiable. Neither were the criteria linked to any specific performance outcome. Nevertheless the project raised awareness of the importance of Widening Participation, and led to government investment in various projects aimed at investigating the potential to succeed in Higher Education.

1.2 Predictors of Academic Performance

A-levels have traditionally been the major source of information relied upon by admissions staff at most UK Universities. However, the meta-analysis conducted by Peers and Johnston (1994) demonstrated an overall association of only 0.28 between A- level and degree grades. Although significant, this result indicates that A-level grades are minimal predictors of future academic performance, with 92% of the variation in final degree performance remaining unexplained.

Tests of academic achievement such as A-levels largely measure subject-specific competence in the form of crystallized intelligence, based on accumulated knowledge and experience. Alternatives to A-levels include specific University entrance examinations, and standardized tests such as the Scholastic Aptitude Test (SAT). It is almost a century since Alfred Binet developed one of the initial intelligence tests with the aim of predicting school performance, and since then, the capacity of standardised cognitive ability tests to predict

academic performance has prompted much research and discussion (e.g. Anastasi, 1988; Cronbach, 1990; Neisser et al., 1996).

The relatively low predictive validity of cognitive factors for academic achievement has led to a recent shift in interest to non-cognitive predictors. It is important to note that as students advance through their education, the range of intellectual ability will become progressively restricted as this is the main selection criterion. This will inevitably reduce the predictive power of cognitive factors within that population. Subsequently, non-cognitive traits become increasingly influential in predicting academic success at Higher Education level (Conard, 2006; Furnham, Chamorro-Premuzic, & McDougall, 2003; Lounsbury, Sundstrom, Loveland, & Gibson, 2003). Non-cognitive factors have also proved to be more useful than previous academic results in predicting the University performance of mature students, especially those with non-traditional entry qualifications (McKenzie & Gow, 2004). A wide range of factors have recently come into spotlight, including personality (Allik & Realo, 1997; Furnham et al, 2003; Rindermann & Neubauerb, 2001), biodata and situational judgement inventories (Oswald, Schmitt, Kim, Ramsay, & Gillespie, 2004; Randsell, 2001), approaches to learning (Diseth & Martinsen, 2003) and emotional intelligence (Newsome, Day, & Catano, 2000; Parker, Summerfeldt, Hogan, & Majeski, 2004). These will be considered in this thesis in conjunction with the Fair Enough criteria.

Furnham et al (2003) proposed that students with low intellectual levels may compensate for their lack of ability by optimizing or developing personality traits and learning strategies that contribute to academic success. Other researchers have suggested that there is a wide overlap in the predictive information provided by traditional assessments of intelligence and personality tests, and that the latter alone could be used for selection purposes (Chamorro-Premuzic & Furnham, 2003; Rindermann & Neubauer, 2001). However, the interaction between all the individual factors that affect academic performance is likely to be rather more complex than this, and many of the studies to date suffer from methodological issues which restrict the extrapolation of results to a wider field.

1.3 Limitations of previous work in this area and how these may be addressed

1.3.1 Range restriction within retrospective studies

Most studies to date have been retrospective, drawing on an easily accessible body of undergraduate participants, and have consequently been constrained by cohort effects. Cognitive factors will already have been selected for to some extent in terms of successful progression to University, and so there will be less variance in academic ability compared to a population of potential applicants.

Range restriction generally reduces the strength of correlations. It is possible to make statistical corrections for this if data are available for the population from which the selection was made, but Universities tend not to retain information relating to non-successful applicants. Places are usually offered on the basis of predicted grades, so a candidate may be 'unsuccessful' at two levels – by failing to be offered a place, or by failing to achieve the required grades to take up a place. Also, potential students base their applications on predicted grades and expectations, so they have already self- selected to some extent. Finally, correcting for range restriction makes assumptions about the distribution of cognitive and non-cognitive traits, by assuming that linear relationships found within study samples also exist within the whole population. It is possible that successful University applicants have distinct characteristics compared to their non-successful peers, and that these do not vary along a linear continuum.

The limitations of retrospective studies could be best addressed by conducting prospective studies in which data are gathered from young people that do not subsequently attend University (either through choice, or because they are 'unsuccessful') as well as those that go on to further study at HE. Data should be collected during participants' pre-University year (year 13 pupils), and followed up for a minimum of one year. Ideally participants would be tracked until graduation, but four-year studies are rarely feasible.

However, previous research has demonstrated that results achieved in the 1st year at University correlate significantly with final year results, thus these can be used with some confidence as a measure of University achievement (Busato, Frans, Prins, Elshout, & Hamaker, 2000).

The current study aimed to include one data set from a sample of year 13 students. This would potentially allow collection of follow-up data from participants who subsequently did not progress to Higher Education, as well as those who did. A comparison of the psychometric profiles of a general applicant pool with those of an undergraduate population would also validate the extrapolation of results obtained from the latter to the former.

1.3.2 Study Design and Analysis

A recent meta-analysis of predictors of college outcomes identified difficulties in comparing the results of different studies (Robbins, Lauver, Davis, Langley, & Carlstrom, 2004). Some studies had amalgamated results from part-time, full time, and both traditional and non-traditional students. The results of such studies must be interpreted with care, as they may have limited practical application due to small effect sizes and lack of specificity regarding the applicant pool. Large sample sizes may yield statistically significant results even though the correlations between variables are too small to have any real meaning in terms of the amount of additional outcome variance explained. Future research needs to focus on specific student groups. This is particularly pertinent within a Widening Participation context where extrapolation of results from broader studies may not be appropriate. The current project aimed to explore academic predictors in initial low-achievers as well as a broader, more typical sample.

Robbins et al (2004) also indicated that several studies had used tests whose psychometric properties had not been fully explored. This has implications for the interpretation of results. The studies presented in this thesis aimed to use measures with

proven reliability and validity, and which had been previously applied within an educational setting.

A final issue involves the shift in interest to explore the effect of non-cognitive factors on academic performance: in many studies, non-cognitive factors have been considered in isolation from cognitive factors (e.g. Diseth, 2003; Paunonen & Ashton, 2001a). However, as non-cognitive measures are more likely to be used in addition to academic predictors rather than as a replacement, it is important that they are explored in terms of their incremental predictive validity. This has been more recently recognized (e.g. Chanorro-Premuzic & Furnham, 2003; Martin, Montgomery, & Saphian, 2006), and there has been concurrent interest in the relationship between cognitive and non-cognitive traits (Chamorro-Premuzic, Moutafi, & Furnham, 2005) and the integration of these factors into an interactive model (Chamorro-Premuzic & Furnham, 2004). In order for research into predictors of academic performance to have a practical application, cognitive and non-cognitive factors need to be explored in tandem and the inter-relationships investigated within specific student groups. The design methodology for the current study aimed to embrace these issues.

1.3.3 Defining 'Success' at University

The parameter for 'success' is often taken as final grade / mark achieved, whereas this should perhaps be defined as 'degree achieved'. Following a meta – analysis of factors affecting college outcomes, Robbins et al (2004) identified one of the problems to be the "lack of conceptual clarity or consistency with regards what constitutes a college outcome" (p262). Indeed, within a context of 'Widening Participation' the focus should perhaps be on the lower end of the ability range, where success could be defined simply as access to University, and a key issue surely should be to establish why some students improve their academic performance while others maintain the same level or show a decrease in performance? That is, given a certain level of academic performance or ability on entrance to University, why do some students exceed expectations?

Identifying characteristics of students whose performance at University improves (compared to those who do not) would provide greater information regarding attributes that can potentially over-ride previous academic performance. Students who have a weaker academic profile on entrance to University have greater capacity to improve, and consequently there is likely to be greater differentiation within this group than within average or high achievers, whose scope to improve will be restricted by a ceiling effect.

Part of this thesis explores characteristics of 'improver students', i.e. initial low-achievers who perform beyond expectations at University. These are compared to characteristics of students whose performance at University falls short of expectations (i.e. initial high achievers whose performance at University declines) and applicants with an 'average' academic profile who sustain similar levels of academic performance at University. Exploring predictors of academic success in initial low-achievers is also more in keeping with the ethos of Widening Participation than research focusing purely on predictors of elite performance.

1.3.4 Practical Application / Ethics

It is important to keep sight of the ultimate aim of research within Widening Participation: namely to explore alternative methods of identifying potential to succeed at University. The ethical aspects of the use of non-cognitive psychometric tests for admission to education have received little consideration to date.

The possibility of test bias and faking, in particular, needs to be considered. Experimental participants may not respond in the same way as *bone fide* applicants due to different levels of test anxiety and motivational factors, and in real life situations, results may be further distorted due to deliberate faking. Although many tests claim to include effective impression management scales, a recent study demonstrated that realistic faking is possible (Brown & Harvey, 2003). Several researchers have demonstrated that respondents will attempt to match their personality profile to their perception of the ideal, or stereotyped, personality for the requirements of a specific job (e.g. Furnham, 1990; Martin,

Bowen, & Hunt, 2002; Paulhus, Bruce, & Trapnell, 1995; Scandell & Wlazelek, 1999; Topping & O'Gorman, 1997). Further to this, it has been demonstrated that there are individual differences in faking ability (McFarland & Ryan, 2000) and that these differences may reflect variations in cognitive ability (Biderman & Nguyen, 2004; Brown & Cothern, 2002). It is likely that University graduates would wish to portray an ideal image when completing personality and attitude measures. The validity of using such tests to predict academic performance is thus questionable if they are simply providing an additional, albeit subtle, measure of cognitive ability.

The current study aims to explore whether a stereotype exists for an 'ideal' student, and will also focus on the impact of realistic faking on test results and their subsequent predictive validity. If faking is indeed possible, this has implications for the use of non-cognitive measures as part of a University application procedure, as this would inevitably lead to test practice and coaching.

1.4 Aims of Current Study

To explore cognitive and non-cognitive factors linked to success in Higher Education.

1.4.1 Objective / Practical Application

Identification of measures, which could be utilised within University admissions procedures to encourage a wider applicant pool.

1.4.2 Specific Aims

- Chapter 2 reviews the literature regarding cognitive and non-cognitive psychometric measures, and their ability to predict performance

- Chapter 3 presents two pilot studies: one which is a preliminary exploration of academic predictors, the second aiming to explore and compare non-cognitive factors in both 6th form pupils and first-year undergraduates

- Chapter 4 explores the inter-relationship between cognitive and non-cognitive factors and their effects on academic performance, with a particular focus on 'improver' students, and aiming to identify specific factors indicative of potential to succeed

- Chapter 5 explores in greater depth the non-cognitive factors that predict academic performance

- Chapter 6 investigates student and tutor perceptions of the 'ideal' profile for an University applicant / student, and explores the extent and effect of 'faking' on non-cognitive measures

- Chapter 7 explores individual differences in faking ability, and the effects of test familiarity and practice on test scores

- Chapter 8 summarises the main findings and presents a model for the integration of cognitive and non-cognitive factors to predict performance at University

1.4.3 Measures to be used

There were four main criteria for inclusion:

1. Measures should be linked to the criteria identified in the 'Fair Enough' report (Sinclair, 2003) as indicative of academic success at HE (see table 1.1).

2. Only measures with sound psychometric properties were considered, that is those with demonstrated internal consistency, test-retest reliability and construct validity.

3. Some evidence of the measures' predictive validity was required, as identified in recent peer-reviewed research. Although newer and subsequently less established measures were considered, well-established tests were preferred because of limited sampling opportunities. This would ensure that results would allow conclusions to be drawn regarding the constructs rather than the validity of the tests.

4. In order to gain sufficient volume of data and participant numbers, individual testing was not feasible, thus only group administered tests were considered.

Based on a broad knowledge of relevant, psychometric constructs, each of the Fair Enough criteria were matched against underlying constructs as shown in table 1.1. Tests to measure the following constructs were subsequently explored, as these covered all the Fair Enough criteria.

- Academic ability
- General Intelligence
- Personality
- Learning Styles / approaches to learning
- Academic Motivation
- Emotional Intelligence
- Self-efficacy

Chapter two reviews the literature regarding these factors and the measures available to collect relevant data.

Table 1.1: 'Fair enough' criteria and underlying constructs

Criterion	Trait
Keeps to course work hand in deadlines	Personality / Learning approach
Follows assignment deadlines	Personality / Learning approach
Focuses on answering questions set in assignments	Approach to Learning
Able to balance paid employment, home responsibilities, leisure activities with study attendance	Emotional Intelligence
Reads independently outside set texts	Learning style / Motivation
Learns from and acts on feedback	Approach to Learning
Does preparatory work outside the classroom	Approach to Learning
Asks for guidance	Emotional Intelligence / Personality
Able to make independent judgments	Emotional Intelligence / Personality
Demonstrates engagement with studies	Motivation / Personality
Takes advantage of learning opportunities on offer outside the curriculum	Approach to Learning
Interest in subject Area	Subject Specific knowledge / Motivation
Persistent in studying something that may be difficult at first	Self - efficacy / Motivation
Participates in class	Personality
Puts effort into work	Personality / motivation
Demonstrates enthusiasm for learning	Personality / motivation
Takes advantage of learning opportunities on offer outside the curriculum	Personality / motivation
Intellectually able	Academic ability
Critical thinking and problem solving ability	General Intelligence
Able to participate in a team	Personality / Emotional Intelligence
Communication and self-confidence	Emotional Intelligence / Personality

CHAPTER 2:
COGNITIVE AND NON-COGNITIVE PREDICTORS OF ACADEMIC PERFORMANCE (LITERATURE REVIEW)

2.1 Cognitive Predictors

2.1.1 Academic Ability

In general there are two possible approaches for assessing academic capacity. The first assesses the student's current level of subject-specific competence while the second relies on measuring aptitude for future learning at college on the basis of tests of general cognitive ability. The relative merits of these two approaches are currently under scrutiny worldwide: the American College Board has implemented major modifications to the SAT in the last decade, with a shift away from measurements that tend to assume that academic ability and aptitude for university is somehow fixed, toward an assessment framework that includes measurement of more adaptable verbal and mathematical abilities (Everson, 2003). The SAT focuses on verbal reasoning and mathematical problem-solving, and interestingly correlates more highly with results for the General Certificate of Secondary Education (GCSE) than with A-levels (McDonald, Newton, & Whetton, 2001b). It is possible that the range of subjects studied at GCSE provide a better reflection of general ability than the more subject-specific A-levels. There are anecdotal suggestions that GCSE results are also better predictors of University success than A-levels, although there is little supporting empirical evidence.

Academic ability at pre-University level is currently assessed in the UK by a combination of A-level and GCSE results. Most Higher Education Institutions offer places on the basis of A-level tariff points. Some, such as Aston University calculate points for the best three subjects, rather than the total points for all. It is thought that accumulating points over a larger number of subjects is a weaker indication of ability, although there is no empirical basis to this. Other establishments specify particular subject requirements. GCSE

English and Mathematics and Science pass grades are also usually necessary. Recent proposals for long term reform of the curriculum and qualifications for 14-19 year-olds in the UK entail a system of specialized pathways based on a core of generic skills, knowledge and experience (Tomlinson, 2003).

Predictive Validity of Academic Achievement for Success at University

Much of the research evaluating specific academic achievements as predictors of University performance has been conducted on an institutional basis, with the aim of refining entry requirements for particular programs of study. A study of academic success in nursing education, for example, demonstrated that basic sciences, among other factors, contributed significantly to student success in the program. The researchers suggested that the analytical skills acquired in science courses might prepare students for critical problem solving in nursing studies (Wong & Wong, 1999).

A wide-scale retrospective study of academic and non-academic characteristics of medical students demonstrated varying predictive effects of Chemistry and Biology grades at both GCSE and A-level (James & Chilvers, 2001). In general it was found that A grades at Ordinary level/GCSE were not consistent independent predictors of success at University. This is interesting when the very stringent requirements for entry to medical school are considered. In common with all retrospective analyses, the study was limited by the fact that the range of grades considered was already restricted by previous entry requirements: applicants who were not offered places or who failed to reach the required grades were not included in the survey. Another study to investigate which pre-professional academic and personal characteristics were related to academic and clinical success in a physical therapy program showed that pre-professional science and cumulative GPAs were significantly correlated with cumulative GPAs in the program (Levine, Knecht, & Eisen, 1986).

It is difficult to compare the results of studies such as those reported above, when entry requirement, and subsequently applicant groups, are not the same. Meta-analyses,

such as that completed by Peers and Johnson (1992) and more recently by Kuncel, Helzlett, and Ones (2001) have attempted to draw together the results of individual projects, but these are limited by the design of original studies, which may include missing data or estimations. In an attempt to overcome these difficulties, The Educational Testing Service in the US set up a collaborative study of 1700 participants within 21 departments, using a common design methodology (Burton & Wang, 2005). They found that the unique contribution of grade point average at entry to final achievement was 9% - very similar to the results obtained by Peers and Johnson in the UK (1992). However, much of the study focused on students enrolled for Masters and Doctorate degrees and it is therefore difficult to generalize their findings at undergraduate level.

A-levels versus the SAT

The current practice of relying on A-level grades to allocate places at University clearly leaves much of the variance in performance at University unaccounted for, and a recent Mori poll for the Sutton Trust showed that 55% of secondary school teachers in England and Wales believed the Scholastic Aptitude Test (SAT) would be a useful tool for University admissions tutors alongside A-level results. In contrast a recent survey undertaken by the National Center for Fair & Open Testing showed that a growing number of colleges and Universities in the US do not require applicants to submit SAT scores. Although it was previously claimed that the SAT could identify a student's potential for Higher Education regardless of educational experience, ethnic background and social circumstances (e.g. Clare, 1999), these claims have little empirical support and have recently been refuted (McDonald et al, 2001a; Powers & Rock, 1999).

The SAT has roughly the same predictive validity as A-levels but has been shown to tap different constructs, the shared variance being approximately 25 percent (McDonald et al, 2001b). Thus administration of SAT *in addition to* A-level does account for more of the variability in University Performance. However the combined predictive validity is still modest – with estimates between approximately 8% and 13% for A level / HSGPA , increasing to just below 20% if SAT results are added (McDonald et al, 2001b). How

much additional variance a measure would have to explain to warrant its wide spread use as part of an application procedure for HE is a debatable point.

A comparison of the SAT with the more recently developed subject specific SAT II revealed that the latter was not only a better predictor of future academic performance, but was also less sensitive to socioeconomic and other background factors (Geiser & Studley, 2001). Baron and Norman (1992), looked at the ability of high school class rank, the SAT I, and SAT II to predict cumulative college GPA's and found that the SAT I was the weakest predictor of college grades, explaining only 4% of the variance, while SAT II scores accounted for 6.8% . They found that in general there was a high correlation between the SAT I, SAT II and other college admissions examinations, and suggested that this was partly due to their similar format (i.e. timed, multiple-choice tests normed on national samples of students). These assessments cater to one kind of learning and test-taking style, and arguably suit a more surface approach to learning, whereas success at University is associated with deep and strategic approaches (Newstead, 1992). The final score may therefore not reflect a student's true abilities and potential to succeed in Higher Education.

There are additional concerns in terms of the application of the SAT within a Widening Participation context:

- The SAT has proved to be poor predictor of performance for students with learning difficulties, or those requiring special test conditions (Ragosta et al, 1991)

- The predictive validity for success at HE declines with age (Moffatt, 1993)

- There is a possibility of test bias: some skills related to test performance (e.g. problem solving) may be affected by the standard of education offered at school (Neisser et al, 1996)

- It has been suggested that the predictive validity of the SAT may be gradually declining due to changes in University policies such as greater number of non-traditional students (McDonald et al, 2001b). It is possible, however, that the

increased tutorial support and intervention procedures for low-achieving students also have a part to play in reducing the effects of pre-University factors.

The popularity of the SAT in the US is declining. Fair Test Public Education Director Robert Schaeffer (2005) states that a number of selective schools are

> ".... reviewing their admissions rules. We expect the ACT/SAT optional list to continue growing as more institutions recognize that the tests remain biased, coachable, educationally damaging and irrelevant to sound admissions practices. As leaders of the new test-optional campuses have eloquently stated, dropping ACT and SAT score requirements will enhance diversity and academic quality."

Conversely, the National Foundation for Educational Research (NFER) have recently launched a £1.6 million five-year study with the aim of examining the ability of the SAT to predict University outcomes in the UK (Goodwin, 2005). This parallel but opposing use of the SAT in the two Educational systems is interesting. It may be that tests that are initially fair and unbiased lose their equitable status over time, as test familiarity and coaching is developed.

In addition to the concerns regarding the use of the SAT within a Widening Participation context, the minimal additional information likely to be provided by the test results failed to justify the use of the SAT in the current study. In support of this decision, a review of aptitude testing in general showed that despite their modest ability to predict success at University, A-level still out perform any other measure of cognitive aptitude in this respect (McDonald et al, 2001a). Thus, for the current study, a combination of GSCE, subject specific, and general A-level results was used.

2.1.2 General Intelligence

A literature review of the validity and utility of selection methods in personnel psychology (Schmidt & Hunter, 1998) identified that general mental ability is by far the most effective predictor of job- related learning, correlating 0.56 with work performance. They suggested that the major reason that more intelligent people have higher job

performance is that they acquire greater, and more rapid, job knowledge - that is that the while mental ability may have a direct effect on job performance, there is an even greater indirect effect, through job knowledge. There have been fewer studies to explore the predictive validity of general ability tests at Higher Education level, although Kuncel et al (2004) showed an average correlation of 0.32 between the Miller Analogies Test and graduate student performance.

General intelligence (g) is comprised of fluid intelligence (g_f) – an innate ability, which is independent of education and experience, and crystallized intelligence (g_c) – a more dynamic ability, which consists primarily of acquired knowledge (Cattell, 1987). Several researchers (e.g. Abad, Colom, Juan-Espinosa, & Garcia, 2003; Deary et al, 1996) have shown that there is greater differentiation of g within lower ability groups: the more highly g-loaded tests were better predictors of performance in lower (compared to higher) ability groups. This indicates that a test of general intelligence could prove particularly helpful in identifying low-achieving students with potential to succeed. As crystallized intelligence would be largely assessed by GCSE and A-level results in the current project, a measure of fluid intelligence would be an useful addition to the test battery. Inclusion of a measure of fluid intelligence would also be useful when exploring non-cognitive factors in terms of partialling out the effect of intelligence on the criterion variables.

Fluid intelligence is assessed by tests of general ability which involve tasks requiring abstract reasoning in situations where past knowledge and education can offer little assistance in coming to an answer (Deary, 2001). Tests aim to tap underlying raw learning ability that can influence a person's ability to manipulate and process information, and should therefore allow identification of aptitude for future learning independent of past scholastic achievements. This is particularly pertinent within a Widening Participation context.

A culture-free measure of fluid intelligence, which would be minimally affected by scholastic achievement, was sought for this study. Three tests were considered on this basis: the WAIS (Weschler Adult Intelligence Scale), Raven's Progressive Matrices and the

MAT (Millers Analogies Test). The WAIS was not appropriate as it requires individual application: tests that could be applied in a group setting were necessary for this study. The MAT was also thought unsuitable as test results on this measure have recently been shown to be affected by verbal ability, which is generally considered to be linked to crystallized rather than fluid intelligence (Kuncel et al, 2004).

Designed to be applied in group settings, Raven's Standard Progressive Matrices (RPM) consist of 60 items of increasing difficulty, which measure a person's ability to form comparisons, build perceptual relations and to reason by analogy. Test performance is claimed to be independent of culture, language and formal schooling (Ravens, 1976) although there is evidence that some of the test items which focus on spatial ability may have a male advantage (Colom, Escorial & Rebollo, 2004; Mackintosh & Bennett, 2005). With this caveat, however, Raven's matrices have been shown to have high reliability and validity and were considered by Spearman (1946)to be the best non verbal measure of 'g', a view more recently endorsed by Jensen (1998). Mills and Tissot (1995) showed that a significantly higher proportion of minority children scored well on the RPM than on a traditional measure, and so this measure would seem to be a good choice from a Widening Participation perspective.

2.2 Non-cognitive Predictors

2.2.1 Personality

Decades of research into personality have led to a general consensus that patterns of individual behaviour can generally be explained by five domains: Neuroticism, Extraversion, Openness (to experience), Agreeableness, and Conscientiousness (e.g. Costa & McCrae, 1992; De Raad & Schouwenburg, 1996; Goldberg, 1990). The NEO FFM (Five Factor Model) was developed on the basis of factor-analysis and theory, and is designed to measure these five variables and their second order factors (Costa & McCrae, 1985; McCrae & John, 1992). The model has received some criticism for being over-simplistic, with claims that single adjectives are unable to fully describe the intra-individual and cross-

situational variations in personality characteristics (Dawda, 1997). Nevertheless the measure has proved robust, with excellent reliability and validity, and has yet to be superseded by a 'better' empirical or theoretical model.

The Big 5 factors

Neuroticism

Neuroticism refers to a tendency to experience negative feelings such as fear, sadness, embarrassment, anger and guilt (Costa & McCrae, 1992). Individuals who score low on Neuroticism demonstrate emotional stability, impulse control, and ability to cope with stress (Costa & McCrae, 1992). Several studies have supported the hypothesis that high Neuroticism has an adverse effect on academic performance (e.g. Ackerman & Heggestad, 1997; De Raad & Schouwenberg, 1996; Duff, Boyle, Dunleavy, & Ferguson 2004). However others have found no such association (Busato et al., 2000; Halamandaris & Power, 1999). Some researchers (e.g. De Fruyt & Mervielde, 1996; Furnham & Mitchell, 1991; Rothstein, Paunonen, Rush, & King, 1994) have provided mixed evidence, finding significant negative correlations using some criterion variables and no such relationships using others.

Neuroticism is consistently negatively correlated with intelligence (e.g. Ackerman & Heggestad, 1997; Chamorro-Premuzic et al, 2005), although more recently it has been suggested that this relationship is mediated by test anxiety and that Neuroticism may not relate to intelligence per se, simply to performance on intelligence tests (Moutafi, Furnham & Tsaousis, 2006). Thus in an academic setting, it is possible that the type of assessment strategy affects the relationship between Neuroticism and performance: examination results are more likely to be negatively affected by high Neuroticism, whereas for continuous assessment this may not be so much of a hindrance, and could even provide an advantage. The current shift in Higher Education towards continuous assessment and more clearly defined assessment criteria may ameliorate some of the potentially negative effects of high Neuroticism.

Extraversion

Extraverts are active, sociable, assertive, and talkative, whereas introverts are independent and reserved (Costa & McCrae, 1992). Social activities at University are likely to be a distraction to extravert personality types, and one might expect a negative effect of Extraversion on academic performance. The majority of studies to date, however, have found little consistent significant relationship between Extraversion and academic success (Ackerman & Heggestad, 1997; Furnham & Mitchell, 1991; Halamandaris & Power, 1999; Wolf & Ackerman, 2005). Other studies have yielded mixed results, suggesting both positive (Chamorro- Premuzic & Furnham, 2003; De Fruyt & Mervielde, 1996) and negative (Busato et al, 2000) associations. It has been suggested that these inconsistent results may be partly due to the indistinct nature of Extraversion as a trait (Martin, Montgomery, & Saphian, 2006). Alternatively, the effect of Extraversion may be determined by the exact nature of the criterion variable: Rothstein et al. (1994) provided mixed evidence about the relationship between Extraversion and academic success at the graduate level, with some criterion variables suggesting a positive relationship and others suggesting no such relationship. Different assessment strategies across institutions may favour varying degrees of Extraversion: emphasis on group projects and presentations, for example, may benefit extraverts whereas assessment strategies heavily weighted by individual essays and research projects may favour more introverted students. It is also likely is that the effect of Extraversion on performance is mediated by environmental factors, or by interactions with other Big Five variables such as Conscientiousness.

Openness to Experience

Openness involves intellectual curiosity and a preference for variety and is the only one of the five factors to show any consistent association with number of years engaged in education (Costa & McCrae, 1992). Individuals who score low on Openness tend to have a more conventional and conservative outlook. Costa and McCrae claim that Openness and intelligence are theoretically independent constructs, but other researchers have suggested both theoretical and empirical links (e.g. Ackerman & Heggestad, 1997; Austin, Deary & Gibson, 1997; Harris, 2004; Holland, Dollinger, Holland, & MacDonald, 1995), though for a different view, see Allik and Realo (1997). Some studies are difficult to interpret and

compare due to the disparate measures of intelligence used: Bates and Shieles (2003) for example showed that Openness correlated with crystallized intelligence, but not with fluid intelligence. Gignac, Stough, & Loukomitis et al (2004) attempted to explore the differential effect of Openness on crystallized and fluid intelligence by partialling out the effects of the latter, and showed a correlation between some facets of openness and general intelligence, though further research is required to clarify this relationship.

Regardless of the relationship with intelligence, one would intuitively predict a correlation between Openness and academic success, due to the impact of intellectual curiosity. This has been confirmed by several studies (e.g. De Fruyt & Mervielde, 1996; Rothstein et al, 1994) and in a meta-analysis by Ackerman and Heggestad, (1997). However, other studies have not supported these findings (e.g. Busato et al, 2000; Wolfe & Johnson, 1995), and interestingly, this factor has not been found to be a good predictor of job performance: indeed it is the least predictive of all the Big 5 traits (Griffin & Hesketh, 2004; Judge, Heller, & Mount, 2002). An early meta-analysis did, however, show that Openness was predictive of training proficiency in the workplace (Salgado, 1997), although a problem with this, as in other similar analyses, was that many of the studies included did not use measures primarily designed to assess the Big Five. Another drawback is that many studies provide insufficient information regarding the criterion variables, thus making comparison and interpretation of results difficult. One could surmise that Openness to experience would be a greater asset for student directed work (e.g. dissertations) than for tutor-guided assignments, but research to date has not explored the differential effect of Openness according to assessment strategy.

Agreeableness

Agreeableness involves being sympathetic, helpful, trusting, and cooperative: individuals scoring low in agreeableness tend to be egocentric and sceptical (Costa & McCrae, 1992). Most research to date has found no significant association between Agreeableness and academic performance (Busato et al, 2000; De Fruyt and Mervielde,1996; Rothstein et al., 1994). Farsides and Woodfield (2003) found a positive

association between Agreeableness and grades, but this was mediated by seminar attendance.

Conscientiousness

The Conscientious individual is organised, purposeful, reliable and self-controlled: low scores indicate a more casual and lackadaisical approach (Costa & McCrae, 1992). Most previous research has supported the 'common-sense' hypothesis that increased Conscientiousness would lead to improved academic performance (e.g. Busato et al., 2000; Chamorro-Premuzic, & Furnham, 2003; De Raad & Schouwenburg, 1996; Paunonen & Ashton, 2001). Although a few studies have come to the opposite conclusions, (e.g. Goff & Ackerman ,1992; Rothstein et al, 1994) these are in the minority. Interestingly, an extensive meta-analysis by Ackerman and Heggestad (1997) did not find a correlation between Conscientiousness and intelligence. Indeed more recent studies (e.g. Moutafi, Furnham, & Paltiel, 2004) have indicated that there is a negative relationship between these two factors, with much speculation as to the direction of causality.

Summary of Big Five effects

There are several reasons for the lack of cohesion in research findings regarding the predictive validity of the Big Five factors. As previously mentioned, different studies use diverse criterion variables, and assessment strategies vary across institutions. It has also been suggested that the traits are too broad: Paunonnen and Ashton (2001) suggest the aggregation of narrow traits into broad factors is counter-productive, and that some predictive effects may be 'cancelled out' if some of the specific second order factors that comprise a particular broad (first order) trait have opposing predictive effects. Further to this, some research could be criticized for placing too much emphasis on the predictive value of each individual trait, whilst ignoring potential interactions between the Big Five traits themselves and with situational factors. More recently this has been recognised and consequently there has been a greater interest in examining the relationship between the various non-cognitive performance predictors. Komarraju and Karau (2005), for example, showed that personality was strongly related to academic motivation, and the correlation

between personality and learning styles are well documented (e.g. Blickle, 1996). These interactions will be explored and discussed further in the empirical chapters.

Despite the criticisms levied at the NEO five factor model, it still surpasses all other models of personality in terms of its theoretical framework and psychometric validity. The original NEO FFM inventory contains 300 items, and is generally completed in 40-60 minutes. The shortened FFI (Five Factor Inventory), is a 60-item measure – it is one of the most widely used measures of personality traits, often used in research settings, and has good reliability, internal consistency, and validity (Costa & McCrae, 1992). The shortened measure has, however, received some criticism for poor factor structure at the item-level (Aluja,García, Rossier, & García, 2005; Eagen, Deary, & Austin, 2000). It has also been suggested that in order to achieve high reliability on the shortened measure, the breadth of some of the original traits was lost (Block, 1995). As a response to these criticisms, McCrae and Costa (2004) proposed a revised version (NEO-FFI-R), but this was not available at the start of this project. Preliminary investigations, however, indicate that the NEO-FFI-R is not superior to the NEO-FFI (Aluja et al, 2005). Used in isolation the shortened NEO-FFI may well be rather broad, but applied in conjunction with other non-cognitive measures was predicted to yield valuable information about the personality traits that underpin academic performance.

2.2.2 Approaches to Learning / Learning Styles

The distinction between 'approaches to learning' and 'learning styles' is subtle: Miller (1991) used 'learning style' to refer to the strategies used by individuals in order to learn, whereas the term 'approaches to learning' has been used to describe how students approach learning tasks, and the influence of motivation for studying (Biggs, 1993). More recently the concept of approaches to learning has been broadened to include both the *intention* and the *process* of studying, and referred to as 'approaches to studying' (Entwistle, 1997). Diseth and Martinsen (2003) also included intentions and motives when defining approaches to learning. In terms of general semantics, however, it is hard to

conceptualise a difference between 'styles' and 'approaches': broadly speaking, both refer to the general characteristics that students bring to the learning process.

Based on early work on experiential learning in the 1900's by such prominent psychologists as Rogers, Jung, and Piaget, the concept of learning theory was actively pioneered by Kolb in the early 1980's. His model gave rise to the experiential learning theory (ELT), based on a four-stage learning cycle of concrete experience (CE), abstract conceptualization (AC) , reflective observation (RO), and active experimentation (AE) (Kolb, 1984). The Learning Style Inventory, initially developed as a means of establishing construct validity for the ELT, identified four main learning styles, each representing the combination of two preferred four-stage cycle styles : diverging (CE / RO) , assimilating (AC / RO), converging (AC / AE), and accommodating (CE / AE). Since its inception, the ILS has been used as a self-assessment and development tool, but there is little research to explore its predictive validity.

Since Kolb's pioneering work, several other models have been proposed: Honey and Mumford (1982) presented a theory developed from Kolb's model, which classified learners as belonging to one of four main types: reflector, activist, pragmatist, theorist. More recent theories have included Gardner's theory of multiple intelligence (Gardner, 1993), and Fleming and Bonwell's VARK (which categorized learners according to their preference for visual, aural, read-write or kinesthetic approaches to teaching and learning (Fleming & Mills, 1992). Learning style theories based on the Myers Briggs Type Indicator, have also become popularized in the last decade (e.g. Schroeder, 1997).

A common feature of all the above models is that they are largely derived from theoretical concepts rather than empirical evidence. Based on the presumption that learning styles are a direct function of personality, the categories are very much focused on the personality traits or types rather than the learning strategy *per se*. That personality and learning styles overlap is not in contention, and much research has focused on this (e.g. Blickle, 1996; Furnham, 1991; Heinstrom, 2000). However, it does seem that many of the measures linked to the learning styles models discussed so far seem to have more value as

development and intervention tools than for predictive purpose: the information gained has often been used to enhance the teaching and learning environment (e.g. Kolb & Kolb, 2005). In general, although learning styles have been linked with educational and career choices (e.g. Furnham, 1991; Kolb, 1984), there is little evidence regarding their ability to predict academic performance.

Marton and Saljo (1976) proposed a model which focused more specifically on a students' motivation for education and their approaches to learning, which was developed further to describe three fundamental approaches: deep, strategic and surface (Entwistle & Waterson, 1988). Students with a deep approach tend to have a general intention to understand the subject matter and are intrinsically motivated, whilst those with a surface approach intend to reproduce learning material. It has been suggested that fear of failure is a primary motive in surface learners (Diseth & Martinsen, 2003). The strategic approach is not related to a specific style: strategic learners will utilise whichever approach they perceive most likely to produce success, and are achievement orientated.

Previous research has indicated that academic performance is positively related to a deep or strategic approach to learning, and negatively related to a surface approach (Newstead, 1992; Sadler-Smith, 1997). Entwistle, Tait, & McCune (2000), suggested that a deep approach is more likely to relate to academic success in later years of study, when assessment strategies reward understanding rather than replication of information. Other studies have found the deep approach to be not significantly predictive (Diseth & Martinsen, 2003; Cassidy & Eachus, 2000). Cassidy and Eachus (2000) suggest that this may be due to a shift in emphasis in later education to performance rather than learning. However it could be that the changing climate within Higher Education, with greater emphasis on continuous assessment and more clearly laid out learning outcomes and assessment criteria, does not reward a deep approach. Further to this, the increased financial pressures and competing demands on students may also favour a more strategic approach.

The ASSIST (The Approaches and Study Skills Inventory for Students) was specifically designed to measure approaches to learning in Higher Education studies

(Entwistle & Tait, 1996). It contains 52 items scored on a five point scale designed to measure the deep, surface and strategic approaches to learning. It has satisfactory psychometric properties, and previous research suggests that the measure predicts some unique variance in academic performance (Diseth & Martinsen, 2003).

2.2.3 Achievement Motivation

There are several contemporary theories of achievement motivation, and although a specific definition and model of academic motivation has proved elusive, the positive relationship between motivation and academic success is well documented (e.g. Busato et al., 2000; Furnham & Mitchell, 1991; Mellanby, Martin, & O'Doherty, 2000; Robbins et al, 2004). Several studies have found that in mature students, especially those with non-traditional qualifications, motivational factors are a better predictor of academic performance than previous academic achievement (e.g. Eppler & Harju, 1997; Hoskins, Newstead, & Dennis, 1997).

Current models of academic motivation are either focused primarily on cognitive aspects, with no provision for external effects, or take into account environmental factors, but with the loss of theoretical precision seen in the cognitive models (Bong, 1996). Common sense would dictate, however, that theoretical models which take no account of external influences would have limited relevance in an educational setting, and that the empirically based social-cognitive theories are more applicable.

Achievement Goal Approach

Traditionally, a dichotomous achievement goal approach has been suggested, and this is still one of the most popular theories of motivation (Elliot, 1999). The model was developed within a social-cognitive framework and focuses on explaining how students approach and respond to achievement situations in terms of their goal orientations (Ames, 1992; Dweck & Leggett, 1988). Two particular goals have been highlighted in the literature; namely *mastery* goals and *performance* goals. Mastery goals focus students on

learning and understanding the content or task and have been related to a number of positive outcomes, including increased academic achievement. Performance goals seem to focus on students demonstrating competence, and comparing their own performance to that of their peers, and are generally seen as having less positive outcomes (Ames, 1992; Covington, 2000; Dweck & Leggett, 1988; Pintrich, 2000). Harackiewicz, Barron, Tauer, Carter, & Elliot (2000), conversely, found that mastery goals were more predictive of continued interest whereas grades were better predicted by performance goals. However, not all the measures used in these studies had reported reliability or validity co-efficients, and so their results must be interpreted with caution.

The past decade has seen increased interest in the distinction between performance-approach goals, where students are focused on outperforming others, and performance-avoidance goals, where students are focused on the avoidance of looking inferior or incompetent in relation to others (e.g. Elliot, 1999; Harackiewicz, Barron, Pintrich, Elliot, & Thrash, 2002; Pintrich, 2000). Current thinking is based on a multiple goal perspective which suggests that performance-approach goals may also be linked with improved performance (Barron & Harackiewicz, 2001; Harackiewicz et al., 2002; Zusho, Pintrich, & Cortina, 2005).

Intrinsic and Extrinsic motivation

An alternative approach to achievement motivation focuses on the interaction of a person's psychological needs with the environment. Two main types of motivators are identified: intrinsic and extrinsic. The former refers to the drive to pursue an activity simply for the pleasure or satisfaction derived from it, whereas the latter motivation involves pursuing an activity out of a sense of obligation, or for external reward. Extrinsic motivation can be sub-divided according to the extent of internalization as a result of contextual factors, and a third category, 'amotivation' (the absence of intent or drive to pursue an activity) completes the continuum. This model builds on Deci and Ryan's self-determination theory, which focuses on the importance of humans' capacity for personality

development and behavioral self-regulation (Ryan & Deci, 2000a). For further explanation, see Ryan and Deci (2000b).

The concept of intrinsic and extrinsic motivation can be logically applied within an educational setting: students who are intrinsically motivated will complete their work because they find academic exploration self rewarding, whereas those who are extrinsically motivated will do so in order to obtain some external reward, or to avoid sanctions. It was initially presumed that intrinsic motivation was somehow 'better' but it is now accepted that not all educational tasks are intrinsically interesting, and that extrinsic motivation can have a positive influence (Deci & Ryan, 2000b). Various studies have demonstrated that greater autonomous extrinsic motivation was associated with increased engagement and better performance (Miserandino, 1996; Ryan and Connell 1989), which is consistent Deci and Ryan's hierarchical model.

Although theoretically distinct, there seem to be similarities between the model of intrinsic and extrinsic motivation, and the previously discussed achievement goal theory. Intrinsic motivation appears to be associated with mastery goals, and extrinsic motivation with performance goals. The effectiveness of the latter are, according to both theories, affected by the degree of internalization or autonomy.

Vallerand's Academic Motivation Scale (AMS) builds on Deci and Ryan's self-determination theory (Vallerand et al, 1992). This is a 28 item, seven factor model reflecting one subscale of amotivation, three ordered subscales of extrinsic motivation (external, introjected, and identified regulation), and three distinct, unordered subscales of intrinsic motivation (intrinsic motivation to know, to accomplish things, and to experience stimulation). The scale initially received mixed reviews, but a recent evaluation by Fairchild, Horst, Finney, and Barron, (2005) acknowledged that the measure is psychometrically sound. Separate versions for College students and school pupils are available which made the measure appropriate for the current study. A recent study by Komarraju and Karau (2005), who used the more detailed and extensive Academic Motivations Inventory, found that applying factor analysis in fact reduced the 16 variables

in that measure to 3 main factors which were comparable with the three domains assessed by the AMS.

2.2.4 Emotional Intelligence

The concept of Emotional Intelligence can be traced back to Thorndike's (1920) theory of social intelligence, but it was formally proposed by Salovey and Mayer (1990), and later popularised by Goleman (1995). Despite being embraced as a concept, there is still much discussion regarding what exactly emotional intelligence is, and how it should be defined. Goleman's definition seemed to include any desirable individual characteristic that could not be otherwise described by cognitive intelligence. The most widely accepted definition of EI, however, describes it as "the ability to monitor one's own and others' feelings and emotions, to discriminate among them and to use this information to guide one's thinking and actions" (Salovey and Mayer, 1990, p.189).

Several alternative models of Emotional Intelligence have been proposed, though these mainly fall into one of two 'camps' - mental ability models , as exemplified by Mayer and Salovey (1997), and mixed models (e.g. Bar-On, 1997; Goleman, 1995). Mental ability models focus on the ability to process affective information (Zeidner, Matthews & Roberts, 2004). Defining emotional intelligence as a mental ability distinguishes it from other human variables, such as personality and learned behaviour patterns, whereas the mixed model also includes motivational factors and affective dispositions.

The approach adopted has implications for the assessment of EI: accepting the mental ability model means that emotional intelligence can not be measured on a self-report basis, but must be directly assessed through maximum performance tests. This can be difficult without monitoring a person's reactions in real life situations, and experimental 'tests' will inevitably involve a degree of subjectivity in determining what the 'correct' responses should be. Consensus scoring is often used to assess responses on EI mental ability measures such as the MSCEIT (Mayer, Salovey and Caruso Emotional Intelligence Test; Mayer, Salovey, & Caruso, 2000). However it has been suggested that what may in

fact be measured in this case is a kind of cultural conformity, that is holding beliefs about emotion that are congruent with cultural norms, and that while this may well be an adaptive trait it does not necessarily represent a personal ability or aptitude (Zeidner, Shani-Zinovich, Matthews & Roberts, 2005). Further to this, gender differences have been shown (Brackett, Mayer, & Warner, 2004; Mayer, Caruso & Salovey, 1999) which would not be expected if this was an ability measure. In contrast, however, the self report measures employed to assess emotional intelligence under the mixed model approach are likely to suffer from psychometric reliability and validity problems (Zeidner et al, 2004). Some self-report measures have also been shown to load heavily on personality factors such as the Big Five, indicating a lack of divergent validity (Davies, Stankov & Roberts,1998).

Despite the conceptual and practical differences between the two models it is interesting to note that the major skill areas of emotional intelligence identified by Mayer and Salovey (perception and expression of emotion; assimilating emotion in thought; understanding and analysing emotion; and reflective regulation of emotion) are very similar to those identified by others. Bar-On's (1997) mixed model, for example includes: intrapersonal skills, interpersonal skills, adaptability scales, stress-management scales, and general mood. Goleman's (1995) model includes: knowing one's emotions, managing emotions, motivating oneself, recognising emotions in others, and handling relationships. Thus these measures do seem to be assessing the same basic qualities. More importantly they also share a lack of theoretical foundation. Addressing this lack of theoretical structure and the difficulty in operationalising EI as an ability measure, Petrides, Furnham and Frederickson (2004) proposed a trait-based model which does have an underpinning theoretical framework, but otherwise seems to have little to distinguish it from the mixed models discussed above.

A link between Emotional Intelligence and success in the work place has been identified (e.g. Goleman, 1998), although it has been suggested that many studies to date lack convincing empirical evidence (Zeidner at al, 2004). Research to explore the implications of EI for academic performance is still in its infancy: certain EI variables have been found to predict more successful transition from high school to University (Parker et

al, 2004), and Petrides, Frederickson and Furnham (2004) also showed that EI was related to academic performance, particularly in lower ability groups. Conversely, a review by Zeidner, Roberts and Mathews, (2002) concluded that there was little objective evidence to show that EI scores could provide any useful information to predict academic success beyond that provided by intelligence and personality factors, a view more recently supported by other researchers (Barchard, 2003; Bastian, Burns & Nettelbeck, 2005; Schulte, Ree & Carretta, 2004).

Despite the mixed evidence regarding the predictive validity of EI in academic settings, due to the current popularity of the construct a measure of EI seemed worthy of inclusion. The main aim was to establish whether EI scores could provide any incremental information above that provided by tests of general ability and basic personality. In general, previous research has indicated that self report measures of EI are more closely linked to personality (Bastian et al, 2005; Dawda & Hart, 2000; Saklofse, Austin & Miniski, 2003) whilst ability measures are, not surprisingly, more closely related to general cognitive aptitude (Bastian et al, 2005; Lopes, Salovey & Strauss, 2003). As separate measures of both fluid and crystallized intelligence were already included in the test battery for the current study, a mental ability measure was redundant.

Many mixed models were also rejected because of their lack of theoretical framework, and in several cases expense further precluded their use for research purposes (e.g. the Bar-On Emotional Quotient Inventory, 1997). The Trait Emotional Intelligence Questionnaire (TEIQue), was however identified as being freely available for research purposes, and also has an underpinning theoretical framework. The TEIQue was developed from the trait-based theory proposed by Petrides et al (2004). It incorporates 15 specific EI features into 4 main domains: well-being (high scores reflect a sense of self-fulfillment), self-control (high scores reflect good control of urges and desires), emotional skills (ability to perceive and express emotions, and develop healthy relationships), and social skills (good at communication and social interactions). Still in a development, early application has suggested it may provide useful predictive information in academic settings (Petrides et al, 2004).

2.2.5 Academic Self-efficacy / self-concept

The concept of self-efficacy is based on the theoretical framework of social cognitive theory, which suggests that human achievement depends on interactions between one's behaviors, personal factors, and environmental influences (Bandura, 1986, 1997). It has been defined as "the belief in one's capabilities to organize and execute courses of action required to produce given attainments". (Bandura, 1997, p 2). Self-efficacy expectations are appraised using information obtained from past performance, vicarious learning, verbal persuasion and support from others, and from personal emotional or physiological reactions (Bandura, 1986).

Academic self-efficacy has been more specifically defined as "one's confidence to succeed at academic tasks, rather than one's actual ability" (Spitzer, 2000, p84), and this has been found to be an effective predictor of academic performance (Bandura, 1997; Lane & Lane, 2001). Chemers, Hu, and Garcia, (2001) found that academic self-efficacy not only had a direct effect on academic performance, but also an indirect effect in terms of expectations and ability to cope with stress. A recent meta- analysis found self efficacy to be the strongest predictor of academic performance (Robins et al, 2004). However this analysis focused on psychosocial and study skills factors, and although the effects of previous academic achievement were partialled out, basic personality factors were not.

The impact of previous experience and environmental effects on self – efficacy makes it difficult to establish causality: students who have a good record of past performance are more likely to respond positively to questions about their confidence levels for future achievements. Self-efficacy beliefs tend to decline as students advance through school (Pintrich & Schunk, 1996), which has been attributed to increased competition, more norm- referenced grading, and less teacher attention to individual progress. The effect of peer- influence on self-efficacy is also well-documented (e.g. Bandura, 1986; Schunk, 1987). However it is also possible that older students develop more accurate and realistic self perceptions due to the incremental effect of feedback on previous work. Conversely,

previous negative experiences at school may have caused a reduction in self-esteem, and it is likely that low achieving schools would produce students with lower self-efficacy, although this has not been explored empirically. Some studies have attempted to overcome the issue of the effect of previous achievement by manipulating rather than measuring existing levels of self-efficacy (e.g. Bouffard-Bouchard, 1990). Apart from the practical limitations, the ethics of such research is questionable.

In order to preserve face validity, self-report measures of self-efficacy are rather transparent, and for University students, responses would inevitably be affected by past experiences. For the purposes of the current study, it seemed that a specific measure of self-efficacy would provide little additional information above that provided by the AMS (Academic motivation scale) and the self-concept sub scale of the TEIQue: although proponents of self-efficacy are at pains to distinguish between this and other related constructs (e.g. self-concept, self-worth and self-motivation) there is undeniably an overlap. Bandura (2001) claims that self-efficacy differs operationally from other self-related constructs : self efficacy is seen as a context specific assessment of competence to perform a given task whereas self-concept is a cognitive appraisal, integrated across various dimensions, typically accompanied by self-evaluative judgment of self-worth (self-esteem). Hence self-efficacy questionnaire items are phrased in terms of what students *can do* rather than what they *will do* or *usually do* in a particular domain. However, self-efficacy for learning has been defined as referring to beliefs about using self-regulatory processes, such as goal setting, self-monitoring, strategy use, self-evaluation, and self-reactions to learn (Zimmerman & Kitsantas, 2005) , thus incorporating motivational constructs.

It has been suggested that at the domain-specific or self-efficacy for learning levels of generality, self-concept and self-efficacy beliefs may be empirically similar (Pajares, 2002). Few researchers have explored the relationships among self-efficacy, self-concept, and academic performances, and results are inconsistent, although there is some evidence that item-specific self-efficacy beliefs are more predictive than domain-specific self-concept beliefs (Mone, Baker, & Jeffries 1995; Pajares & Miller, 1994).

Self-efficacy may play a mediating role between other predictor and criterion variables (e.g. Schunk and Pajares, 2002; Zimmerman & Kitsanas, 2005) which intuitively makes more sense than viewing it as a predictor variable in isolation: students are unlikely to achieve performance beyond their potential simply by believing that they can.

In addition to the conceptual difficulties surrounding self-efficacy, an appropriate standardized measure of academic self-efficacy proved elusive. To assess students' functioning in various academic settings, Bandura (1989) developed two self-efficacy scales: a *self-efficacy for academic achievement* scale focusing on students' perceived capability to achieve on various academic tasks, such as mathematics, reading and writing, and *self-efficacy for self-regulated learning* focusing on students' perceived capability to engage in goal setting, planning, and organising during academic studying, neither of which were deemed appropriate for University students. Further to this, more recent thinking centres around scales being designed for a specific purpose (Bandura , 2001), and so rather than incorporate a standard measure, individual questions relating to students' beliefs about current and potential levels of performance were designed for inclusion in the test battery (see Appendix I).

2.3 Summary

As a result of the literature review, the following measures were selected:

- A level / GCSE results (crystallized intelligence / academic achievement)
- Raven's Progressive Matrices (fluid intelligence / aptitude)
- NEO Five factor Inventory (personality)
- ASSIST: Approaches and Study Skills Inventory for students (learning styles)
- AMS: Academic Motivation Scale (achievement motivation)
- TEIQue (Emotional Intelligence)
- Self ratings regarding current and potential behviour (self- concept / efficacy)

The chosen measures were cross-matched against the criteria identified in the Fair Enough report (Sinclair, 2003) to ensure that all aspects were covered by at least one measure, as shown in table 2.1

Table 2.1: Summary of measures matched against student qualities

Criterion	Trait	Measure
Keeps to course work hand in deadlines	Conscientiousness	NEO (C)
Follows assignment deadlines	Conscientiousness	NEO (C)
Focuses on answering questions set in assignments	Approach to Learning (strategic)	ASSIST
Able to balance paid employment, home responsibilities, leisure activities with study attendance	EI (adaptability)	TEIQue
Reads independently outside set texts	Approach to Learning (deep)	ASSIST
Learns from and acts on feedback	Approach to Learning (strateg)	ASSIST
Does preparatory work outside the classroom	Approach to Learning (deep)	ASSIST
Asks for guidance	EI (assertiveness)	TEIQue
Able to make independent judgments	EI (impulsiveness)	TEIQue
Demonstrates engagement with studies	Conscientiousness	NEO (C)
Takes advantage of learning opportunities on offer outside the curriculum	Approach to Learning (deep)	ASSIST
Interest in subject Area	Academic Motivation (intrins)	AMS
Persistent in studying something that may be difficult at first	EI (self-motivation)	TEIQue
Participates in class	Extraversion	NEO (E)
Puts effort into work	Conscientiousness	NEO (C)
Demonstrates enthusiasm for learning	Openness to experience	NEO (O)
Takes advantage of learning opportunities on offer outside the curriculum	Openness to experience	NEO (O)
Intellectually able	Fluid / crystallized intelligence	RPM / GCSE
Critical thinking and problem solving ability	Fluid intelligence	RPM
Able to participate in a team	Extraversion / Agreeableness	NEO (E/A)
Communication and self-confidence	Neuroticism / EI	NEO /TEIQue

CHAPTER 3
PREDICTORS OF ACADEMIC SUCCESS - PILOT STUDIES

Two pilot studies were conducted prior to the main study.

1. An analysis of academic predictors of performance, in order to explore previous claims of their poor predictive validity (Peers & Johnston, 1994) and to investigate the viability of using end of first and second year grades as criterion variables.

2. A comparison of undergraduate and A-level student psychometric profiles in order to establish if undergraduate results can be meaningfully extrapolated to a pre-University population

3.1 Academic Predictors of University Success in Psychology

(This study has been published: see Huws N., Reddy, P., & Talcott, J B., 2006: Appendix II)

3.1.1 Introduction

A retrospective study was undertaken to explore the academic profiles of a single cohort of Psychology Undergraduate students at Aston University (based in Birmingham, an industrial town in the midlands of the UK). Peers and Johnson (1994) identified a relatively low predictive validity of A-levels for future academic performance in Social Sciences, and suggested that this was due to the subject not being studied prior to University. However, the last decade has witnessed the growth of Social Science subjects at A-level, and in particular Psychology, with 45,000 candidates being examined in this subject in 2003 (Green, 2003). The main focus was to assess the relative predictive effects of a variety of pre – University academic achievements, with the additional aim of assessing the viability of using end of first and second year marks as the criterion variables in the main study.

Admission to the Psychology degree course at Aston University is largely based on A-level grades or equivalent qualifications, with no specific subject requirements or exclusions: a standard offer of BBB in the best three A-levels (BBC until 2003/4) is made in most cases, although a minimum GCSE requirement of five passes at grades A to C including English, Mathematics and at least one science is also expected of traditional A-level applicants. Entrants have a wide range of academic achievement in terms of grades and subjects and are believed to cover the HEFCE POLAR (participation of local areas) classification range. POLAR statistics are a measure of the proportion of young people in an area who go on to enter Higher Education aged 18 -19, and indicate demographic inequalities (POLAR: a short guide, 2005).The diversity of backgrounds in Aston undergraduates makes a retrospective study more meaningful than those conducted in Universities with a more academically homogeneous student group.

For applicants who have not completed their A-levels prior to application, offers are made on the basis of predicted grades. James and Chilvers (2001) found that overall grades achieved at A-level tended to be lower than those predicted, and recommended (for their institution) that if predicted grades were borderline, the lower estimate should be used. However, there is little research to date regarding the relative predictive validity of actual and predicted A-level grades.

3.1.2 Method

Participants

The sample comprised 56 students (9 males and 47 females) who graduated in Human Psychology at Aston University in 2003, and represented all graduates who complied with the following criteria for inclusion, including international students. The sample was restricted to young participants (aged under 21 at the time of entry) to ensure that the group would have received fairly similar educational and cultural experiences prior to University. Students whose records were incomplete, for example because they had transferred from another University, were also excluded. The majority (71%) of the

participants had entered University directly from secondary education (aged < 19), 21% had taken a gap year, and 7% two gap years prior to University entrance.

Academic Records

Academic records for each participant were retrieved from their student files. These contained a copy of their original UCAS (Universities and Colleges Admissions Service) form along with details of their academic performance at University. The variables considered included: age at entry, GCSE grades and subjects, A-level grades and subjects, average marks at the end of the first, second, and final year of study, and whether or not a work placement was undertaken between the second and final year. AS grades were *not* considered in this study. Student files and the data contained within these are the property of the University, but for ethical reasons and to comply with data protection regulations, the data used in this study was anonymously coded and cannot therefore be traced back to individual students.

GCSE and A-level results were coded according to the current UCAS grading system (Universities and Admissions services, 2005).

For GCSE results: A* = 6, A = 5, B = 4, C = 3

For A-level results: A = 120, B = 100, C = 80, D = 60, E = 40

3.1.3 Results

The data were screened for input errors and outliers.

Table 3.1 displays descriptive statistics for the entire sample. The profile of a typical student emerges as having taken 3 or 4 A-levels, with a median grade of 'B'. The range and distribution of total results for both GCSE and A-levels, using the UCAS scoring system, are displayed in Figure 3.1. The distribution of marks attained at the end of the first, second, and final year at University are displayed in Figure 3.2.

Table 3.1: Descriptive Statistics for Psychology graduates from Aston in 2003

Variable	Category	Result
Number of A-levels studied	2	1 (2%)
	3	27 (48%)
	4	27 (48%)
	5	1 (2%)
Studied Psychology at A-level	Yes	34 (61%)
	No	22 (39%)
Studied General Studies at A-level	Yes	27 (48%)
	No	29 (52%)
Median academic grades prior to University	GCSE English	B
	GCSE Maths	B
	GCSE Science	B
	Best 5 GCSE's	23 points (sd = 3)*
	A-level Psychology	B
	A-level General Studies	B
	Total A-level (A2) Tariff	320 tariff points (sd = 67)**
Performance at University (%)	End of 1st year marks	57 (sd = 6)
	End of 2nd year marks	61 (sd = 4)
	Final degree marks	63 (sd = 4)
Work placement undertaken?	Yes	40 (71%)
	No	16 (29%)

* Calculated according to UCAS grading (A* = 6, A = 5, B = 4, C = 3)

** Calculated according to UCAS grading (A = 120, B = 100, C = 80, D = 60, E = 40)

Figure 3.1: Distribution of GCSE and A level results for 2003 Aston Graduates

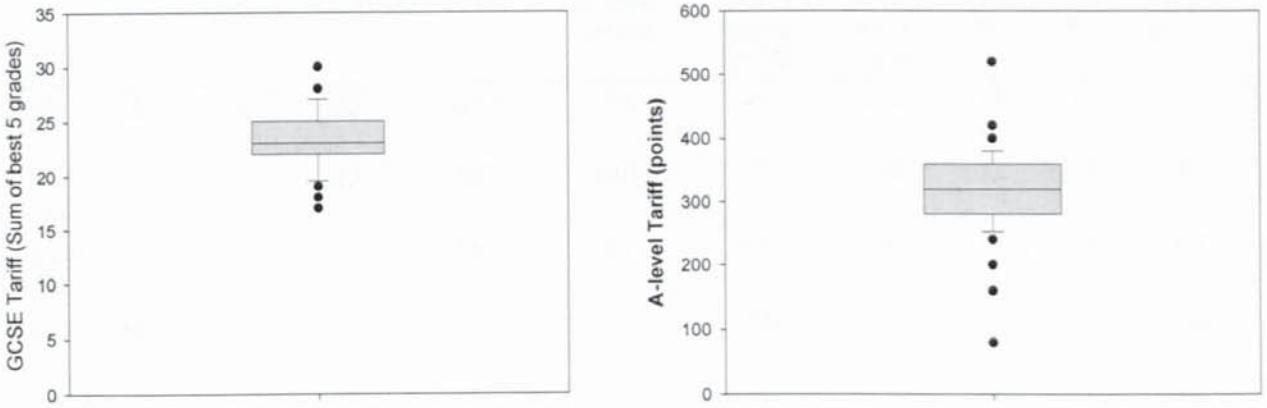


Figure 3.2: Distribution of 1st, 2nd and final year marks for 2003 Aston Graduates

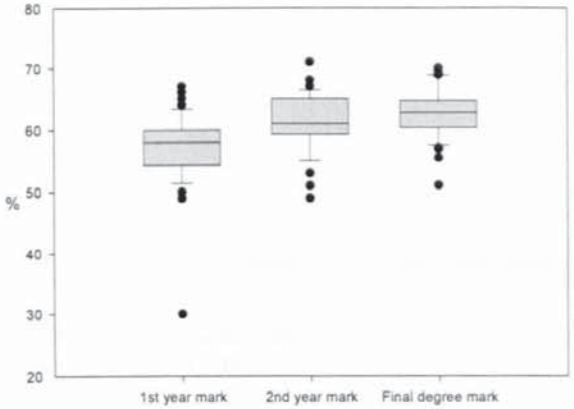


Table 3.2 displays the correlations between variables. Despite being ordinal data, GCSE and A level scores broadly satisfied the conditions for normality and were therefore included in the analysis. This is consistent with other researchers who have treated GCSE and A-level grades as scale data (McDonald et al, 2001a). Pre-University variables were moderately correlated with final year performance, with grades achieved at GCSE level, specifically Science (double award for all but two students) ($r = 0.38$, $p < 0.01$) and English ($r = 0.29$, $p < 0.05$) emerging as the two strongest single predictors. A-levels were relatively poor correlates of final year performance, with grade achieved at Psychology A-level failing to predict any of the variability in final degree marks.

Table 3.2: Correlations between academic variables for graduates from Aston in 2003

	English GCSE	Science GCSE	Best 5 GCSE	Psychology A- level (n=34)	General Studies A-level (n=27)	Total A-level (A2) Tariff	1st year %	2nd year %	Final year project	Final %
Maths GCSE	.18	.32*	.41**	.14	.45*	.03	.15	.12	.07	.19
English GCSE		.35*	.66**	.01	.33	-.02	.12	.14	.10	.29*
Science GCSE			.56**	.01	.43*	.00	.27	.23	.35*	.38**
Best 5 GCSE				.02	.38	-.12	.16	.12	.06	.28*
Psychology A-level (n=34)					.02+	.44**	.03	.16	.22	.19
General Studies A-level (n=27)						.22	.21	.00	.10	.14
Total A-level (A2)Tariff							.03	.08	.08	.06
1st year %								.58**	.30*	.55**
2nd year %									.53**	.73**
Final year project										.77**

** Correlation is significant at the .01 level (2-tailed).
* Correlation is significant at the .05 level (2-tailed).

+ n = 19 for this comparison

Effect of Studying Psychology at A level

The poor correlation between grade achieved at Psychology A-level and subsequent achievement at degree level does not indicate whether actually studying the subject prior to University was of benefit: hence an independent samples *t* test was used to compare those students who studied Psychology at A level (n = 34) with those who did not (n = 21). There were no significant differences between the two sample groups in terms of their end of first year, second year, or final degree results.

Effect of Studying General Studies at A level

An independent samples *t* test also revealed no significant differences in the final results between those students who had taken General Studies at A level (n = 27) and those who had not (n = 29). However closer inspection of the data indicated that General Studies was often taken as an 'extra' subject: 81% of students who had studied General Studies had taken 4 or more A-levels, compared with only 21% of those who had not. Repeating the analysis after removing the contribution of General Studies from the total A-level tariff, however, did not result in a positive effect between the latter and final degree performance.

Academic Predictors

The pre-university indicators that correlated significantly with final year marks were Science GCSE, English GCSE and the composite measure summing scores for the best 5 GCSE's. Stepwise regression revealed that Science GCSE was the best single predictor of academic success ($r = 0.38$, $p < 0.01$). The other two predictor variables did not explain significant additional variance once the variance attributable to this factor was removed.

First-year marks explained 32% of the variance in final degree performance ($r = 0.55$, $p < 0.001$), and second year marks 53% ($r = 0.73$, $p < 0.001$). The second year marks, however contribute to the final overall degree results which inflates the correlation.

Effect of the Placement Year

An analysis of covariance was used to compare the final year performance of those students who elected to undertake a work placement (n = 40) with those who did not (n = 16), covarying for first year marks. Both the main effect [$F(1, 53) = 9.24$, $p < 0.01$, $\eta_p^2 = 0.15$] and the effect of the covariate [$F(1,53) = 26.46$, $p < 0.01$, $\eta_p^2 = 0.33$] were significant. This indicates that the work placement made a significant, independent contribution to final degree performance, although the effect of first year marks was greater.

3.1.4 Discussion

The pilot study demonstrated no predictive effect of A- level subject or grade on subsequent academic achievement in this cohort. General Studies A- level results were found to be non predictive. This agrees with previous research by James and Chilvers (2001), who also found General Studies A-level grades to be poor predictors of achievement, and recommended that these should not be used when selecting students for their institution. The acceptability of General Studies as part of a student's entrance profile seems to vary across Universities. In this study, inclusion or exclusion of General Studies marks within students' overall A-level profile had little effect on any results, thus implying that its predictive validity is equivalent to other subjects.

A-level results in Psychology also appeared to have no effect, implying that previous subject-specific knowledge is of little benefit to Psychology undergraduates. However this may be attributable in part to differences in curriculum between the A-level syllabus and the course format at Aston. Whereas the former is primarily fact based, and tends to skim several subject areas, many of the modules at Aston have a research bias, with an emphasis on analysis and interpretation. There are also likely differences in assessment strategies, with an increasing emphasis on individual research and independent study as students progress through the course. This could also partly explain the predictive effect of Science GCSE, which is discussed below.

It would be incautious to assume from the low predictive validity of A-levels that they are of no importance whatsoever. However, it has been suggested that the grades achieved may be less important than the qualities required in order to complete a course of A-level study (McDonald et al., 2001a). For more 'popular' or vocational subjects such as Psychology, general interest in the subject may over-ride purely academic factors. Previous research has suggested an interactive relationship between subject interest and achievement: a study by Harackiewicz, Barron, Tauer and Elliot (2002) showed that students who were rated as having high interest and who had received high grades in an

Introductory Psychology course were more likely to continue to study the subject at a higher level.

The single most significant predictor of success in this cohort was performance in Science GCSE. This is more likely due to the analytic and research skills required to perform well in Science, however, than the subject specific knowledge attained. Jacona, Keehn and Corrigan (1987) maintained that science-based courses requiring systematic didactic principles relate well to courses that require a high degree of conceptual thought, and this could certainly be applied to Psychology. It is interesting to note that Science GCSE also co-varied with Maths GCSE and General Studies A-level, although neither of the latter correlated with final degree performance. This would indicate that students who achieve high marks in Science are equipped with skills that allow them to perform well in other diverse areas. This supports previous research which has identified science as a good predictor of performance (James & Chilvers, 2001; Wong & Wong, 1999).

English GCSE was also a significant predictor of final year performance. Final year marks are heavily weighted by a written project, where English language skills could feasibly have an impact. However, English GCSE grades did not correlate with the project marks, and the correlation between English GCSE and final year mark held even when the project marks were partialled out ($pr = 0.35$, $p < 0$ .01).

It could be argued that the restricted range of grades at A-level in our sample might explain the lower predictive validity of these scores compared to GCSE grades. The range of marks at GCSE and A level in our sample were however comparable, (see Figure 3. 1), so it is unlikely that the comparatively better prediction of final year performance afforded by GCSE marks resulted from such a statistical artifact.

The results of the pilot study confirmed that there is a large correlation between first year marks and final degree performance ($r = 0.55$, $p < 0.001$), suggesting that it is possible to make early predictions regarding which students which are likely to succeed at University. This also tallies with previous research findings which identified the most

striking predictor of final academic performance in higher education to be the mark obtained on the very first examination at University (Busato et al, 2000). Despite some increase in the ability to predict final degree performance as students progressed through their course of studies, almost 50% of the total variability remained unexplained by academic factors. The additional predictive effect of the work placement on final year performance seen in this sample implied that non-cognitive factors also play a role in ensuring student success. This supports Reddy and Moores (2006) findings that final year students who had taken a placement year achieved significantly higher marks in their final year, and were also considered by academic staff to have higher levels of transferable skills.

3.1.4 Conclusions

The pilot study served to highlight certain trends in terms of predictors of performance at University. The finding that Science and English GCSE grades were effective predictors of final degree mark, whereas Psychology A-level grades were not, suggests that general analytic and literary ability are more useful predictors of academic success than subject-specific knowledge. The incremental effect of the work placement seen in the current study implies that degree outcome is not decided by academic aptitude alone. This supports further research to explore the effect of general ability and non-cognitive traits on performance at University.

The strong correlations between first and second year marks and final degree performance justify the use of the former as criterion variables to assess performance at University.

3.2 A comparison of Undergraduate and A-level student profiles

3.2.1 Introduction

As discussed in Chapter one, a limitation of many previous studies exploring the relationship between non-cognitive factors and performance at University is that they are retrospective, leading to a restriction in the range of academic achievement. Statistical correction for range restrictions makes assumptions about the distribution of cognitive and non-cognitive traits in pre-University populations.

One solution would be to conduct prospective studies, and gather data from a wide range of pre-University students rather than only those who progress into Higher Education. However, this has practical implications: University undergraduates are easy to recruit as participants - they often have a requirement to accumulate research hours to satisfy their course requirements, or alternatively can be offered a financial incentive. In schools, however, time table and syllabus restrictions may limit research access to students.

The second pilot study aimed to gather data on a variety of psychometric measures from A-level (Year 13) students, and from first-year undergraduate participants. There were two main objectives

1. To gather follow up data from the Year 13 students in terms of their A-level results and destination analysis. This would allow comparison of data gathered from those students who progressed to University with those who did not.

2. To explore differences between the two populations. Similar psychometric profiles would justify conducting the main study using undergraduate participants, whereas large differences in responses would suggest that results from this population could not be extrapolated to a pre-university population.

3.2.2 Method

Participants

30 schools in the West Midlands area were approached in an attempt to recruit Year 13 Psychology A-level pupils for participation in the study. A short lecture on Psychometrics was offered in exchange for data collection. A total of 34 (9 males, 25 females) participants were recruited (all aged 17 or 18), from the two schools who agreed to participate in the study. Undergraduate data were collected from Psychology and Combined Honours first year undergraduates, who received research credits for participating. The sample was restricted to students who had entered University directly from school (all aged 18), in order to reduce the impact of age and other extraneous differences between groups. Sixty two undergraduates (55 women, 7 men) took part in the study. A final sample of 34 undergraduates who had taken a year out prior to entering University (27 women, 7 men) was included to control for the effect of general maturity.

Measures

All participants completed a consent form, a demographic information form, and the following measures (described in Chapter 2):

- Raven's Progressive Matrices
- NEO-FFI (Five factor Inventory)
- AMS (Academic Motivation Scale).
- ASSIST (Approaches and Study Skills Inventory for Students)
- TEIQue (Trait Emotional Intelligence Quotient)

Procedure

Participants were administered a pen and paper version of all the measures, and were assured of confidentiality. Scripted instructions were used to ensure equivalence of conditions across all testing sessions. Twenty minutes were allowed for completion of the Ravens matrices, and participants were briefed to work as quickly but correctly as possible. The remaining measures were un-timed, and were completed in a prescribed order as listed above.

Follow up information was requested from schools nine months after the initial data collection, in the autumn term, when students would have received A-level results and progressed onto Higher Education or equivalent.

3.2.3 Results

Scoring

The raw data were screened for outliers, input errors, and to confirm normality. Data gathered for all variables were normally distributed, with the exception of 'Amotivation' which showed a strong negative skew and kurtosis, and were therefore not included in the analysis. As this factor did not relate to any of the Fair Enough criteria and was therefore not critical to the analysis, it was not considered further.

Test results were scored according to test producers' directions with the exception of the TEIQue, where raw data were submitted to the test originators who then returned trait scores.

Undergraduate vs. School pupil scores

A multivariate analysis of variance (MANOVA) was undertaken to explore any differences in scores on non-cognitive variables between school pupils (n = 34), young participants (n = 62) and mature undergraduates (n=34). The participant groups were entered as independent variables in the model, with dependent variables comprised of scores achieved on all the non-cognitive measures employed in the study (see Table 3.3). The overall model was significant: Pillai's trace $F(38, 218) = 1.68$, $p < 0.05$, suggesting a difference between groups on some of the variables. However, investigation of the results and post hocs indicated that this difference between groups was largely due to a single variable - 'Emotional Skills'. This was checked by repeating the MANOVA with this variable excluded, and the result was no longer significant, $F(36, 220) = 1.41$, $p = 0.07$. School pupils scored significantly lower than both young participants and mature undergraduates for this variable. However there was no significant difference between the two undergraduate groups implying that the difference was not solely due to continuing maturity.

Table 3.3: Comparisons of participant groups based on age

Variable (unit)	A-level responders (a) n = 34	Undergraduate Young Participants (b) n = 62	Mature Undergraduates (c) n = 34	*F*	Sidak post-hocs
Ravens	49.0 (.78)	49.7 (.58)	49.5 (.80)	.25 (.00)	
Intrinsic motivation to know	19.2 (.81)	21.0 (.60)	20.3 (.81)	1.65 (.03)	
Intrinsic motivation to accomplish	17.38 (.82)	17.4 (.61)	16.6 (.83)	.33 (.01)	
Intrinsic motivation to experience stimulation	16.12 (.87)	13.5 (.65)	13.2 (.89)	3.62*(.05)	
Extrinsic motivation identified regulation	22.0 (.63)	23.3 (.47)	22.7 (.64)	1.42 (.02)	
Extrinsic motivation introjected regulation	19.8 (.87)	19.3(.65)	19.0 (.88)	.20 (.00)	
Extrinsic motivation external regulation	22.0 (.79)	22.4 (.58)	21.33 (80)	.63 (.01)	
Neuroticism (t-score)	56.9 (1.80)	56.8 (1.33)	55.3 (1.83)	.27 (.00)	
Extraversion (t-score)	52.8 (1.81)	53.0 (1.34)	54.9 (1.83)	.47 (.01)	
Openness (t-score)	46.7 (1.55)	51.1 (1.15)	48.8 (1.57)	2.6 (.04)	
Agreeableness (t-score)	43.1 (1.55)	44.4 1.52)	47.4 (2.08)	1.16 (.02)	
Conscientiousness (t-score)	43.2 (1.85)	43.2 (1.16)	40.6 (1.88)	.70 (.01)	
Deep approach	55.1 (1.63)	58.4 (1.20)	56.2 (1.65)	1.53 (.02)	
Strategic approach	72.2 (2.18)	72.2 (1.62)	69.8 (2.22)	.41 (.01)	
Surface approach	46.1 (1.51)	45.4 (1.12)	47.5 (1.53)	.63 (.01)	
Well being	5.0 (.14)	5.1 (.10)	5.0 (.14)	.41 (.01)	
Self control	3.9 (.13)	4.03 (.10)	4.1 (.13)	.54 (.01)	
Emotional skills	4.6 (.12)	5.2 (.09)	5.1 (.12)	8.63**(.12)	b > a*, c> a*
Social skills	4.6 (.13)	4.8 (.09)	4.6 (.13)	1.17 (.02)	

Values in parentheses behind means are standard errors. Values in parentheses after the F ratios are the effect sizes.

** Differences are significant at the 0.01 level (2-tailed).
* Differences are significant at the 0.05 level (2-tailed).

3.2.4 Discussion

This study encountered one of the difficulties in gathering data from pre-University participants: of the thirty schools approached only two agreed to take part, and neither of these provided the required follow up information. In most cases, reasons for not wishing to participate in the initial data collection sessions were not given, but when they were, these were largely held to be curriculum constraints, though issues with data protection were also cited. This could well explain the dearth of prospective studies in this area, and meant that the primary aim of the study – to compare data gathered from those students who progressed to University with those who did not – could not be satisfied.

The secondary aim was to explore differences between undergraduate and A-level students on a variety psychometric factors. The MANOVA showed that there were significant differences between groups, but this was almost entirely due to the 'emotional skills' variable.

Without follow up data for the school age population it is not possible to ascertain whether students who have poor emotional skills are less likely to apply to University, or are less successful in their applications. Parker et al (2004) explored the role played by Emotional Intelligence in the transition from high school to university, and found several dimensions to be predictive. However, their study did not include any other non-cognitive variables, so it is not possible to deduce if EI contributed to any unique variance in outcome. They also suggested that emotional and social competencies are likely to change over the course of a student's study and that EI scores are therefore not particularly stable. Other researchers have also found that Emotional Intelligence develops with age (Bar-On, 1997), and so it seems likely that the group differences reflect emotional state rather than trait characteristics. It is not possible to conclude whether emotional skills increase as a result of age or of entering University, or a combination of both, or if developmental factors accounted for all the difference between groups. Population norms are not yet available for the TEIQue, and as it is a relatively new measure there were no other data in the literature to enable comparisons with similar participants.

The only other significant difference between groups was 'intrinsic motivation to experience stimulation' (IMES). IMES refers to an individual's desire to perform an activity in order to experience sensory stimulation, which may be either intellectual or physical. A-level students scored higher than the two undergraduate groups on this variable, although the post hocs were non-significant. Whilst one could speculate that participants who score higher on this factor are less likely to progress to Higher Education, perhaps due to sensation seeking elsewhere, the small difference between groups could just be a statistical artifact. Further insight could be gained by exploring differences between students who *choose* not to progress to University and those who fail to achieve the entry requirements.

3.2.5 Conclusions

This study showed that the psychometric profiles for year 13 (A-level) and undergraduate participants were very similar. Indeed the two participant groups showed significant differences on only one facet of the whole range of predictor variables considered for the main study. Emotional skills have been shown to develop through adolescence, and so it is fair to predict that the differences between groups were largely due to environmental and developmental factors. Therefore it was felt that exploration of predictors of academic performance in undergraduate participants should yield information which could, with some caveats, be meaningfully applied to a pre-University population.

CHAPTER 4

PREDICTING ACADEMIC SUCCESS AT UNIVERSITY: THE ROLE OF COGNITIVE AND NON-COGNITIVE FACTORS

4.1 Introduction

This study aimed to explore the relative effects of cognitive and non-cognitive factors on academic performance at University. Previous chapters have discussed the background and rationale for this: the initial pilot study confirmed that although previous academic achievement can predict some of the variance in University success, the majority of this remains unexplained. Recent studies have indicated that non-cognitive factors may provide additional predictive information (e.g. Busato et al, 2000; Chamorro-Premuzic & Furnham, 2003), and the effect of the placement year on final year marks in the pilot study, and previous studies (eg Reddy & Moores, 2006) also suggested that factors other than previous academic performance affect final year results.

The main research questions were:

- What inter-relationships exist between cognitive and non-cognitive variables?
- What factors predict academic performance at University, and do these vary for different entry groups?
- Can non-cognitive factors provide any unique predictive information for academic performance?

4.2 Methods

4.2.1 Participants

One hundred and ten Psychology first year undergraduates (89 women, 21 men) took part in the study. Fifty six percent of participants had entered University directly from school, 25 % had taken one year out, 6% two years out, and the remainder three or more (these were classed as 'mature' students). Participants received research credits for participating.

4.2.2 Measures

The following measures were used, for which a rationale and description were presented in Chapter two.

- Demographic Information (Appendix I)
- Raven's Progressive Matrices
- NEO-FFI (Five Factor Inventory)
- AMS (Academic Motivation Scale)
- ASSIST (Approaches and Study Skills Inventory for students)
- TEIQue (Trait Emotional Intelligence Questionnaire)
- Self-assessment / Ideal profile measures (Appendix III)

Academic Performance

Previous academic information was obtained via self report sections on the demographic information sheet (see Appendix I). University performance was assessed using end of first and second year marks. These are compiled from aggregates of eight individual modules. Student data are the property of the University, but for ethical reasons and to comply with data protection regulations, the information included in this study was anonymously coded and cannot therefore be traced back to individual students.

4.2.3 Procedure

Participants were administered pen and paper versions of all the measures, and were assured of confidentiality of results. Several separate sessions were required for the collection of all data and so scripted instructions were used to ensure equivalent conditions. Twenty minutes were allowed for completion of the Ravens matrices, and participants were briefed to work as quickly but correctly as possible. The remaining measures were not timed, and were completed in a prescribed order, as listed above.

Scoring

The raw data were screened for outliers, input errors, and to confirm normality. Test results were scored according to test producers' directions with the exception of the TEIQue, where raw data were submitted to the test authors who then returned trait scores. Data gathered for all variables were normally distributed, with the exception of 'Amotivation' which were heavily skewed and kurtosed. As this factor did not relate to any of the Fair Enough criteria and was therefore not critical to the analysis, it was not considered further.

4.3 Results

Table 4.1 displays the descriptive statistics and reliability indices for all study variables.

4.3.1 Effect of Age / Years out

The sample was comprised a mixed age group, so a multivariate analysis of variance was conducted to explore the effect on test scores of taking 0, 1, 2 and 3 or more years out between school and University. Years out were entered as independent variables, with test scores for all non-cognitive factors as dependent variables. Years out are representative of educational age, and more meaningful in this context than chronological age. Tests of between subjects effects were non-significant for all factors, indicating that participant age did not affect results, Pillai's trace, $F(60, 258) = 0.88$, $p = 0.71$. This

indicates that there were no significant differences between participants due to educational age, and data from all participants were therefore included in subsequent analyses.

Table 4.1: Descriptive Statistics for total sample (n= 110)

Variable (unit)	*M* (*SD*)	*Cronbach's alpha*
A level (aggregate UCAS score)	282.4 (37.1)	n/a
End of year mark (%)	56.6 (9.1)	n/a
Raven's Matrices (score)	49.6 (4.9)	n/a
Neuroticism (T-score)	55.6 (10.6)	0.86
Extraversion (T-score)	54.0 (10.0)	0.76
Openness (T-score)	50.9 (9.2)	0.60
Agreeableness (T-score)	45.9 (11.1)	0.67
Conscientiousness (T-score)	42.9 (10.5)	0.81
Deep learning approach (score)	57.9 (8.8)	0.81
Strategic learning approach (score)	72.2 (12.3)	0.88
Surface learning approach (score)	45.5 (9.5)	0.77
Intrinsic motivation to know	20.93 (4.4)	0.86
Intrinsic motivation to accomplish	17.58 (4.8)	0.84
Intrinsic motivation to experience stimulation	13.63 (4.80)	0.82
Extrinsic motivation identified regulation	23.26 (3.59)	0.68
Extrinsic motivation introjected regulation	19.35 (5.02)	0.78
Extrinsic motivation external regulation	22.07 (4.60)	0.83
Wellbeing (score) [§]	5.1 (0.80)	n/a
Self Control (score) [§]	4.10 (0.75)	n/a
Emotional Skills (self control) [§]	5.19 (0.67)	n/a
Social Skills (score) [§]	4.78 (0.76)	n/a
Emotional Intelligence (TEIQue score) [§]	4.75 (0.5)	n/a

[§] It was not possible to compute alpha values for these variables as raw data were converted to factor scores by the test producers

Table 4.2 Correlations between scores on non-cognitive variables

	N	E	O	A	C	IM1	IM 2	IM 3	EM 1	EM 2	EM 3	Deep	Strat	Surf	Well being	Self control	Emot skills	Social skills	Teique total
Ravens	-.15	-.20*	.14	-.03	-.20*	-.14	-.13	-.02	-.27**	-.11	-.15	-.06	-.15	-.06	.05	.17	-.13	-.01	.01
N		-.32**	-.04	-.32**	-.21*	.04	-.03	.00	.09	.15	.08	-.15	-.12	.46**	-.60**	-.64**	-.22*	-.35**	-.63**
E			.08	.12	-.01	-.07	.06	.08	-.02	.03	.00	.130	.032	.05	.44**	.12	.39**	.54**	.51**
O				-.13	-.01	.09	.11	.23*	-.05	-.09	-.21*	.40**	.12	-.26**	.10	-.05	.10	.36**	.175
A					.33**	-.10	-.12	-.09	.10	-.11	.03	.06	.17	-.31**	.32**	.56**	.29**	-.12	.37**
C						.10	.01	.01	.22*	.06	.06	.28**	.69**	-.34**	.26**	.37**	.27**	.17	.42**
IM 1							.79**	.70**	.54**	.56**	.29**	.48**	.36**	-.00	.05	-.10	.13	.12	.06
IM 2								.69**	.48**	.61**	.23*	.42**	.22*	-.05	.09	.03	.12	.24*	.15
IM 3									.37**	.46**	.17	.52**	.23*	.00	-.02	-.08	.07	.14	.03
EM 1										.40**	.46**	.17	.30**	-.02	.15	-.00	.17	.06	.13
EM 2											.45**	.26**	.28**	.16	-.05	-.12	.05	.10	-.02
EM 3												.07	.21*	.15	.13	-.04	.19*	.06	.11
Deep													.43**	-.23*	.16	-.00	.32**	.32**	.28**
Strategic														-.29**	.34**	.14	.36**	.18	.39**
Shallow															-.40**	-.50**	-.10	-.13	-.42**
Well being																.47**	.56**	.44**	.90**
Self control																	.12	.17	.61**
Emotional skills																		.46**	.74**
Social skills																			.68**

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Key

IM1: Intrinsic motivation to know; IM2: Intrinsic motivation to accomplish; IM3: Intrinsic motivation to experience stimulation
EM1: Extrinsic motivation identified regulation; EM2:Extrinsic motivation introjected regulation; EM3: Extrinsic motivation external regulation

Within Factor correlations
- NEO
- AMS
- ASSIST
- TEIQue

Between factor correlations
- Ravens
- NEO
- AMS
- ASSIST

4.3.2 What inter-relationships exist between cognitive and non-cognitive variables?

Within measure correlations

High within measure correlations indicate lack of factor independence, and so these were explored to ascertain if there was potential for data reduction.

NEO-FFI

Moderate negative correlations were evident between Neuroticism and Extraversion, Agreeableness and Conscientiousness ($r = -0.32$, $p < 0.01$, $r = -0.32$, $p < 0.01$ and $r = -0.21$, $p < 0.05$ respectively). A moderate positive correlation was found between Conscientiousness and Agreeableness ($r = 0.33$, $p < 0.01$). These are largely in agreement with the data published by the test manufacturers (Costa & McCrae, 1992).

AMS

The intrinsic motivation sub scales showed strong inter- correlations (range: $r = 0.69$ to 0.79, all $p < 0.01$). The extrinsic motivation sub scales also showed moderate inter-correlations (range: $r = 0.40$ to 0.46, all $p < 0.01$). There were also weak to moderate correlations between several intrinsic and extrinsic subscales (range: $r = 0.23$, $p < 0.05$ to $r = 0.61$, $p < 0.01$). There is little published data regarding these inter- scale relationships on this measure, and the strength of the correlations suggest that the data could be reduced into two broad factors.

ASSIST

There was a moderate positive correlation between the deep and strategic approaches ($r = 0.43$, $p < 0.01$). The surface approach shows weak negative correlations with both deep and strategic approaches ($r = -0.23$, $p < 0.05$, and $r = -0.29$, $p < 0.01$ respectively). These correlations are comparable with those reported by the test manufacturers, ($r = 0.35$, $r = -0.20$, and $r = -0.22$) for the same relationships respectively, (Entwistle, Tait, & McCune, 2000).

Emotional Intelligence

There were moderate positive correlations between the wellbeing subscales, and the three other sub-scales (range: $r = 0.44$, $p < 0.01$ to $r = 0.56$, $p < 0.01$). There was also a moderate correlation between social and emotional skills, and all four subscales showed strong correlations with the total score (range: $r = 0.61$, $p < 0.01$ to $r = 0.90$, $p < 0.01$). This implies that the total score offers little unique information.

Between Measure Correlations:

What inter-relationships exist between cognitive and non-cognitive variables?

Raven's Matrices

There were weak negative correlations between Raven's scores and scores on Conscientiousness and Extraversion (both $r = -0.20$, $p < 0.05$), which agrees with previous findings (Moutafi et al, 2005), although the evidence for the latter relationship is mixed. There was also a negative correlation with extrinsic motivation (identified regulation) ($r = -0.27$, $p < 0.01$).

NEO – FFI

Openness showed a weak positive correlation with Intrinsic motivation to experience stimulation ($r = 0.21$, $p < 0.05$) and a negative correlation with extrinsic motivation external regulation ($r = -0.21$, $p < 0.05$). This is consistent with Komarraju and Karau's (2005) results, which showed a positive correlation between Openness and 'engaged' motivation, and a negative correlation with 'avoidance' motivation, which are comparable constructs to the intrinsic and motivation scales in the AMS. Conscientiousness showed a weak positive correlation with extrinsic motivation identified regulation ($r = 0.22$, $p < 0.05$). There were no other significant relationships between the five personality factors and the six motivational sub scales.

A moderate correlation was evident between Neuroticism and a surface approach to learning ($r = 0.46$, $p < 0.01$), whilst Openness , Agreeableness, and Conscientiousness all showed weak to moderate negative correlations with this trait (range : $r = -0.26$, $p < 0.01$ to $r = -0.34$, $p < 0.01$). Openness and Conscientiousness both correlated positively with a deep approach ($r = 0.40$, $p < 0.01$ and $r = 0.28$, $p < 0.01$) whilst the latter also showed a strong correlation with the Strategic approach ($r = 0.69$, $p < 0.01$). These data are all consistent with previous findings (e.g. Blicke, 1996; Diseth, 2003; Heinstrom, 2000)

Correlations between the NEO factors and the Emotional Intelligence traits revealed a weak to moderate negative correlations between neuroticism and all four subsets of the TEIQue Emotional Intelligence scale, and with the TEIQue total score (range: $r = -0.22$, $p < 0.01$ to $r = -0.64$, $p < 0.01$). Extraversion showed a moderate positive correlation with all TEIQue scores with the exception of self control (range: $r = 0.39$. $p < 0.39$ to $r = 0.54$, $p < 0.1$). Openness only correlated with social skills ($r = 0.36$, $p < 0.01$) while Agreeableness and Conscientiousness both showed weak to moderate correlations with all scores apart from this subscale (range $r = 0.27$, $p < 0.01$ to $r = 0.56$, $p < 0.01$). These findings confirm evidence from the literature (Bastian, Burns & Nettelbeck, 2005).

Academic Motivation

All three intrinsic motivation subsets correlated with the deep and strategic approaches to learning (range: $r = 0.2$, $p < 0.05$ to $r = 0.52$, $p < 0.01$). The extrinsic motivation subsets also correlated with the strategic approach (range: $r = 0.23$, $p < 0.05$ to $r = 0.30$, $p < 0.01$). These results confirm previous findings of relationships between achievement motivation and approaches to learning (eg Diseth & Martinsen, 2003).

Approaches to Learning

In addition to the relationships discussed above, there were positive correlations between the deep and strategic approaches and several TEIQue sub-sets (range: $r = 0.28$, $p < 0.01$ to $r = 0.38$, $p < 0.01$) and negative correlations between the surface approach (range: $r = -0.40$, $p < 0.01$ to $r = -0.50$, $p < 0.50$).

4.3.3 Data Reduction

The high r values between elements of the AMS sub-sets suggested that the data could be reduced to produce separate single scores for intrinsic and extrinsic motivation. Factor analysis with eigenvalues over 1 extracted. This is a technique used to explore if variables within a set form independent coherent subsets (Tabachnick & Fidell, 2001). Two factors were clearly identified, explaining 75% of the total variance (see table 4.3), although 'extrinsic motivation introjected regulation' contributed to both.

Table 4.3: Rotated Component Matrix for AMS sub- scales

	Component	
	1	2
Intrinsic motivation to know	**.862**	.288
Intrinsic motivation to accomplish	**.889**	.222
Intrinsic motivation to experience stimulation	**.871**	.072
Extrinsic motivation identified regulation	.404	**.667**
Extrinsic motivation introjected regulation	**.564**	**.539**
Extrinsic motivation external regulation	.015	**.927**

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

Removal of Variables

The TEIQue total was removed from all further analysis due to the very high correlations with all contributing sub-scales, especially 'wellbeing' ($r = 0.90$, $p < 0.01$).

Table 4.4 shows correlations between the reduced variables.

Table 4.4: Correlations between revised non-cognitive variables

	N	E	O	A	C	IM	EM	Deep	Strat	Surf	Well Being	Self control	Emot skills	Social skills
Ravens	-.15	-.20*	.14	-.03	-.20*	-.07	-.22*	-.06	-.15	-.06	.05	.171	-.13	-.01
N		-.32**	-.04	-.32**	-.21*	-.01	.13	-.15	-.12	.46**	-.60**	-.64**	-.22*	-.35**
E			.081	.12	-.01	.03	-.02	.130	.03	.049	.44**	.12	.39**	.54**
O				-.13	-.01	.21*	-.25**	.40**	.12	-.26**	.10	-.05	.10	.36**
A					.33**	-.13	.07	.06	.17	-.31**	.32**	.56**	.29**	-.12
C						.03	.14	.28**	.69**	-.34**	.26**	.37**	.27**	.17
IM								.52**	.25**	-.04	.97**	-.05	.06	.17
EM								.01	.25**	.14	.13	-.04	.18	.03
Deep approach									.43**	-.23*	.16	-.00	.32**	.32**
Strategic approach										-.29**	.34**	.14	.36**	.18
Surface approach											-.40**	-.50**	-.10	-.13
Well Being												.47**	.56**	.44**
Self control													.12	.17
Emotional skills														.46**

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Within Factor correlations
- NEO
- ASSIST
- TEIQue

Between factor correlations
- Ravens
- NEO
- AMS
- ASSIST

4.3.4 The Impact of Personality on Other Non-Cognitive Factor Scores

To explore the extent to which personality traits underlie other non-cognitive factors, stepwise regressions were conducted on all non-cognitive factors, with the Big Five factors as independent variables. Non-cognitive factors whose variance could be largely explained by personality constructs would have little to contribute as predictor variables. The results are displayed in table 4.5, which shows that the Big Five scores contributed to a varying degree of the variance in other non-cognitive factors. However, sufficient variance remained unexplained to justify including all factors in subsequent analysis.

Table 4.5: Regression of other non-cognitive variables on personality

Dependent Variable	Multiple R	R^2	R^2 change	Big 5
Deep learning approach	0.48	.23	.15 .08	O C
Strategic learning	0.69	.48	.48	C
Surface learning approach	0.59	.35	.21 .07 .07	N C O
Intrinsic motivation	0.21	.04	.04	O
Extrinsic motivation	0.25	.04	.04	O
Well Being	0.64	.41	.37 .04	N C
Self Control	0.76	.57	.41 .14 .02	N A C
Emotional Skills	0.48	.22	.16 .06	E C
Social Skills	0.65	.42	.29 .10 .03	E O N

4.3.5 What factors predict academic performance at University, and do these vary for different entry groups?

To explore the hypothesis that the predictive effect of non-cognitive factors may differ according to academic ability, a sample of low achievers (≤ 260 A level tariff points) and high achievers (≥ 300 A level tariff points) were extracted from the total sample. These cutoffs were selected because the entry requirement for Aston at the time of data collection was 280 tariff points. Descriptive statistics for these samples are displayed in table 4.6, and correlations with end of year marks in table 4.7.

Table 4.6: Descriptive statistics for Low and High A' level achievers:

Variable	Low achievers (n = 42) Mean (SD)	High achievers (n = 45) Mean (SD)	t value	Effect size
Year 1 marks (%)	53.1 (9.6)	60.5 (7.6)	3.92**	.39
Year 2 marks (%)	56.0 (9.1)	61.5 (6.1)	3.06**	.32
Ravens score (max: 60)	49.8 (4.9)	49.1 (5.2)	-.62	.07
Neuroticism (t-score)	54.0 (11.2)	56.5 (10.1)	1.09	.11
Extraversion (t-score)	53.7 (9.6)	53.1 (11.3)	-.24	.03
Openness (t-score)	50.1 (10.1)	51.7 (8.4)	.84	.09
Agreeableness (t-score)	45.7 (11.4)	46.6 (11.5)	.40	.04
Conscientiousness (t)	40.8 (9.3)	45.3 (11.4)	2.00*	.21
Deep approach	57.1 (8.9)	59.9 (7.7)	1.60	.17
Strategic approach	68.0 (12.1)	76.0 (11.7)	3.14**	.32
Surface approach	46.1 (9.4)	43.4 (8.5)	-1.40	.15
English GCSE (points)	4.4 (.70)	4.7 (0.64)	1.53	.16
Maths GCSE (points)	3.7 (.85)	4.2 (.82)	2.81**	.29
Science GCSE (points)	3.8 (1.0)	4.4 (.78)	3.04**	.31
Total GCSE (points)	11.5 (2.4)	13.1 (1.8)	3.38**	.34
Intrinsic motivation (Z)	.03 (1.0)	.03 (.85)	.02	.00
Extrinsic motivation (Z)	-.12 (1.1)	-.01 (.99)	.51	.06
Wellbeing	5.0 (.79)	5.2 (.85)	.88	.10
Self control	4.2 (.74)	4.1 (.77)	-.38	.04
Emotional skills	5.1 (.63)	5.2 (.70)	1.11	.12
Social skills	4.8 (4.7)	4.8 (.78)	.60	.06

** Significant difference at the 0.01 level (2-tailed) * Significant difference at the 0.05 level (2-tailed).

Table 4.7: Pearson's Correlations between predictor and criterion variables according to A-level achievement

Criterion Variable	Low A' level achievers (≤ 260 tariff points) (n = 42)		High A' level achievers (≥ 300 tariff points) (n = 45)		Total sample (n = 110)	
	1st year	2nd year	1st year	2nd year	1st year	2nd year
Ravens	.14	.07	-.20	-.06	-.03	.02
Neuroticism	.06	.09	.10	.16	.07	.09
Extraversion	.06	-.01	-.02	-.02	.01	-.09
Openness	.17	.22	.07	-.01	.21*	.19*
Agreeableness	.19	.22	.02	.31*	.15	.13
Conscientiousness	.02	-.16	.29*	.30*	.24**	.18*
Intrinsic motivation	.29*	.37*	.17	.10	.08	.01
Extrinsic Motivation	.21	.18	.19	-.13	.15	.06
Deep approach	.29*	.38*	.19	.07	.27**	.21*
Strategic approach	.18	.04	.41**	.34*	.38**	.19*
Shallow approach	-.31*	-.29*	-.09	-.09	-.25**	-.23*
Well Being	.05	.27*	.04	-.10	.16	.16
Self control	-.09	-.02	-.22	-.05	-.11	-.01
Emotional skills	.01	.15	.13	.12	.23**	.14
Social skills	.01	.10	-.15	-.21	-.04	.01
English GCSE	-.02	.03	.16	.24	.03	.12
Maths GCSE	.16	.40*	-.10	.00	.16	.29**
Science GCSE	.35*	.62**	.04	.19	.28**	.45**
Best 5 GCSE	.25	.53**	.13	.29*	.28**	.41**
Psychology A-level	.45**	.51**	.14	.21	.43**	.50**
Best 3 A-levels	-.06	.04	-.03	-.08	.23*	.23*
1st year marks		.77*		.79**		.81**

** Correlation is significant at the 0.01 level (1-tailed).
* Correlation is significant at the 0.05 level (1-tailed).

4.3.6 Effect of Studying Psychology at A-level of Performance at University

The correlation between Psychology grades at A-level and University performance (see table 4.7) does not indicate whether prior knowledge of the subject is of benefit: to explore this, the academic performance of participants who had studied Psychology (n = 78) was compared those who had not (n = 29). Table 4.8 shows that participants who had studied Psychology at A-level achieved significantly higher marks in the first year. This effect had, however, diminished by the second year (the reduced participant numbers for the second year are due to attrition).

Table 4.8: The effect of studying Psychology at A-level

	Psychology A level?	N	% Marks Mean (SD)	t
1st year performance	no	29	51.5 (10.2)	-3.37**
	yes	78	58.5 (7.9)	
2nd year performance	no	21	56.9 (9.1)	-1.08
	yes	71	59.1 (8.1)	

** Difference is significant at the 0.01 level (1-tailed).

4.3.7 Can non-cognitive factors provide any unique predictive information for academic performance?

To examine the incremental validity of non-cognitive factors over and above cognitive factors, hierarchical (sequential) multiple regressions were undertaken to predict 1st and 2nd year marks. This regression method was used in order to establish the incremental effect of non-cognitive factors once academic factors had been accounted for. Variables relating to previous academic achievements were entered first into the analysis. The Big Five factors were then entered followed by other non-cognitive factors, following the hypothesis that the latter are underpinned by basic personality traits. To test the latter hypothesis, in instances where Big Five factors were included in the initial regression models, the analyses were repeated with the second and third entry variables integrated, i.e. with all non-cognitive variables entered together.

Summary of steps:

(1) First entry : cognitive factors shown to correlate with the dependent variable
(2) Second entry : Big Five variables shown to correlate with the dependent variable
(3) Third entry : other non-cognitive variables shown to correlate with the dependent variable

(See table 4.7 for the correlations between variables)

Table 4.9: Regression results for total sample

Step	Variable(s)	Dependent variable: 1st year marks		
		Multiple R	R^2	R^2 change
1	Psychology A level	.417**	.174	.174
2	Ns			
3	Emotional Skills	.511**	.261	.087

Step	Variable(s)	Dependent variable: 2nd year marks		
		Multiple R	R^2	R^2 change
1	Psychology A level	.497**	.247	.247
	Best 5 GCSE	.571**	.326	.079
2	Ns			

** Correlation is significant at the 0.01 level (1-tailed).

* Correlation is significant at the 0.05 level (1-tailed).

Table 4.10: Regression results for Initial Low Achievers

Step	Variable(s)	Dependent variable: 1st year marks		
		Multiple R	R^2	R^2 change
1	ns			
2	ns			
3	Deep learning approach	.608**	.369	.369

Step	Variable(s)	Dependent variable: 2nd year marks		
		Multiple R	R^2	R^2 change
1	Science GCSEs	.560**	.313	.313
	Psychology A level	.687*	.472	.159
2	ns			
3	Deep learning approach	.840**	.705	.233

** Correlation is significant at the 0.01 level (1-tailed).
* Correlation is significant at the 0.05 level (1-tailed).

Table 4.11: Regression results for High Achievers

Step	Variable(s)	Dependent variable: 1st year marks		
		Multiple R	R^2	R^2 change
1	ns			
2	Conscientiousness	.294*	.086	.086
3	ns			
All non-cognitive variables entered together in step 2				
1	ns			
2	Strategic learning approach	.405*	.164	.164

Step	Variable(s)	Dependent variable: 2nd year marks		
		Multiple R	R^2	R^2 change
1	ns			
2	Agreeableness	.310*	.096	.096
3	Strategic learning approach	.444*	.197	.101
All non-cognitive variables entered together in sep 2				
1	ns			
2	Strategic learning approach	.336*	.113	.113

** Correlation is significant at the 0.01 level (1-tailed).
* Correlation is significant at the 0.05 level (1-tailed).

The results displayed in tables 4.9 – 4.11 show that academic performance was predicted by different factors according to academic achievement at entry. For the total sample (table 4.9) first year marks were predicted by Psychology A level grades ($r = 0.42$, $p < 0.01$), with Emotional skills resulting in a significant increment in r^2 (r^2 change = 0.09, $p < 0.01$). Second year marks for this group were predicted by academic factors alone (Psychology A-level grade and Best GCSE grades), $r = 0.57$, $p < 0.01$.

For low achievers (table 4.10), first year marks were predicted solely by a deep learning approach ($r = 0.61$, $p < 0.01$). Second year marks were predicted by academic factors (Psychology A-level grades and GCSE Science), $r = 0.69$, $p < 0.01$, with deep learning approach resulting in a significant increment in r^2 (r^2 change = 0.71, $p < 0.01$).

For high achievers (table 4.11) first year marks were predicted solely by Conscientiousness ($r = 0.29$, $p < 0.05$). However, when the analysis war repeated with all non-cognitive variables entered simultaneously in step two of the regression, the strategic learning approach was more predictive ($r = 0.41$, $p < 0.05$). When second year marks were entered as the dependent variable, results were predicted by agreeableness ($r = .31$, $p < 0.05$) with strategic learning approach resulting in a significant increment in r^2 (r^2 change = 0.10, $p < 0.05$). Once again though when the analysis was repeated with all non-cognitive variables entered simultaneously in step two of the regression, the strategic learning approach alone was predictive ($r = 0.34$, $p < 0.05$).

4.3.8 'Extreme groups' MANOVA

In order to obtain a more detailed comparison of high and low entry participants, four groups comprising extreme scoring pupils were created: group a (low A' levels / low degree marks, n = 13), group b (high A' levels, low degree scores, n = 4), group c (high A' levels, low degree scores, n = 10) and group d (high A levels, high degree scores, n = 24). Low and high A' level groups were established as previously described. High and low scoring degree students were participants achieving less than 50% and over 60% in their 2nd year respectively, as these represent third class degree and below, compared to upper

second classification and above. Second year marks were used as these contribute towards, and correlate with, final year marks. The results of the MANOVA, followed by Sidak post hocs are presented in table 4.12

The comparisons of most interest were between groups c and a, that is students with initial low academic performance, whose performance at University has either improved, or remained poor. Post hocs revealed that these groups show significant differences in scores for deep learning approach and Science GCSE. They also show higher scores for Intrinsic motivation, though this is not significant ($p = 0.075$) Consistently high achievers scored higher on both strategic and deep approaches to learning, Science GCSE, Maths GCSE, and total GCSE scores. It is interesting to note that group b, who performed well at A-level but whose performance at University declined, have the highest scores for Neuroticism and surface learning approach, and lowest score for Wellbeing and Openness, although the differences are not significant, and the results must be interpreted with caution due to the small number of participants in this group.

Table 4.12: Comparisons of participant groups based on splits of A' level and 2nd year degree performance

	Low A level / Low degree marks (a)	High A levels / Low degree marks (b)	Low A levels/ High degree marks (c)	High A levels / High degree marks (d)	*F*	Sidak tests
Ravens score	48.85 (1.50)	50.25 (2.71)	49.80 (1.71)	49.42 (1.10)	.096 (.01)	
Neuroticism	52.92 (3.12)	62.25 (5.6)	58.10 (3.56)	56.50 (2.30)	.852 (.05)	
Extraversion	56.85 (2.90)	50.25 (5.22)	54.00 (3.30)	54.63 (2.13)	.441 (.03)	
Openness	48.31 (2.62)	43.50(4.72)	53.50(2.99)	52.42(1.93)	1.605 (.09)	
Agreeableness	45.23 (2.99)	54.00 (5.38)	48.60 (3.40)	49.54 (2.20)	.822 (.05)	
Conscientiousness	40.46 (2.84)	44.50 (5.11)	41.90 (3.23)	47.50 (2.10)	1.576 (.09)	
Deep approach	50. 85 (2.21)	54.50 (3.98)	63.00 (2.52)	61.04 (1.62)	6.220** (.28)	c > a*, d > a*
Strategic	63.85 (3.20)	67.25 (5.77)	69.50 (3.65)	78.75 (2.36)	5.274** (.25)	d > a*
Surface	47.23 (2.56)	49.00 (4.61)	44.00 (2.92)	41.46 (1.88)	1.532 (.09)	
English GCSE	4.39 (.20)	4.75 (.36)	4.40 (.23)	4.79 (.15)	1.277 (.08)	
Maths GCSE	4.54 (.19)	4.25 (.35)	4.20 (.22)	4.33 (.14)	3.826* (.20)	d > a*
Science GCSE	3.39 (.25)	4.00 (.44)	4.60 (.28)	4.67 (.18)	6.532** (.29)	d > a*, c > a*
Total GCSE	11.31 (.47)	13.00 (.85)	13.20 (.54)	13.79 (.35	6.051** (.28)	d > a*
Intrinsic motivation	-.596 (.26)	-.115 (.46)	.356 (.29)	.123 (.19)	2.457 (.14)	
Extrinsic motivation	-.616 (.31)	-.998 (.56)	.185 (.35)	-.063 (.23)	1.798 (.10)	
Wellbeing	4.99 (.21)	4.32 (.38)	5.04 (.24)	5.16 (.16)	1.436 (.08)	
Self control	4.35 (.22)	4.24 (.40)	4.00 (.25)	4.14 (.16)	.411 (.03)	
Emotional skills	5.02 (.17)	5.05 (.31)	5.24 (.19)	5.35 (.13)	.918 (.06)	
Social skills	4.93 (.19)	4.48 (.34)	4.72 (.22)	4.75 (.14)	.506 (.03)	

Values in parentheses behind means are standard errors. Values in parentheses after the F ratios are the effect sizes.

** Significant at the 0.01 level (2-tailed).
* Significant at the 0.05 level (2-tailed).

4.4 Discussion

There were three main aims to this study:

1. To explore inter-relationships between cognitive and non-cognitive variables
2. To identify the factors that predict academic performance at University for different entry groups
3. To identify whether non-cognitive factors provide any unique predictive information for academic performance

4.4.1 What inter-relationships exist between cognitive and non-cognitive variables?

Raven's Matrices / NEO – FFI

The strongest relationship between psychometric intelligence and personality is claimed to be for Openness, and correlations of around 0.30 have been reported (e.g. Ackerman & Heggestad, 1997; Austin et al, 2002). Some researchers have suggested that Openness may be conceptualized as a self-report measure of intelligence (e.g. Goff & Ackerman, 1992) and recent thinking suggests that self-assessed intelligence may mediate the relationship between intelligence and certain personality factors (Chamorro-Premuzic et al , 2005). Another theory suggests that individuals with higher fluid ability develop more open personalities, leading in turn to the development of higher crystallized ability (Chamorro-Premuzic & Furnham, 2004; Moutafi et al, 2005). However a longitudinal study by Gow, Whiteman, Pattie and Deary (2005) failed to demonstrate a residual link between Openness and adult mental ability after adjusting for childhood IQ, which refutes the developmental theory. Chamorro-Premuzic et al, (2005) found a relationship of 0.21 between Openness and g_f, (measured in their study, as in the current one, by Raven's matrices). The relationship of 0.14 obtained in the current study was non-significant: this correlation may have been dampened by range restriction, although the undergraduate sample is similar to those used in other studies.

Conscientiousness has also been shown to correlate with intelligence: results of the current study indicated a negative relationship between these factors, in line with recent research (e.g. Moutafi et al, 2005). It has been suggested that in competitive situations, less intelligent subjects increase their Conscientiousness, whereas those with high intelligence do not develop this trait to the same extent. Moutafi et al (2004) showed that the relationship was stronger for fluid as opposed to crystallized intelligence which would support the theory that intelligence affects Conscientiousness rather than vice versa, although for a fuller picture the interaction between Conscientiousness, Openness and intelligence should be considered.

Negative correlations have also been reported between Neuroticism and intelligence (e.g. Gow et al, 2005). The correlation of -0.15 in the current study was not significant, but is of the same magnitude as that reported by Ackerman and Heggestad (1997) in their meta-analysis (which clearly had a greater sample size). It has been suggested that the association between Neuroticism and intelligence is due to the effect of the former on test performance rather than actual ability (Chamorro-Premuzic & Furnham, 2004) Several researchers have claimed that although performance on cognitive tests may be affected by non-cognitive factors, the constructs themselves are orthogonal (e.g. Escorial, Garcia, Cuevas & Juan-Esinosa, 2006; Zeidner & Matthews, 2000). This would be difficult to prove as it is not possible to remove personality effects from test-taking situations.

Similar negative relationships have been reported between Extraversion and ability, and this was also supported by the current study. The nature of the relationship between extraversion and intelligence is thought to be mediated by the type of test, so Extraversion, like Neuroticism is thought to be related to test performance rather than intelligence *per se.*

Raven's Matrices / AMS

Ravens scores were also showed a significant, but weak, negative correlation with extrinsic motivation. This suggests that more intelligent subject are less likely to be

motivated by external reward, and confirms Busato et al's (2000) results, which showed a similarly small correlation of - 0.17 between intellectual ability and fear of failure.

NEO - FFI / AMS

Previous studies have shown relationships between Conscientiousness, Agreeableness, Neuroticism and motivation (e.g. Busato, Prins, Elshout, & Hamaker, 1999), but in the current study these Big Five factors did not correlate with either intrinsic or extrinsic motivation. Openness to experience, however, showed a positive correlation with intrinsic motivation, and a negative correlation with extrinsic motivation, consistent with Komarraju and Karau's (2005) results which showed a positive correlation between Openness and 'engaged' motivation, and a negative correlation with 'avoidance' motivation. This suggests that more open individuals are not only more likely to engage in intellectual pursuits, but are intrinsically motivated to do so.

NEO - FFI / ASSIST

It is generally accepted that there is considerable overlap between personality factors and approaches to learning (e.g. Busato et al, 1999; De Raad & Schouwenburg, 1996; Duff et al, 2004; Jackson & Lawty – Jones, 1996). The results of the current study concur with previous findings (e.g. Blicke, 1996; Diseth, 2003; Heinstrom, 2000; Zhang, 2003) and also make intuitive sense. The strategic approach showed a strong positive correlation with Conscientiousness: students who adopt a strategic approach are well-organised and good at time management, both facets of Conscientiousness. The deep approach correlated with both Openness and Conscientiousness, the former being the stronger relationship. The deep approach is connected with critical analysis and seeking a deeper meaning, which are facets of Openness. Finally, the surface approach correlated positively with Neuroticism, and negatively with Openness, Agreeableness and Conscientiousness. Students who adopt a surface approach tend to show a lack of critical analysis, and are not interested in seeking a deeper meaning. They also tend to have fear of failure as a primary motive (Diseth & Martinsen, 2003), which is related to Neuroticism.

The relationship between personality and learning approaches is considered to be causal (e.g. De Raad & Schouwenburg, 1996; Duff et al, 2004). As personality traits are thought to remain relatively stable through adult life, it does seem probable that personality factors determine learning approaches rather than vice versa. Regression of approaches to learning on personality scores in the current study confirmed a relatively strong effect of the latter, with personality accounting for 23%, 48% and 40% of the variance in deep, strategic and surface approaches respectively. These figures are consistent with those quoted by Duff et al (2004), who used structural equation modeling to demonstrate that Big Five scores accounted for between 22.7% and 43.6% of the variance across scores on the three approaches to learning dimensions. Diseth (2003) suggested that personality factors account for 10 – 25% of the variance in approaches to learning, and proposed that each of the approaches to learning variables were predicted by a mixture of personality factors rather than a single trait. In the current study, the strategic approach was predicted solely by Conscientiousness, whereas there were multiple effects of personality factors on the strategic and shallow approach.

Jackson and Lawty-Jones (1996) suggested that learning styles are simply a sub set of personality whereas Furnham, Jackson, and Miller (1999) further specified the former to be a learnt component of the latter. This would support suggestions that the personality – performance relationship is not stable over time (e.g. Baker & Bichsel, 2006; Harackiewicz et al, 2002).

The strong relationships between the Big Five and approaches to learning prompt the question – do the latter provide any additional information beyond that which is provided by personality scores? The results of the current study confirmed claims by previous researchers that although personality factors do contribute towards approaches to learning scores, a substantial amount of variance remains unexplained, and that ASSIST scores can provide independent predictive information (Diseth, 2003; Duff et al, 2004; Furnham, et al, 1999). This will be discussed further when the predictive validities of each measures are considered in the next section.

NEO - FFI / TEIQue

Previous research has suggested that there is considerable overlap between Emotional Intelligence constructs and personality factors (e.g. Petrides & Furnham, 2001; Schulte et al, 2004).The significant correlations between the total TEIQue score and Neuroticism (negative) and Extraversion, Agreeableness and Conscientiousness (positive) agreed with previous findings (e.g. Bastian et al, 2005), although other researchers have not found a significant relationship with Openness and Agreeableness (Petrides & Furnham, 2001).

Some researchers have suggested that EI scores provide little unique information regarding academic performance (e.g. Schulte et al, 2004) but others claim that they can provide incremental validity over that provided by personality measures alone (Saklofske et al, 2003). Regression of the total EI score on the Big Five scores produced a multiple correlation of 0.79; hence 62% of the variance in the total TEIQue score could be explained by personality. Schulte et al (2004) calculated a similar multiple correlation of 0.81 in their study, in which they predicted EI scores from g, Agreeableness, and gender, and suggested that EI scores may consequently have limited predictive value. However, as the maximum total variance in academic performance explained by most studies utilizing a variety of cognitive and non-cognitive measures rarely rises above 20%, any measure which can explain additional variance, however small, is of theoretical interest.

AMS / ASSIST

Previous literature highlights a relationship between achievement motivation and approaches to learning (e.g. Diseth & Martinsen, 2003). In the current study, the strategic approach showed significant, but weak, positive correlations with both intrinsic and extrinsic motivation, whereas the deep approach showed a moderate positive correlation with intrinsic motivation. This confirms previous findings of a relationship between intrinsic values and deep information processing (Bruinsma, 2002). More recent research has suggested that not all extrinsic motivation is undesirable, as initially thought, (Deci &

Ryan, 2000b), which could explain the association between the strategic approach and a balance of both motivation types. Interestingly there were no significant correlations between a surface approach and motivation.

ASSIST / TEIQue

Correlations were noted between approaches to learning and some EI factors, but it is likely that this is due to the shared influence of Big Five factors.

4.4.2 What factors predict academic performance at University, and are these different for low ability entry groups?

Many studies to date have focused solely on academic predictors (e.g. Peers & Johnston, 1994), or on non-cognitive factors (Diseth, 2003; Paunonen & Ashton, 2001a). Only recently has the importance of exploring the incremental predictive validity of non-cognitive factors over academic factors been recognized (e.g.Chamorro-Premuzic & Furnham, 2003; Lounsbury et al, 2003; Martin et al, 2006). Non-cognitive factors that predict academic success are of interest within a Widening Participation context: they may provide useful information to identify pupils who have previously not performed well academically but who have the attributes to succeed at University (Oswald et al, 2004). Yet no studies to date have focused specifically on the comparative predictive validity of cognitive and non-cognitive measures according to previous academic achievement. The current study addressed this by considering previous low and high achievers separately. Some relevant differences were evident, with implications for the use of these measures for University admissions.

Total Group Analysis

Despite correlations with Conscientiousness, approaches to learning, and a range of previous academic achievements, regression analysis indicated that the most important

predictors of 1st year performance were Emotional skills and Psychology A-level grades, respectively explaining 17% and 9% of the unique variance. By the second year, Emotional skills no longer made a significant contribution. This confirms previous research which suggests that although EI skills can provide some useful information regarding academic performance in the absence of other predictors (Parker et al, 2004a), this effect diminishes greatly if other variables are also included in the analysis (Barchard, 2003; Newsome at al, 2000). This trait has also been shown to be most useful when predicting the success of the transition for school to University (Austin, Evans, Goldwater & Potter, 2005; Parker et al, 2004b).

In the 2nd year, Psychology A-level grades explained 25% of the total variance in performance, while Best 5 GCSE scores contributed an additional 8%. Thus previous academic factors, particularly A-level grade, had a greater impact on second year marks than first year marks. It was also shown that students who studied Psychology at A-level achieved better first year marks than those who did not, consistent with previous research which has identified prior knowledge as an important predictor of academic achievement (Hardy, Zamboanga, Thompson & Reay, 2003). However, this advantage was not evident in the second year. In the first year, previous subject knowledge may be of greater advantage as some of the introductory material at University may replicate the A-level syllabus. Second year studies not only involve the introduction of more advanced subject matter, but there is greater emphasis on analysis and discussion. Paradoxically, for those participants who *had* studied Psychology at A-level, the grade achieved had greater impact in the second year than the first: this suggests that the effect of previous achievements in Psychology is linked to motivational factors rather than subject knowledge. Previous research has shown that subject-specific motivation may lead to enhanced performance (Breen & Lindsay, 2002), and it has also been suggested that A-levels in general may serve not simply as a measure of achievement or ability, but as an indication that students are motivated and already posses good study skills (McManus, Smither, Partridge, Keeling & Flemming, 2003).

It is interesting to note that the effect of Psychology A-level was not evident in the pilot study reported in Chapter 3. A-level data in the pilot study related to entrants from 5 years previous and so the difference in results may reflect syllabus changes or different assessment strategies at University.

Low achievers

First year marks achieved by low achievers correlated with intrinsic motivation, deep and surface approaches to learning, science GCSE and Psychology A-level grades. Hierarchical regression however revealed that all the predicted variance in performance could be explained by a single factor: the deep approach to learning (37% of total variance explained). This is considerably greater than the correlation of 0.26 reported between these factors by Sadler- Smith (1997), which highlights the importance of exploring specific student groups rather than broad samples.

The deep approach also predicted second year marks, with an additional effect of Science GCSE and Psychology A-level grades. Together these factors explained an astounding 71% of the total variance. This implies that, for lower achieving students, deep processing skills are highly important, as are analytic skills (Science GCSE grade) and subject specific motivation (Psychology A- level grade). Personality factors are thought to underpin learning (e.g. De Raad & Schouwenburg, 1996; Duff et al, 2004), but in the current study, the effects of the deep approach over-rode Openness. Diseth, (2003) suggested that the deep approach is a mediator between Openness and achievement, but it perhaps should be considered a facilitator rather than mediator, and the total effect may be synergistic.

High achievers

In this group, first year marks correlated with a strategic approach to learning and Conscientiousness. Regression with Big Five factors entered before other non cognitive factors indicated that Conscientiousness was the only significant predictive variable for 1st

year marks, explaining 9% of the total variance in academic performance, identical to the result obtained by Wolfe and Johnson (1995). However, when the analysis was repeated with all non-cognitive variables entered together, Conscientiousness was no longer predictive; instead the strategic approach predicted 16% of the variance. Previous research has suggested correlations ranging from $r = 0.14$ to $r = 0.26$, between strategic approaches and academic performance (Newstead, 1992; Sadler-Smith, 1997), and it has been suggested that differences in results may be partly attributable to assessment strategies (Entwistle et al 2000). The analyses in the current study were close to the 0.05 significance level so it is likely that both factors do have a role to play. Conard (2005) suggested that certain behaviour may mediate the relationship between Conscientiousness and academic performance: it is possible that in educational settings Conscientiousness is manifested as a strategic approach, in much the same way as the deep approach seems more influential than the underlying trait of Openness.

A similarly interesting pattern emerged when second year marks were entered as the dependent variable. When Big Five factors were entered first, Agreeableness and the strategic approach each explained 10% of the unique variance. Yet when these were entered together, Agreeableness was no longer included in the regression model. Agreeableness has generally been held to be non-predictive of academic performance, although Chamorro-Premuzic and Furnham (2003) reported a small positive correlation of 0.17 with exam marks. Allik and Realo (1997) conversely found that high scorers on an IT course were more likely to score low for Agreeableness: this disparity could relate to different requirements and assessment strategies for these two distinct vocations.

4.4.3 Can non-cognitive factors provide any unique predictive information?

The results clearly indicate that non-cognitive predictors need to be considered in terms of the incremental information they provide. When the total sample was considered, although several non- cognitive predictors correlated with marks at university, they did not

explain any unique variance. For this group, previous academic achievement was the main predictor.

For the low achievers, all predictive factors had greater significance. This is the group of most interest to the current study as they fall into the Widening Participation target group. For this group, deep processing skills and analytic skills seem to be of great importance, and could potentially discriminate between applicants likely to succeed at University and those who would not. This is not to say that these skills are not important in all students, more likely that they are previously embedded in students who are already achieving a certain standard. This theory is supported by the result of the extreme group MANOVA which showed that the key difference between initial low achievers who subsequently went to improve their performance at University and those who did not, were a deep learning approach and Science GCSE scores.

Consistently high achieving students also had high scores for the deep approach. In direct comparison, students whose performance declined at University scored low for the deep approach, and also for wellbeing, and showed high scores for Neuroticism. These differences were not all significant, and care must be taken in interpretation due to the small number in this sub set, but do suggest that emotional stability and deep processing skills are important factors for maintaining academic performance. Recent research has indicated that EI provides little incremental information once ability and personality scores are accounted for (Newsome et al, 2000), but may have a moderating effect between ability and performance. This moderating effect is generally considered in a positive direction (i.e. the benefits of high EI for low ability students) but the opposite may be equally true. Several researchers have indicated that Neuroticism may well have a negative effect on performance (e.g. De Raad & Schouwenburg, 1996; Duff et al, 2004).

Contrary to suggestions from the literature that approaches to learning are a sub set of personality (e.g. Duff et al, 2004; Jackson & Lawty-Jones, 1996), the current study supported the view that they make an unique contribution to the variance in academic performance (Diseth & Martinsen, 2003), and are in fact superior measures of academic performance (Furnham et al, 1999). Conscientiousness, largely believed to be the best non-

cognitive predictor of performance both in education (e.g. Chammorro-Premuzic & Furnham, 2003; Oswald et al, 2004) and in the work place (Barrick & Mount, 1991; Hurtz & Donovan, 2000), was less influential .

In general, academic performance was best predicted by a combination of previous ability, personality and approaches to learning. The academic motivation scores provided no unique information. The TEIQue scores provided some information regarding 1st year performance, but were not predictive for the 2nd year. This corroborates previous research which suggests that EI measures may be useful to identify students at risk of failure and therefore have implications for intervention (Bastian et al, 2005). Raven's matrices were also non-predictive, in line with previous research which has indicated that there is little relationship between measures of non-verbal ability and college performance (McLaurin & Farrar, 1973).

4.5 Summary

1. For a broad sample, previous academic achievement is the best predictor of success at University. Emotional skills are important for the 1st year but effects diminish by the second year

2. For high achievers, strategic learning approach scores can allow further differentiation.

3. For low achievers, deep processing skills, analytic skills, and subject specific motivation all make significant contributions to subsequent academic performance.

4. Emotional stability, well being, and deep processing skills may be implicated in maintaining academic performance at University. Screening of Undergraduates and implementation of intervention strategies may be warranted for low scorers.

4.6 Conclusions, Limitations and Further Research

1. This study highlighted the dangers of studying too broad, or conversely, too narrow a range of participants. In analyzing the broad 'total sample' the impact of non-cognitive factors was lost. Conversely analyzing data from the high ability group alone could have led to the erroneous conclusion that cognitive factors provide no useful predictive information regarding academic performance. This participant group was more homogeneous in terms of academic ability, leading to range restriction and what has been referred to as the 'right-tail phenomenon (e.g. Calvin, 2000): because lower scoring participants had been screened out, remaining ones were all from upper part of the testing curve. The results confirm the observation made by Furnham et al (2003) that for elite students, "once selected, it is effort rather than ability that best determines University success" (p62).

2. Certain relationships were identified between personality, approaches to learning and academic performance, but the analysis was limited because only broad factors were measured. Consideration of second order factors would allow further exploration of this area, and this was subsequently done via a separate study, reported in Chapter five.

3. It is clear that non-cognitive measures can provide useful predictive information regarding performance at University. However, introducing these measures as part of the application process could potentially lead to test practice, coaching, and faking, which could impact on their predictive validity. The results of a study to explore the extent and effect of impression management on non-cognitive measures used in an educational context are reported in Chapter six.

CHAPTER FIVE
WHAT FACETS OF CONSCIENTIOUSNESS, OPENNESS, AND APPROACHES TO LEARNING PREDICT ACADEMIC PERFORMANCE?

5.1 Introduction

Previous research has identified a predictive relationship between Conscientiousness and academic performance (Busato et al, 2000; Chamorro-Premuzic & Furnham, 2003), although in the study reported in Chapter four of this thesis this trait did not provide any unique predictive information when other factors were also considered. The evidence regarding Openness is somewhat mixed, with some researchers reporting a correlation with academic success (e.g. Ackerman & Heggestad, 1997), and others (eg Busato et al, 2000) refuting this. The study reported in Chapter four reported a correlation between Openness and academic performance in some student groups, but no unique variance was explained by this factor. The effect of Openness on academic performance is therefore is debatable.

Most studies incorporating a measure of personality have employed the 60 item NEO – FFI which yields scores for the broad Big Five factors, but not for the narrow, second order traits. The full version of the measure (the NEO PI) yields scores for both broad and narrow traits, but is a much lengthier 240 item test which takes 30 – 40 minutes to complete. Because of time constraints, especially when the personality measure is part of a battery of tests, the FFI is the more attractive option, and also produces a more manageable number of variables.

Some researchers have explored the second order (narrow) personality factors which comprise the broader traits: Paunonen and Ashton (2001b) compared the predictive validity of broad and narrow Big Five traits for a range of social criteria and found that a substantial amount of the criterion variance predicted by second-order traits was not predicted by the broad factor traits. They recommended that narrow traits should therefore be used in predictive contexts. Recently the relationship between narrow personality traits

and intelligence has been explored (Lounsbury, Welsh, Gibson & Sundstrom, 2005; Moutafi, Furnham, & Crump, 2006), but only a few studies to date have explored the relationship between second order factors and academic performance. Paunonen and Ashton (2001a) found that scores for the narrow traits of the Personality Research Form (PRF) were better predictors of academic performance than broad traits in a cohort of Psychology undergraduates. However their study focused on comparing broad traits with only one second order trait for each factor under consideration, and the latter were 'selected' by five psychology graduates, thus introducing a high level of subjectivity.

There is much evidence relating approaches to learning academic performance (e.g. Diseth & Martinsen, 2003; Sadler-Smith, 1997). Scores for the deep and strategic approaches have in particular shown positive correlations with academic success, and with the personality traits of Openness and Conscientiousness respectively (Blickle, 1996). However there is again little documented research to explore the narrow facets of each learning approach. It is possible that narrow (second order) traits would yield more detailed information, especially when the overlap between personality and approaches to learning is considered: examination of second order traits may lead to greater understanding of the relationships between personality, approaches to learning and academic performance.

5.1.1 Openness

The six sub-factors of Openness to experience identified in Costa and McCrae's (1992) model are fantasy, aesthetics, feelings, actions, ideas and values. 'Fantasy' refers to extent of imagination, creativity and fantasy life. Scores on the 'Aesthetics' facet refer to interest and appreciation of art and beauty. 'Feelings' refer to how receptive respondents are to their own emotions, and the value placed on these. Scores on the 'Actions' sub-scale indicate respondents' preference for novelty rather than familiarity, and the extent to which they are prepared to try different activities. The 'Ideas' sub- factor refers to open-mindedness and intellectual curiosity, characterized by active pursuit of intellectual interests. Scores on the 'Values' subscale indicate how willing respondents are to re-examine social, political and religious values.

Clearly some of the facets (e.g. ideas) are more conceptually related to academic activities than others. Moutafi et al (2006) found that the Ideas facet showed the strongest correlation with fluid intelligence ($r = 0.20$). They also found a weak but significant correlation between intelligence and Action ($r = 0.07$) whereas none of the other sub-scales showed significant relationships. It is possible that amalgamation of all the subscales for this factor might dampen the strength of the correlation between the broad factor and the criterion variable. Unfortunately the study by Moutafi et al (2006) did not include a measure of crystallized intelligence. The latter may well be related to different second order facets, thus providing further information regarding the much debated relationship between g_f, g_c and Openness.

Griffin and Hesketh (2004) suggested that Openness is comprised of two main factors: Openness to external experience (consisting of Actions, Ideas, and Values) and Openness to internal experience (Fantasy, Feelings, and Aesthetics). They proposed that only Openness to external experience would provide predictive information regarding job performance, though their empirical data provided only weak support for this hypothesis. Gignac et al (2005) similarly proposed two main sub sets for Openness: general Openness and objective Openness. Paunonen and Ashton (2001a), in one of the few studies to date to explore the relative effects of narrow and broad traits on academic performance, found that the broad trait of Openness did not significantly predict final course grade. However, some of the sub factors did show significant positive correlations with academic performance (most notably that of Understanding, $r = 0.23$), whereas others showed significant negative correlations. Combining second order traits which have both positive and negative effects would reduce the impact of the broad factor, resulting in a significant decrease in overall predictive validity.

In general, there is growing evidence that the narrow traits of Openness may provide more and differential information regarding academic performance, and the NEO test authors

themselves agree that Openness is one of the broadest and least well understood of the Big Five factors (e.g. McCrae, 1994).

5.1.2 Conscientiousness

The six sub-factors of Conscientiousness identified in Costa and McCrae's (1992) model are Competence, Order, Dutifulness, Achievement striving, Self-Discipline and Deliberation. 'Competence' refers to a sense of being capable, careful and effective. 'Order' refers to organization skills. 'Dutifulness' refers to the extent that respondents adhere to their principles and moral obligations. 'Achievement striving' refers to aspiration levels, and working hard to achieve goals. Scores on the 'Self – Discipline' sub-scale refer to respondents' ability to complete tasks despite distraction. 'Deliberation' is related to how cautious respondents are, and the extent to which they think before acting.

Recent studies have shown that there is a negative correlation between the broad trait of Conscientiousness and intelligence, and it has been suggested that this is due to adaptivity (Moutafi et al, 2004). In terms of the narrow traits, Moutafi et al, 2006 demonstrated small negative correlations between the second order factors Order, Self-discipline and Deliberation with g_f, which supports the argument that fluid intelligence affects the development of Conscientiousness.

Most researchers have demonstrated significant positive correlations between Conscientiousness and academic success (e.g. Bustao et al, 2000; Chamorro-Premuzic & Furnham, 2003; Paunonen & Ashton, 2001a). Paunonen and Ashton (2001a) showed that the correlation between the broad trait and academic performance ($r = 0.26$) was largely due to the effects of the second order factors Achievement ($r = 0.26$) and Endurance ($r = 0.19$) and dampened by the negative effect of Impulsivity ($r = - 0.17$). As these researchers relied on a different psychometric measure, it is not possible to make direct comparisons with Moutafi et al's (2006) results. However it does seem as if the sub factors which affect fluid intelligence may differ from those which affect academic performance. This could explain some of the disparity in research to date regarding the effect of Conscientiousness

on cognitive ability and achievement. No studies to date have explored the relationship between the sub-factors of Conscientiousness with both fluid intelligence and academic achievement.

5.1.3 Approaches to Learning

Previous research has identified positive correlations between academic performance and the deep and strategic approaches and negative relationship with the surface approach (e.g. Sadler-Smith, 1996), although the results of the study reported in Chapter four indicated that scores for the surface approach do not yield any unique predictive information. For this reason, only data relating to the deep and strategic approaches were considered in this follow-up study. The deep approach is comprised of four self-explanatory sub-factors; seeking meaning, relating ideas, use of evidence, and interest in ideas. The strategic approach is comprised of organised studying, time-management, alertness to assessment demands, achieving, and monitoring effectiveness. There are no documented studies to date reporting the relationships between the ASSIST sub-scales and personality factors, or their predictive validity for academic performance.

The current study aimed to explore the predictive validity of the second-order traits which contribute to the broad factors of Openness to experience, Conscientiousness, and the deep and strategic approaches to learning. A secondary aim was to analyse the relationships within and between these two measures in order to gain further insight into the relationship between personality ands approaches to learning.

The main research questions were

- What does analysis of second order factors reveal about the relationship between personality and approaches to learning?

- Do second order factors yield greater predictive information than the broad traits?

5.2 Methods

5.2.1 Participants

Data were obtained from first year undergraduates on the Psychology programme at Aston. All received research credit for their participation. Fifty four participants (49 women, 5 men) took part in the study. The mean age was 19 years (range 18 – 36).

5.2.2 Measures

All participants completed a demographic information form, the Raven's progressive matrices, the NEO PI-R (form S), and the ASSIST.

The NEO-PI consists of 240 items on a 5-point scale and gives scores on six facets of each main domain (as detailed in the introduction). It is the original full length test from which the NEO-FFI was derived, and has proven reliability and validity (Costa & McCrae, 1992).

5.2.3 Procedure

The procedure followed the same format as that outlined in Chapter four.

5.3 Results

Data were screened for outliers and input errors and results scored according to test producers' directions. Descriptive and reliability data are presented in table 5.1. It was noted that the Cronbach's alpha values for some of the sub factors were very low, implying a lack of internal reliability. Two of the Conscientiousness sub-factors had negative values

which indicate that there was a negative average covariance among items. These discrepancies were noted but the variables were left in the analysis.

Conscientiousness and Openness FFI broad scores were computed by extracting the relevant questions from the full test battery and converting the scores on these to t-scores, using norms provided by the test manufacturers.

Table 5.1: Descriptive and reliability statistics for study variables

Variable (unit)	M (SD)	Cronbach's alpha
End of year marks (%)	57.30 (7.36)	n/a
Ravens	49.50 (4.74)	n/a
O1 (fantasy)	20.28 (4.34)	.25
O2 (aesthetics)	20.02 (4.07)	.58
O3 (feelings)	24.59 (2.92)	.43
O4 (actions)	18.11 (3.46)	.38
O5 (ideas)	21.89 (3.80)	.67
O6 (values)	23.67 (2.95)	.39
Openness FFI broad score (t- score)	**57.35 (8.36)**	**.53**
C1 (competence)	19.22 (3.95)	.59
C2 (order)	17.00 (4.37)	.25
C3 (dutifulness)	21.26 (4.27)	-.18
C4 (achievement striving)	19.35 (4.06)	.49
C5 (self-discipline)	17.63 (5.37)	.43
C6 (deliberation)	15.89 (3.59)	-.41
Conscientiousness FFI broad score (t-score)	**39.00 (11.02)**	**.79**
Deep approach (seeking meaning)	13.96 (3.26)	.73
Deep approach (relating ideas)	13.89 (3.27)	.66
Deep approach (use of evidence)	15.11 (2.38)	.31
Deep approach (interest in ideas)	15.57 (3.38)	.81
Deep approach broad score	**58.54 (10.53)**	**.88**
Strategic (organised studying)	12.94 (3.58)	.66
Strategic (time management)	11.46 (4.38)	.88
Strategic approach (alertness to assessment demands)	14.39 (3.02)	.61
Strategic approach (achieving)	14.24 (3.39)	.74
Strategic approach (monitoring performance)	15.54 (2.72)	.34
Strategic approach broad score	**68.57 (13.44)**	**.90**

5.3.1 What does analysis of second order factors reveal about the relationship between personality and approaches to learning?

Within Factor Correlations

Personality

Table 5.2: Within factor correlations for Openness and Conscientiousness

	O2	O3	O4	O5	O6	O broad score	C1	C2	C3	C4	C5	C6	C broad score
O1	.22	.36**	.10	-.18	.05	**.24**	-.15	-.36**	-.26	-.32*	-.30*	-.38**	**-.32***
O2		.42**	.24	.37**	.25	**.76****	.21	.10	.24	.22	.08	-.04	**.05**
O3			.15	.34*	.47**	**.51****	.19	-.09	.02	.08	.09	-.25	**.02**
O4				.22	.38**	**.42****	.26	-.02	.11	.04	.16	.01	**.08**
O5					.32*	**.62****	.45**	.33**	.46**	.54**	.50**	.24	**.28***
O6						**.45****	.09	-.17	.04	-.00	-.05	-.27	**-.19**
O broad score							**.33***	**.06**	**.32***	**.29***	**.16**	**.04**	**-.02**
C1								.44*	.48**	.66**	.63**	.38**	**.64****
C2									.59**	.68**	.72**	.53**	**.76****
C3										.64**	.67**	.38**	**.61****
C4											.79**	.44**	**.70****
C5												.37**	**.86****
C6													**.36****

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Within factor correlations for Openness
Within factor correlations for Conscientiousness
Between factor correlations

The correlations between the second order personality factors are shown in table 5.2. The narrow Conscientiousness traits showed high inter –correlations as expected. For Openness however, O1 (Fantasy) did not show a significant correlation with any other factors with the exception of O3 (Feelings) and also showed negative correlations with all the second order Conscientiousness traits. O4 (Actions) similarly only showed a significant correlation with O6 (Deliberation).There were also moderate correlations between O5 and

all the second order Conscientiousness traits (ranging from $r = 0.33$, $p < 0.05$ to $r = 0.54$, $p < 0.01$). These results imply poor coherency between the narrow and broad factors of Openness.

Approaches to Learning

The inter-correlations between second order traits are shown in table 5.3. As expected, there were moderate to strong relationships between the sub factors for each approach, and moderate correlations between sub factors for the two traits. This implies that the narrow factors for each trait do all contribute towards the broad score.

Between Factor correlations

Table 5.4 shows the correlations between the second-order personality factors and the approaches to learning sub factors. In line with the relationships between broad factors found in Chapter four, there were moderate correlations between the Openness and deep sub-factors, weak to moderate correlations between the Conscientiousness and deep, and moderate to strong correlations between Conscientiousness and strategic approach sub factors. A few exceptions were evident: O1 (Feelings) did not correlate with any of the deep approach second order factors, but showed negative correlations with some of the Conscientiousness facets. O4 (Action) showed stronger correlation with the strategic facets than deep. The final anomaly was C6 (Deliberation) which did not correlate significantly with any of the learning approaches sub factors. Thus the associations seen when broad factors only are included in the analysis apparently lack sensitivity in terms of specific relationships between some of the second order factors.

Table 5.3: Within factor correlations for the deep and strategic approaches to learning

	Deep (relating)	Deep (evidence)	Deep (interest)	**Deep broad score**	Strategic (org)	Strategic (time)	Strategic (alert)	Stretegic (achieve)	Strategic (monitor)	**Strategic broad score**
Deep (seeking meaning)	.69**	.63**	.63**	**.87****	.43**	.48**	.43**	.52**	.49**	**.60****
Deep (relating ideas)		.63**	.72**	**.90****	.31*	.35**	.10	.40**	.30*	**.38****
Deep (use of evidence)			.52**	**.79****	.27*	.41**	.19	.40**	.32*	**.42****
Deep (interest in ideas)				**.86****	.36**	.47**	.33*	.56**	.28*	**.52****
Deep broad score					**.41****	**.50****	**.31***	**.56****	**.41****	**.57****
Strategic (organised studying)						.72**	.20	.67**	.51**	**.82****
Strategic (time management							.38**	.80**	.50**	**.91****
Strategic (alertness to assessment demands)								.32*	.40**	**.56****
Strategic (achieving)									.49**	**.86****
Strategic (monitoring performance)										.71**

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Within factor correlations for the Deep approach
Between factor correlations
Within factor correlations for the Strategic approach

Table 5.4: Correlation between the 2nd order factors of Openness, Conscientiousness and approaches to learning

	Deep seeking	Deep relating	Deep evidence	Deep interest	**Deep broad score**	Strategic organize	Strategic time	Strategic alert	Strategic achieve	Strategic monitor	**Strategic broad score**
O1	-.17	.01	-.00	-.08	**-.08**	-.15	-.31*	-.25	-.30*	.00	**-.27***
O2	.10	.28*	.34*	.47**	**.34***	.16	.20	.10	.26	.01	**.20**
O3	.22	.37**	.34*	.36**	**..37***	.01	.11	.05	-.01	-.10	**.03**
O4	.12	.18	.32*	.19	**..22**	.22	.11	.19	.27*	.26	**.26**
O5	.35**	.59**	.49**	.52**	**.57****	.07	.23	.04	.38**	.07	**.21**
O6	.25	.31*	.31*	.27*	**.33***	-.05	.02	.20	.00	.11	**.06**
O broad score	**.16**	**.39****	**.45****	**.38****	**.40****	**.07**	**.07**	**.01**	**.18**	**.04**	**.10**
C1	.28*	.26	.27*	.30*	**.32***	.51**	.60**	.35*	.52**	.37**	**.60****
C2	.18	.16	.05	.25	**.20**	.38**	.41**	.11	.42**	.05	**.37****
C3	.16	.19	.27*	.23	**.24**	.30*	.42**	.04	.46**	.24	**.39****
C4	.23	.32*	.20	.40**	**.35***	.37**	.55**	.14	.55**	.16	**.48****
C5	.26	.31*	.28*	.39**	**.36****	.46**	.68**	.16	.61**	.29*	**.59****
C6	-.01	-.03	.09	-.03	**.00**	.19	.16	-.02	.22	-.03	**.15**
C broad score	**.31***	**.21**	**.16**	**.32***	**.30***	**.57****	**.74****	**.32***	**.68****	**.37****	**.71****

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Between factor correlations for Openness and the deep approach
Between factor correlations for Openness and the strategic approach
Between factor correlations for Conscientiousness and the deep approach
Between factor correlations for Conscientiousness and the strategic approach

5.3.2 Do second order factors yield greater predictive information than the broad traits?

The within-factors correlations (tables 5.2 and 5.3) suggested that for Conscientiousness and both learning approaches the broad factor traits were representative of the second order components. For Openness, however, the narrow traits did not all correlate with each other or with the broad factor. This was explored further by undertaking a separate principal components factor analysis for each measure. This would show whether the second order factors loaded onto the appropriate broad scores. Tables 5.5 and 5.6 show the rotated solutions with eigenvalues over 1 extracted.

Table 5.5 shows the rotated solution for the NEO Openness and Conscientiousness second order factors. Three components were extracted, explaining 65.7% of the total variance. Component 1 could clearly be identified as Conscientiousness, although the Openness second order trait -'ideas' also contributed towards this. Component 2 largely represented the Openness second order traits O1, O2 and O3 (Fantasy, Aesthetics and Feelings. Component 3 largely represented the Openness second order traits O4 and O6 (Action and Values) with some input from O5 (Ideas). These results support Griffin and Hesketh's (2004) suggestion that Openness is comprised of two main factors: openness to external experience (consisting of Actions, Ideas, and Values) and openness to internal experience (Fantasy, Feelings, and Aesthetics).

Table 5.6 shows the rotated solution for the ASSIST deep and strategic second order factors. Two components were extracted, explaining 70.0% of the total variance. The second order factors clearly load onto the respective broad factors for each trait implying a good model fit.

Table 5.5: Rotated component matrix for exploratory factor analysis of NEO second order factors

	Component *(Eigenvalues)*		
	1 *(4.42)*	**2** *(2.44)*	**3** *(1.02)*
O1 (fantasy)	-.381	**.695**	-.143
O2 (aesthetics)	.249	**.676**	.187
O3 (feelings)	.061	**.788**	.286
O4 (actions)	.079	.019	**.768**
O5 (ideas)	**.614**	.251	.406
O6 (values)	-.073	.269	**.810**
C1 (competence)	**.727**	.117	.213
C2 (order)	**.821**	-.134	-.172
C3 (dutifulness)	**.787**	.022	.066
C4 (achievement striving)	**.896**	.050	.009
C5 (self-discipline)	**.878**	-.013	.054
C6 (deliberation)	**.603**	-.382	-.132

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

Table 5.6: Rotated component matrix for exploratory factor analysis of ASSIST second order factors

	Component *(Eigenvalues)*	
	1 *(4.68)*	**2** *(1.35)*
Deep approach (seeking meaning)	.421	**.758**
Deep approach (relating ideas)	.123	**.905**
Deep approach (use of evidence)	.191	**.796**
Deep approach (interest in ideas)	.312	**.785**
Strategic (organised studying)	**.814**	.154
Strategic (time management)	**.851**	.263
Strategic approach (alertness to assess demands)	**.524**	.143
Strategic approach (achieving)	**.799**	.337
Strategic approach (monitoring performance)	**.707**	.198

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

Predictive Validity

Pearson's correlations between all second order factors and the criterion variables (Raven's scores and end of first year marks) are displayed in table 5.7. The broad traits of Conscientiousness and the strategic approach both showed significant correlations with end of year marks ($r = 0.28$, $p < 0.05$ and $r = 0.32$, $p < 0.05$) respectively. Both these variables also showed negative correlations with Ravens scores, although these were not significant. This supports the view that Conscientiousness is an adaptive trait (Moutafi et al, 2004), and that it mediates the relationship between intelligence and academic performance. Second order factors for these two traits largely mirrored the broad trait relationships.

The deep approach broad and narrow traits also correlated positively with end of year performance, but none of these were significant; this may have been partly due to lack of statistical power due to the relatively small sample size. The correlations between the deep approach and Raven's scores were very weak (approaching zero), implying that any relationship between the deep approach and academic performance is independent of fluid intelligence.

The broad trait of Openness showed small positive correlations with both Ravens scores and end of year marks, but second order traits for this trait showed a range of negative and positive correlations with both criterion variables, (although none were significant for this sample size).

Table 5.7: Correlations between predictor and criterion variables

Predictor variable	Correlation with Raven's scores	Correlation with end of year marks
Deep approach (seeking meaning)	-.03	.21
Deep approach (relating ideas)	.05	.08
Deep approach (use of evidence)	-.02	.24
Deep approach (interest in ideas)	.01	.09
Total (broad) score for deep approach	**.01**	**.17**
Strategic (organised studying)	-.08	.27
Strategic (time management)	-.24	.24
Strategic approach (alertness)	.06	.29*
Strategic approach (achieving)	-.14	.31*
Strategic approach (monitoring performance)	.11	.16
Total (broad) score for Strategic approach	**-.10**	**.32***
O1 (fantasy)	.15	-.22
O2 (aesthetics)	.08	.04
O3 (feelings)	-.11	-.13
O4 (actions)	.12	.24
O5 (ideas)	.02	.16
O6 (values)	.19	.03
Openness broad score	**.15**	**.10**
C1 (competence)	-.05	.24
C2 (order)	-.15	.33*
C3 (dutifulness)	-.06	.29*
C4 (achievement striving)	-.12	.22
C5 (self-discipline)	-.17	.27*
C6 (deliberation)	-.14	.16
Conscientiousness broad score	**-.16**	**.28***

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

The factor scores for the three components created by the factor analysis were also correlated with the two criterion variables (table 5.8). Component 1, which was comprised mainly of Conscientiousness second order factors and O5 (Ideas) was named 'Academic Conscientiousness'. The two Openness sub factors were named according to Griffin and Hesketh's (2004) suggestions of Openness to internal experiences (component 2) and Openness to external experience (component 3).

It was found that while both Openness sub factors had equal strength correlations of 0.17 with end of year marks, the effects were in opposite directions. It is therefore likely that Openness to internal experience has a suppressing effect on the relationship between the broad trait of Openness and academic performance. Partial correlation of Openness with end of year marks was conducted, controlling for Openness to internal experience. The increased correlation between Openness and end of year marks from $r = 0.10$ to $r = 0.25$ (both ns) tended to support the hypothesis, although it would be necessary to repeat the analysis with greater participant numbers to confirm this.

'Academic Conscientiousness' showed a positive correlation with the criterion variable ($r = 0.30$, $p < 0.05$), which was not significantly different to the correlation between the latter and the broad factor of Conscientiousness ($r = 0.28$, $p < 0.05$). Thus although the factor analysis indicated that the Openness second order factor O5 (Ideas) loaded onto Conscientiousness, its impact was minimal in terms of predictive validity for academic performance.

Table 5.8: Correlations between the sub-factors, Ravens scores and end of year marks

	Ravens	End of year marks
Academic Conscientiousness	-.15	.30*
Openness to Internal experience	.03	-.17
Openness to External experience	.17	.17

* Correlation is significant at the 0.05 level (2-tailed).

5.4 Discussion

5.4.1 What does analysis of second order factors reveal about the inter- relationships between personality and approaches to learning?

The results confirmed the positive relationship between the broad traits of Openness and the deep approach to learning, and that between Conscientiousness and the strategic approach, found in the initial study, and reported in the literature (Blicke, 1996).

The second order factors generally mirrored the relationship of the broad factors with a few notable exceptions. O1 (Fantasy) did not show positive correlations with any of the deep sub- factors, in fact there were some small negative correlations. This facet also showed a negative correlation with Conscientiousness, and with the strategic sub-factors. Low scorers on Fantasy are defined as being more prosaic and preferring to keep their mind of the job (Costa & McCrae, 1992). An example question (reverse scored) is 'I don't like to waste my time day dreaming'. It is clear that agreeing with statement, in an academic context, would be in keeping with Conscientiousness and a strategic approach. Although participants were briefed to respond to the test items 'as their true selves' undoubtedly the academic setting in which they completed the measures would affect their interpretation.

The second order O5 (Ideas) also showed some unexpected correlations with the Conscientiousness sub-factors (ranging from $r = 0.33$, $p < 0.05$ to $r = 0.50$, $p < 0.01$) and also the broad score for Conscientiousness. Factor analysis confirmed that O5 loaded onto the same components as the second order factors for Conscientiousness. The O5 facet is a measure of intellectual curiosity and abstract ideas, and the link with Conscientiousness is not easy to explain, especially considering the negative relationship between Conscientiousness and intelligence. It is possible that O5, like O1, yields different information when items are answered in an academic context, and further exploration is warranted.

The final second order factor which did not follow the expected pattern was C6 (Deliberation): scores on this facet did not show any significant correlations with any of the approaches to learning sub-factors, and only a modest correlation with the total score for Conscientiousness ($r = 0.36$, $p < 0.05$). It was noted that this factor had a negative reliability coefficient implying lack of internal consistency within the test items. Some of the questions for this facet bear little relation to academic settings (e.g. 'I plan ahead carefully when I go on a trip), which possibly explains the negative inter-item correlations and also why there is little relation between this facet and approaches to learning variables.

5.4.2 Do second order factors yield greater predictive information than the broad traits?

For both approaches to learning, the broad factor scores did seem to provide the same information as the second order factors. For the deep approach, the 'relating ideas' and 'seeking meaning' factors had higher correlations with end of year marks than the remaining two, but in general the correlations were close enough to justify aggregation of narrow to broad traits. Similarly for the strategic approach, the broad score was representative of the facets. This was also the case for Conscientiousness: despite some variation in the size of correlations, which affected significance levels, little additional information was provided by consideration of the narrow traits. Indeed the low alpha values for the individual sub factors would lead one to question their validity: the broad factor is possibly more reliable and consistent for this trait, at least within an academic setting.

O5 (Ideas) did not seem to truly belong to the broad Openness factor, and seemed to be more closely linked to Conscientiousness and deep approach scores. Moutafi et al (2006) found that the Ideas facet showed the strongest correlation with fluid intelligence ($r = 0.20$). They also found a weak correlation between action and intelligence ($r = 0.07$) whereas none of the other sub-scales showed a significant relationship in their study. The correlations between these two variables and the Ravens matrices scores in the current study were 0.2 and 0.12 for Action and Ideas respectively (both non significant). It is

interesting to note that the two sub factors which showed the strongest correlations with fluid intelligence in Moutafi et al's (2006) study also showed the strongest positive correlations with academic performance in the current study.

Further analysis of the results for Openness revealed that two of the sub-factors: O1 (Fantasy) and O3 (Feelings) showed negative correlations with the main criterion variable, thus dampening the effects of the other traits when scores were aggregated. O1 also showed negative correlations with Conscientiousness and the strategic approach. It is possible that high scores for O1 are counter productive in an academic setting, although it is interesting to note that this facet showed one of the strongest positive correlation with the Ravens scores ($r = 0.15$, ns). It also should be noted that this sub factor had a low reliability coefficient of 0.25 implying a lack of internal consistency. O3 (Feelings) refers to receptivity to one's own feelings: it is feasible that high scores on this may increase creativity, but create dissonance which is not useful in first year studies. It would be interesting to explore if the negative relationship between this facet and performance continues at higher levels of study, or indeed in different subject areas.

Factor analysis supported previous suggestions that Openness is comprised of two main sub-factors (Gignac, 2005; Griffin & Hesketh, 2004). Griffin and Hesketh (2004) claimed that only Openness to external experience has predictive validity - in the current study both sub- factors correlated with end of year marks, but whilst the correlation with Openness to external experience was positive, Openness to internal experience showed a negative relationship, although neither reached significance. Openness is the most difficult trait to define, and it is possible that some elements are more applicable in an academic setting.

5.4.3 Limitations and Future Directions

Due to the sample size, correlations up to 0.26, which are comparable with others in the literature, were not significant due to lack of power. A minimum of 82 participants are

required in order for correlations under 0.30 to be significant at 80% power, and recruitment for this study failed to reach this target. It would therefore be useful to repeat the study with larger numbers. It would also be interesting to explore the relationship between the second order factors and academic success in different subject matters. Fact based and analytic subjects such as Sciences may benefit from higher levels of some Openness second order traits than Art based courses where high imagination and creativity may be of more benefit. It is also possible that different sub-factors are more useful for particular assessment strategies: multiple choice questions for example will require a more focussed and narrow approach whereas essay type assessment may reward a more imaginative outlook.

5.5 Conclusions

This study showed that additional detail could be obtained from narrow traits compared to the broad traits of personality and approaches to learning. However, with the exception of Openness, the broad traits did yield the same over all predictive information, and demonstrated greater internal consistency. Some Openness narrow traits had a negative predictive effect, and consequently dampened the over all effect for this factor. It is possible that this factor is sensitive to the test environment: interpretation of some test items within an academic context may affect their predictive-ness. Further exploration with different and larger samples is required for a fuller picture.

CHAPTER SIX
AN EXPLORATION OF THE EXTENT AND EFFECT OF FAKING ON NON-COGNITIVE MEASURES IN AN EDUCATIONAL SETTING

(Parts of this Chapter have been presented as a poster: Huws, N. & Talcott J., B., 2006. See Appendix IV)

6.1 Introduction

Previous studies have shown that non-cognitive measures can provide useful predictive information regarding academic performance (eg Conard, 2006: Furnham, Chamorro-Premuzic, & McDougall, 2003). This is supported by the result presented in Chapter four and five of this thesis. However, the self-report nature of non-cognitive measures renders them vulnerable to response distortion, which has implications for the validity of their use in educational settings.

A number of labels have been given to the practice of responding to psychometric measures in a manner that will result in a positive evaluation. These include social desirability, faking, impression management, self-enhancement and over-claiming (e.g. Paulhus, Harms, Bruce, & Lysy, 2003; Douglas, McDaniel & Snell, 1996). Paulhus (1984), however, suggested that there are only two main components: self-deception (when respondents genuinely believe their responses to be true) and impression management (deliberate enhancement of responses to create a specific impression). McFarland and Ryan (2000) state that the term 'faking' should only be used to refer to the latter - when individuals deliberately distort responses in order to be viewed favorably. It is likely that University applicants would wish to portray a positive image when completing personality and attitude measures, and that their responses may well be deliberately distorted. An exploration of 'faking' is therefore warranted if the use of non-cognitive measures is to be considered within an educational context.

Many non-cognitive tests embed social desirability scales within the test items, which are designed to identify respondents prone to self-enhancement. Although some researchers have found these useful in identifying faking respondents (e.g. Dalen, Stanton

& Roberts, 2001) other studies have shown that these can be faked as well, and that they do not seem to provide any additional analytic information about respondents 'true' characteristics. (Brown & Harvey, 2003; Pauls & Crost, 2004).

6.1.1 Individual Differences in Faking Ability

In the workplace, it has been shown that applicant scores tend to be more extreme than those for non-applicants (Brown & Barrett, 1999) but that this does not necessary affect predictive validity, merely that different norms need to be established for applicant groups. For example, an early comparison of applicant versus incumbent and student norms revealed higher scores for Extraversion and lower scores for Neuroticism in applicant groups (Barrick & Mount, 1996). However, it has been shown that individuals vary in their extent of faking (McFarland & Ryan, 2000), and it is therefore not possible to correct for faking by uniform 'scaling down' of scores. Douglas et al (1996) suggested that these individual differences are largely due to three factors – situational characteristics (e.g. motivation to fake), opportunity (someone who's true score is already very high has less scope to fake), and personal characteristics. Some individuals may feel that faking is morally wrong: McFarland and Ryan (2000) found that participants who scored high for integrity were less likely to fake. Other researchers have claimed that the ability to fake is a construct in itself (Mersman & Shultz, 1998; Viswesvaran & Ones, 1999) related to factors such as social intelligence or cognitive ability (McFarland & Ryan, 2000; Pauls & Crost 2005). The validity of using non-cognitive measures to predict academic performance is thus questionable if they are simply providing an additional, albeit subtle, measure of cognitive ability.

The extent of faking has been shown to vary not only between individuals, but also across scales (McFarland & Ryan, 2000; Zickar, Gibby & Robie, 2004), and Scandell and Wlazeleck (1996) suggested that faking performance under experimental conditions may also be affected by self-perceived personality. It is likely that faking patterns within

individuals are a result of a complex interaction of environmental, cognitive and non-cognitive factors.

Experimental participants briefed to fake-good (that is, to project themselves in the best possible light) have shown similar patterns of response distortion to genuine applicants (Bagby & Marshall, 2003). However, another study found that while subjects instructed to fake-good could do so with ease, the scores of subjects briefed to respond as job applicants were more likely to resemble those of honest respondents (Ryan & Sackett, 1987). What is difficult to ascertain is how honest the 'honest' responses were.

6.1.2 What are Participants Faking Towards?

Several researchers have demonstrated that respondents will attempt to match their personality profile to their perception of the ideal, or stereotyped, personality for the requirements of a specific job (e.g. Furnham, 1990; Mahar et al, 2006: Martin et al, 2002). Pauls and Crost (2005) also found that participants in applicant conditions responded as if they were in a specific social role, thus demonstrating that the propensity for response distortion depends on instructional set. Successful faking in the real world must depend on the accuracy of the respondents' stereotype, and it has been suggested that in order to measure the effectiveness of faking on personality measures, there needs to be an evaluation of what it is that participants are faking towards (Martin et al, 2002). How well the stereotype profile produced in faking conditions relates to the profile of successful employees has not been established: Dalen et al (2001) found that participants briefed to produce fake-good responses in line with a specific job description produced similar stereotyped profiles, but that these did not match the ideal profile for this role (although their study fails to state how this ideal profile was produced). Mahar, Cologo, and Duck (1995) similarly showed that respondents could fake to a stereotype, but that this profile was not representative of workers in the target occupation. However they did not explore the success levels of the latter.

Much of the research on faking has focused on personality traits, especially the Big Five: of these, some researchers have proposed that Openness to experience is the construct most difficult to fake, whereas Conscientiousness is the most easily faked (Furnham, 1997; McFarland & Ryan, 2000). However a meta-analysis by Viswesvaran and Ones (1999) showed that all Big Five factors were equally fakeable. Participants instructed to fake-good have been shown to increase their average scores by as much as one standard deviation compared to when items were answered under 'honest' conditions (Furnham, 1986). Viswesvaran and Ones (1999) reported an average increase of approximately 0.75 standard deviation between instructional conditions in repeated measures studies, and an average of 0.5 standard deviation in between group comparisons. Zickar and Robie (1999) showed that even greater effect sizes of resulted if participants received coaching prior to completing the measures, ranging from 0.92 to 1.20, suggesting that the effects of faking could increase if coaching for non-cognitive tests became widespread.

6.1.3 Effect of Faking on Predictive Validity

Whether response distortion decreases the validity of non-cognitive measures is a contentious issue. Several studies have indicated that faking degrades the factor structure, and consequently the construct validity of personality measures (e.g. Brown & Barrett, 1999; Douglas et al, 1996). It has also been shown that faking decreases variance and increases inter-scale correlation (Topping and O'Gorman, 1997), partly due to ceiling effects, but also due to faking participants giving more consistent responses (Douglas et al, 1996). The latter found that faking also affected criterion related validity, and that this decreased inversely to the proportion of fakers in the sample. Dalen et al (2001), however, disagreed with this, stating that faking produces a "profile of inappropriate typology" and that the presence of even a few fakers within a large sample would be exposed by a detection measure, consequently having no effect on overall predictive validity. Paulhus (1984) who distinguished between impression management and self-deception, suggested that the former was a threat to validity whereas the latter was not. Barrick and Mount (1996), however, claimed that predictive validity was maintained regardless of whether personality scores were distorted by self-deception or impression management, and it is

interesting to note that theirs was one of the few studies to use actual job-applicants rather than experimental participants or incumbents. Ones and Viswesvaran (1998) also found no effect of faking on the predictive validity of the Big Five factors for job performance, whereas Peeters and Lievens (2005) reported that faking on situational judgement tests (SJT) had a negative effect on their criterion-related validity for the academic success of college students. Furthermore, faking removed the incremental validity of the SJT over and above cognitive ability and personality that was seen in honest respondents.

There has been no research to date to explore the effects of faking on measures of approaches to learning, academic motivation, or Emotional Intelligence when these are applied in an educational context. The aim of the current study was therefore to compare groups of honest responders with participants briefed to 'fake' on a battery of non-cognitive measures, and assess the effects of faking on their ability to predict academic performance. Self-deception, by its nature is difficult to operationalise and therefore not easy to explore in an experimental context. It is also difficult to control for and arguably should not affect results as it should remain constant across experimental conditions, due to its association with other non-cognitive factors rather than the testing situation. The opportunity for impression management (deliberate faking), is, however, greatly dependant on the situation, and is more likely to impact on the potential use of psychometric measures for educational purposes. This study therefore focused on participant attempts at impression management by deliberately faking their responses.

The main research questions were:

- Is there a stereotypic profile of the ideal student, and does the profile produced by respondents (potential applicants) differ from that produced by University staff (potential recruiters)
- Are participants able to fake to this profile?
- Does this stereotype reflect academically successful students?
- What are the effects of faking on the validity of the non-cognitive psychometric measures used in this study?

6.2 Methods

6.2.1 Participants

Data were obtained from first year undergraduates on the Psychology programme at Aston. All received research credit for their participation. Fifty four participants (41 women, 13 men) took part in the study. Their mean age was 19 years (range 18 – 39).

The data presented in Chapter four (gathered from undergraduate participants who completed the same measures under 'true' conditions) were used as control data in this study.

Data regarding the ideal student profile were also collected from University lecturers and Admissions staff, via an internet survey. Ninety one members of staff completed the survey, but no other information was gathered from this group.

6.2.2 Measures

All participants completed the same measures, as detailed in Chapter 4 : a demographic information form, the Raven's progressive matrices, the NEO –FFI, the ASSIST, the AMS , the TEIQue , a self-assessment questionnaire, and an 'ideal student' profile.

6.2.3 Procedure

The experimental protocol was approved by the Aston University Ethics Committee. Following briefing and informed consent, participants completed the demographic information sheet, and the timed Raven's test. They then completed the self and ideal profile sheets and were subsequently briefed to complete the remaining measures as if responding as a University applicant, and that they should portray themselves as

positively as possible, in line with the ideal profile previously completed. They were advised that some personality measures may contain 'lie-detector' scales and that their responses should therefore be realistic.

Staff responses were gathered via a web link to an internet survey, which was emailed to all relevant staff.

6.3 Results

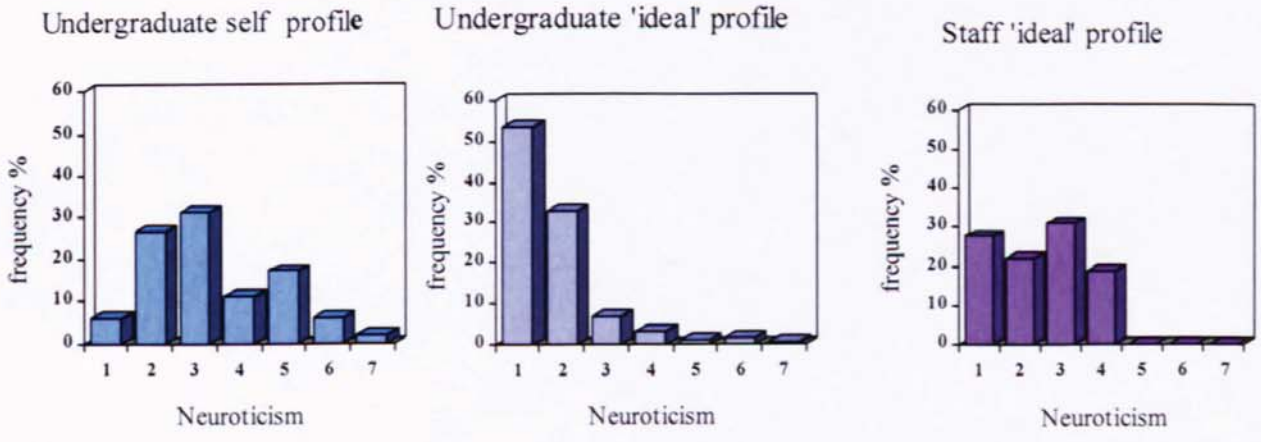
Data were screened and converted to t-scores or regression factor scores where appropriate, in line with the methodology outlined in Chapter four.

6.3.1 Is there a stereotype for the ideal student?

Comparisons of 'Self' versus 'Ideal' ratings

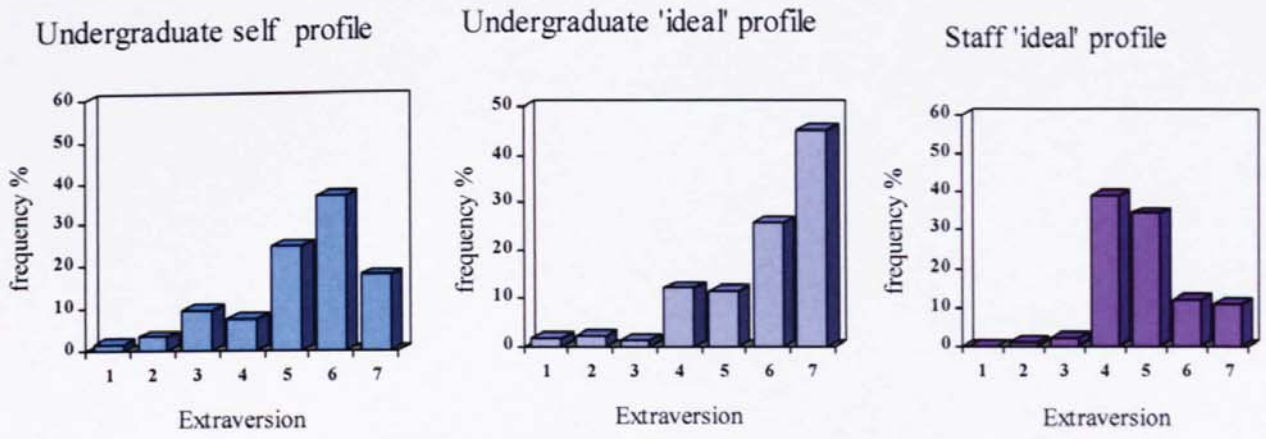
Figures 6.1 – 6.5 present the descriptive data for the ideal student profiles by staff and the total undergraduate sample, along with self- assessed undergraduate ratings.

Figure 6.1: Distribution of participant ratings for Neuroticism as a function of respondent group.



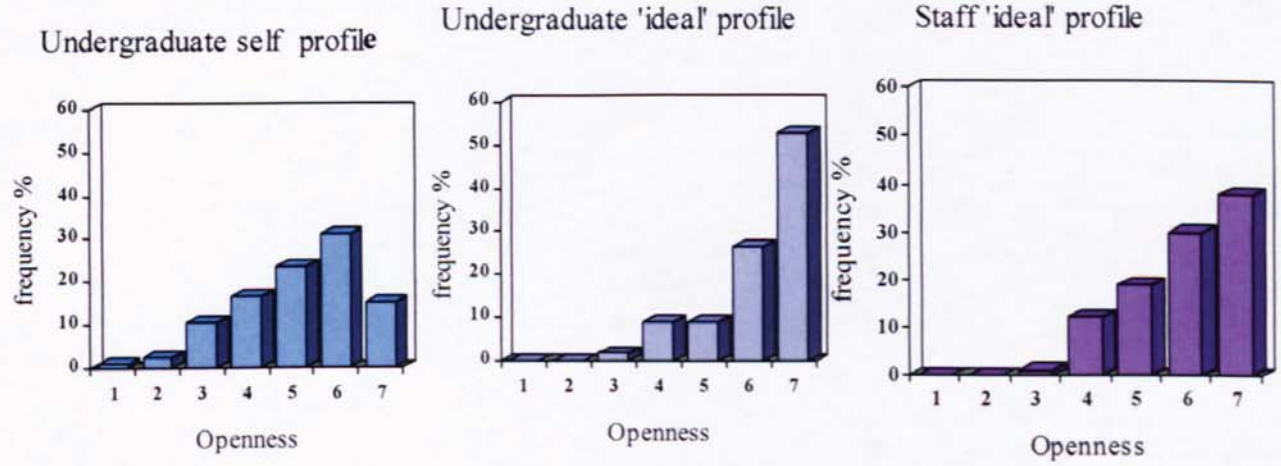
The figures suggest that while undergraduate self ratings approximate a normal distribution, the ideal ratings for both undergraduate and staff ideal profiles have a positive skew, indicating a stereotype scoring low for Neuroticism. This is most pronounced in the undergraduate group.

Figure 6.2: Mean participant ratings for Extraversion as a function of respondent group.



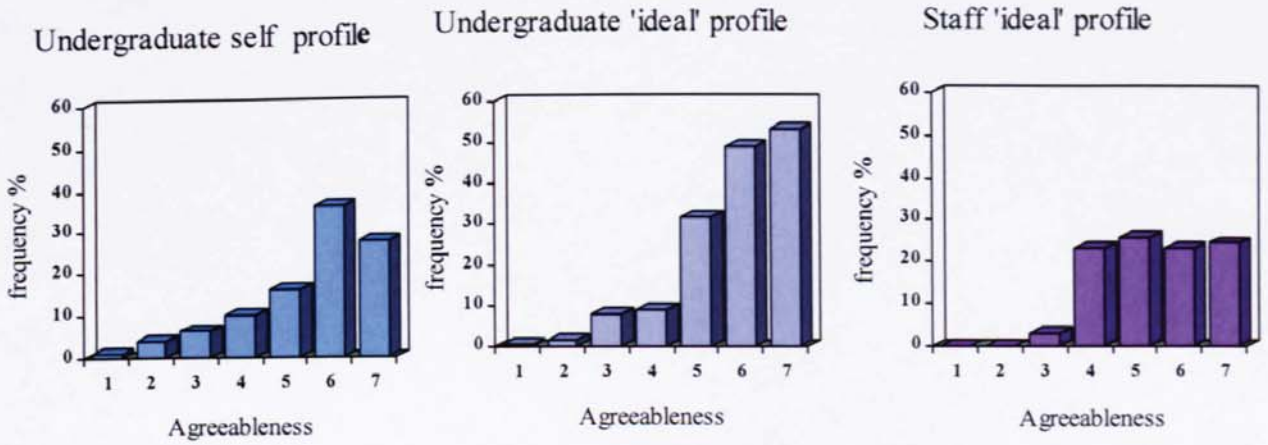
The undergraduate self ratings for Extraversion demonstrate a slight negative skew, indicating that participants rate themselves as tending toward high scores for extraversion. This is more pronounced in the ideal profile produced by the undergraduate group. Ideal profiles produced by staff, however, show no clear stereotype.

Figure 6.3: Mean participant ratings for Openness as a function of respondent group



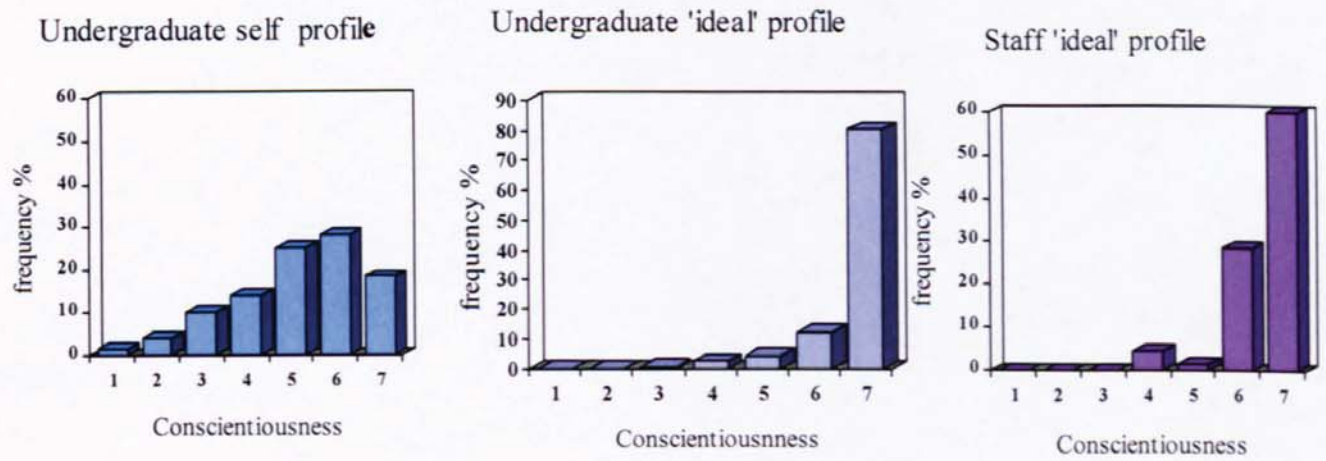
The figures suggest that while undergraduate self ratings for Openness are normally distributed, the ideal ratings for both undergraduate and staff ideal profiles have a negative skew, indicating a stereotype scoring high for Openness.

Figure 6.4: Mean participant ratings for Agreeableness as a function of respondent group



The undergraduate self ratings for agreeableness show a slight negative skew, indicating that participants rate themselves as tending towards high scores for Agreeableness. This is more pronounced in the ideal profile for both undergraduates and staff.

Figure 6.5: Mean participant ratings for Conscientiousness as a function of respondent group



Undergraduate self ratings for Conscientiousness also appear to be normally distributed, but the ideal ratings for both undergraduate and staff ideal profiles have a strong positive skew, indicating a stereotype scoring high for this trait.

The differences between the three respondent groups were explored for significance (see table 6.1). The mean profiles of the ideal student produced by undergraduates were significantly different to their self rating on all the Big Five personality traits, with lower scores for Neuroticism, and higher scores for all other traits (minimum Wilcoxon $z = 10.28$, $p < 0.001$). These results were endorsed by staff ratings on all traits with the exception of Agreeableness, where there were no significant difference in staff ideal ratings and undergraduate self ratings, and Extraversion where the staff ideal profile scores were lower than undergraduate self ratings. There were also, however, significant differences between the ideal student profile produced by undergraduates and staff: the former produced lower scores on Neuroticism, and higher scores for all other Big Five traits, thus the stereotype produced by undergraduates was more extreme than that produced by staff. The strongest and most consistent stereotype was for Conscientiousness and Openness: both respondent groups defined ideal students as achieving high scores for these traits.

Table 6.1: Identification of differences between participant groups

Big 5 Variable	Staff ideal rating / Student ideal rating Mann Whitney U significance	Student ideal rating / Student self rating Wilcoxon Z significance (repeated measures)	Staff ideal rating / Student Self rating Mann Whitney U significance
Neuroticism	4.86**	10.28**	4.55**
Extraversion	6.09**	10.47**	3.51**
Openness	2.22*	10.80**	4.38**
Agreeableness	4.79**	10.70**	1.50
Conscientiousness	2.39*	11.00**	7.62**

** significant at $p < 0.01$
* significant at $p < 0.05$

6.3.2 Are participants able to fake to this profile?

Table 6.2 presents the data for the control and 'fake' respondent groups on each of the study variables. Exploration of group scores revealed no significant differences on the measure of fluid intelligence (Raven's scores), or of previous (A-level grades) or current (first year marks) academic performance. This implies that any differences shown on the non-cognitive parameters were due to the experimental manipulation rather than to pre-existing differences between groups. Participants responding in the 'fake' condition scored significantly higher than the control group on Extraversion ($p < 0.05$), Agreeableness ($p < 0.01$) and Conscientiousness ($p < 0.01$), and lower on Neuroticism ($p < 0.01$). Compared to the controls, the experimental group also scored significantly higher on the deep and strategic approaches to learning ($p < 0.05$ and $p < 0.01$ respectively), intrinsic motivation ($p < 0.01$) and Emotional Intelligence ($p < 0.05$). They scored lower on the surface approach to learning ($p < 0.01$).

Correlations between personality and other non-cognitive measures

Correlations between the Big Five traits and other non-cognitive variables are shown in Table 6.3. Significant bivariate relationships between several of the Big Five and other non-cognitive measures were identified for both respondent groups. The differences between correlations for the two groups were explored by using Fisher-Z transformations to convert Pearson's r values to the normally distributed 'z' variable. The correlation between strategic approach to learning and Conscientiousness was significantly lower in the faking group (Z score for difference = 3.08, $p< 0.01$), as was the negative correlation between Emotional Intelligence and Neuroticism (Z score for difference = 2.35, $p < 0.05$). There were no other significantly different pairs.

Table 6.2: Descriptive and inferential statistics for relevant study variables as a function of respondent condition.

Variable (unit)	Control responders (n = 110)		'Fake' responders (n = 54)		Combined	*t value*	Effect size
	M (SD)	*Cronbach's alpha*	*M (SD)*	*Cronbach's alpha*			(d)
A level (aggregate UCAS score)	304.1 (71.1)	n/a	287.1(64.5)	n/a	299.1 (69.3)	-1.46	.24
End of year mark (%)	56.6 (9.1)	n/a	53.8 (7.3)	n/a	55.7 (8.6)	-1.95	.32
Raven's Matrices (score)	49.6 (4.9)	n/a	48.4 (5.7)	n/a	49.2 (5.2)	-1.31	.24
Neuroticism (T-score)	55.6 (10.6)	0.86	48.3 (10.0)	0.87	53.2 (10.9)	-4.30**	.67
Extraversion (T-score)	54.0 (10.0)	0.76	57.9 (8.0)	0.76	55.3 (9.5)	2.50*	.41
Openness (T-score)	50.9 (9.2)	0.60	52.8 (9.0)	0.71	51.5 (9.1)	1.22	.21
Agreeableness (T-score)	45.9 (11.1)	0.67	51.5 (10.3)	0.69	47.7 (11.1)	3.08**	.50
Conscientiousness (T-score)	42.9 (10.5)	0.81	50.3 (10.6)	0.89	45.2 (11.1)	4.33**	.69
Deep learning approach (score)	57.9 (8.8)	0.81	60.9 (8.6)	0.84	58.9 (8.8)	2.05*	.32
Strategic learning approach (score)	72.2 (12.3)	0.88	78.8 (10.6)	0.86	74.4 (12.2)	3.41**	.52
Surface learning approach (score)	45.5 (9.5)	0.77	39.5 (10.9)	0.86	43.5 (10.3)	-3.60**	.60
Intrinsic motivation (regression factor score)	-0.15 (1.0)	n/a	0.31 (1.0)	n/a	0.0 (1.0)	2.81**	.46
Extrinsic motivation (regression factor score)	0.10 (0.9)	n/a	-0.21 (1.1)	n/a	0.0 (1.0)	-1.88	.31
Emotional Intelligence (TEIQue score) §	4.75 (0.5)	n/a	4.95 (0.6)	n/a	8.81 (0.54)	2.22*	.37

* $p < 0.05$ ** $p < 0.01$ §

It was not possible to compute Cronbach's alpha values for the TEIQue scores as these were calculated from the raw data by the test producers.

Table 6.3: Pearson's r correlations between Big 5 and approaches to learning factors for both respondent groups

	Neuroticism	Extraversion	Openness	Agreeable	Consc
Deep approach					
Control	-.15	.13	.40**	.06	.28**
Fake	-.08	.31*	.50**	.01	.27*
Strategic approach					
Control	-.12	.03	.12	.17	.70**
Fake	-.24	.24	.09	.16	.33*
Surface approach					
Control	.46**	.05	-.26**	-.31**	-.34**
Fake	.32*	-.21	-.38**	-.40**	-.44**
Intrinsic motivation					
Control	-.00	.02	.20*	-.12	.05
Fake	-.05	.37**	.25	.03	.06
Extrinsic motivation					
Control	.14	-.00	-.23*	.03	.13
Fake	.26	-.21	-.23	-.33*	-.24
Emotional Intelligence					
Control[a]	-.63**	.51**	.18	.37**	.42**
Fake[b]	-.32*	.42**	.38**	.44**	.40**

[a] n = 107
[b] n = 51
** p <0.01 (2-tailed).
* p < 0.05 (2-tailed).

6.3.3 What are the effects of faking on the validity of the measures?

Correlations between Predictor and Criterion Variables

Table 6.4 shows the relationship between the hypothesized predictor variables and academic performance for the experimental and control groups. For respondents in the control condition, Openness, Conscientiousness, and deep and strategic approaches to learning all showed significant positive correlations with end of year marks. In contrast, the surface approach variable was negatively correlated with this outcome variable.

Correlations between predictor variables and degree marks for the 'fake' respondent group were mostly non-significant: only the relationship with conscientiousness was significant ($p < 0.05$).

Table 6.4: Inter-Correlations between Big 5 and approaches to learning and academic success as a function of respondent group.

	End of Year Marks Fake responders	End of Year Marks Control responders
Neuroticism	-.15	.07
Extraversion	-.11	.01
Openness	.11	.21*
Agreeableness	.09	.15
Conscientiousness	.36*	.24*
Deep learning approach	.12	.27**
Strategic learning approach	.07	.37**
Surface learning approach	-.06	-.25**
Intrinsic motivation	-.05	.08
Extrinsic motivation	-.07	.16
Emotional Intelligence	-.05	.11

Effect of 'Fakers' on total sample

The total data set (comprised of 110 'true' participants, and 54 fakers) was sorted in descending order of scores first for 'Conscientiousness' and then, in a separate analysis, for 'Openness'. These two variables were selected as they showed the most consistent stereotype, and were both predictive of the outcome measure. The sample was spilt into participants in the top 50%, and those in the bottom 50%. The split was arbitrary, with the aim of exploring whether fakers would rise to the top of the sample. A Chi-square test of independence was performed to explore the distribution of fakers within the sample It was found that when participants were ranked for Conscientiousness, the number of fakers in

the top 50% of scores was significantly higher than that which would have occurred due to chance , χ^2 (1, 164) = 8.95, $p < 0.01$ (see table 6.5). When the scores were ranked for Openness however the distribution was not significantly different to chance, χ^2 (1, 164) = 2.76, $p = 0.13$ (see table 6.6).This implies that in a population comprised of both fakers and 'true' participants, participants who fake their scores for Conscientiousness will tend to rise to the top of the sample.

Table 6.5: Effect of faking on distribution of total participants ranked for Conscientiousness

	Rank	
	In top 50%	In bottom 50%
'True' responders	46 (55)	64 (55)
'Fake' responders	36 (27)	18 (27)

Expected values in parenthesis.

Table 6.6: Effect of faking on distribution of total participants ranked for Openness

	Rank	
	In top 50%	In bottom 50%
'True' responders	50 (55)	60 (55)
'Fake' responders	32 (27)	22 (27)

Expected values in parenthesis.

6.4 Discussion

6.4.1 Is there a stereotype profile of the ideal student, and does the profile produced by potential applicants differ from that produced by potential recruiters?

Furnham (1990) and others have suggested that profiles of faking respondents might reflect their stereotype of members of the target occupation, although some researchers have claimed that this stereotype does not necessarily represent a successful worker in that field (Dalen et al, 2001; Mahar, et al, 1995). The current study revealed a definitive stereotype of what was perceived to be the ideal University applicant with respect to the Big Five. The profile produced by undergraduates (potential applicants) was characterized by low scores on Neuroticism, and high scores on the other four traits. The ideal profile produced by staff did not demonstrate such an obvious stereotype: whilst endorsing the undergraduate high scores attributed for Conscientiousness and Openness, the scores for the remaining traits were not so extreme. There are many possible reasons why the stereotype produced by the undergraduate participants was more pronounced; this could be related to youth, idealism, or questionnaire response style. It is also not clear if the stereotype produced by the two participant groups was independently derived: staff views may have directly or subliminally affected the undergraduate opinions.

6.4.2 Are students able to fake to this profile?

Analysis of group differences showed that participants were able to 'fake' to the stereotype produced by the undergraduate group on all the Big 5 traits, except Openness to experience. These data are consistent with previous findings, which claim that Openness to experience is the least fakeable trait (Furnham, 1997; McFarland & Ryan, 2000). The average difference in scores between experimental conditions ranged from 0.37 SD to 0.69 SD which is also consistent with the data reported by Viswesvaran and Ones (1999) (see table 6.2).

No specific directional hypotheses were made about the potential effect of faking on the other non-cognitive measures used in this study. It was found, however, that participants who faked increased their 'strategic' and decreased their 'surface' approaches to learning scores. A small increase in 'deep' scores in the faking condition was also apparent. There was also a significant difference in scores for intrinsic motivation: faking participants scored higher on this construct. The final difference was for Emotional Intelligence, with slightly higher scores ($p < 0.05$) in the faking group.

Previous research has shown faking levels to vary between individuals (Mersman & Shultz, 1998; Viswesvaran & Ones, 1999). Respondents higher in Neuroticism and lower in Conscientiousness have been shown to fake to a greater extent (McFarland & Ryan, 2000). However it has been suggested that this is due to opportunity rather than an inherent tendency (Douglas et al 1996).This was quite possibly the case in the current study: low Neuroticism and high Conscientiousness were seen as ideal, thus participants who would normally score high on Neuroticism and low Conscientiousness would have greater scope to fake. It is also interesting to note that the scores for Conscientiousness in the control group were slightly lower than the norms provided by the test manufacturers (Costa & McCrae, 1992). This increases the potential for score differences between the two experimental groups. Further to this, because the stereotype for the ideal student was so consistent, much of the data was clustered at the extreme ends of the scales, leading to skewness, and subsequent lack of variance. Hence it was not possible to determine if participants were able to complete the NEO-FFI in line with their individual ideal profile. It would seem that 'faking ability' is a hypothetically interesting construct but is, by its very nature, difficult to measure, and consequently it was not considered as a separate factor in this study.

6.4.3 Does this stereotype reflect academically successful students?

Academic performance was predicted in the control group by Conscientiousness, Openness, deep and strategic approaches to learning (positive correlation) and surface

learning approach (negative correlation). All these variables showed score differences between the two respondent groups, and the two personality factors (Openness and Conscientiousness) showed the most significant and persistent stereotype in terms of the ideal student profile data. This indicates that the stereotype of an ideal student produced by participants in this study does reflect successful traits within the target population. The results also suggest that students recognize the value of deep and strategic approaches to learning compared to a surface approach, but in real world conditions do not necessarily use these strategies.

6.4.4 What are the effects of faking on the validity of these measures?

Previous research has shown that faking leads to reduced variance (Douglas et al. 1996), and it was suggested that this was due partly to a ceiling effect, but also because faking responders will tend to reply more consistently across a specific scale. Conversely, Zickar and Robie (1999), suggested that there was greater variation in the response processes used by fakers, with a subsequent increase in common variance. Different measures were used in these two studies, along with diverse participant groups (college students in the former and army recruits in the latter) making comparison difficult. Results from the current study indicated that faking had little effect on variance: the variances of data produced by the combined group (i.e. a population of 33% fakers) were very similar to those of the control group. This refutes previous claims that populations high in fakers can be identified on this basis (Zickar & Robie, 1999).

Several researchers have claimed that faking on non-cognitive measures may act to inflate inter-scale correlations, and that this may affect their validity (Zickar & Robie,1999; Ellingson, Sackett & Hough, 1999; Paul & Crost, 2004; Schmit & Ryan ,1993). Paulhus et al. (1995) also highlighted the effect of outliers on the inflated correlations between scales in some studies. In the current study the NEO-FFI raw scores were converted to t-scores therefore adjusting for outliers on this measure. Pauls and Crost (2005) found that in applicant instruction conditions, compared to generic fake-good conditions, only a few relationships significantly increased. In the current study participants were briefed to fake

realistically (i.e. as applicants) to try and reduce the incidence of extreme scores. Inter-correlations are evident between the Big Five factors and other non-cognitive measures, consistent with previous literature (e.g. Blickle, 1996), and as discussed in Chapter four.

Although there were some differences in the size of correlations between the two experimental groups, there were only two 'pairs' where this difference was significant. These were the correlation between 'Conscientiousness' and 'strategic approach to learning', and the negative correlation between Neuroticism and Emotional Intelligence. Contrary to expectations, the correlations were lower in the fake group. This arguably could be due to range restriction in this group (the large changes in mean scores for Conscientiousness and Neuroticism feasibly producing a ceiling effect). However, the similar variances seen for both groups would not really support this explanation, and the mean scores for both Conscientiousness and Neuroticism in the faking group still lie within the 'average' band of adult norms provided by the NEO-FFI test producers (Costa and McCrae, 1992). An alternative reason could be a difference in faking ability across these diverse constructs, which is consistent with previous research (Zickar et al, 2004; McFarland & Ryan, 2000). With the exception of these two correlations, however, it would seem that realistic faking had not adversely affected inter scale relationships. Internal consistency also seemed unaffected as the Cronbach's Alpha values in the fake group were largely consistent with those in the control group, and with those reported by the test producers.

Research to date regarding the effect of faking on the predictive validity of non-cognitive psychometric measures has been inconclusive (e.g., Ones, Viswesvaran & Reiss, 1996; Peeters & Lievens, 2005). The results for the 'true' respondents in this study indicated a positive correlation between end of year marks and Conscientiousness, Openness, and deep and strategic approaches to learning, and a negative correlation with a surface approach. The relationship between predictor and outcome variables for true respondents were discussed in greater depth in Chapter four, and are consistent with previous findings (e.g., Chamorro-Premuzic, & Furnham, 2003; Sadler-Smith, 1997). In contrast the only factor that correlated with academic performance in the experimental

(fake) group was Conscientiousness. The stability of the effect of Conscientiousness might suggest that it is resistant to faking – however on the basis of the large difference in scores on this measure between conditions, this is unlikely to be the case. Furthermore, previous studies have shown that Conscientiousness may be the easiest trait to fake (Furnham, 1997; McFarland & Ryan, 2000), and so it is more likely that there is less variation in faking ability on this factor. Although participants who would naturally score highly may be somewhat restricted by a ceiling effect, there is in general likely to be a more uniform increase in scores. This implies that within a specific group of participants, Conscientiousness is the most robust predictor of academic performance, but it may be difficult to establish population norms as scores on this factor seem highly sensitive to instructional set.

A few previous studies have explored the effect of the presence of fakers on the total sample. Douglas et al (1996), for example, conducted a Monte Carlo simulation and found that in a population of 10% fakers , 5 of the top 10 scores for 'Conscientiousness' were fake. This is consistent with the data in the current study, which demonstrates that 'fake' participants tended to rise to the top of the sample when ranked for trait. Conversely, faking did not affect the distribution of scores for Openness, although the single trial method employed in the current study would need to be replicated to confirm this. It seems ironic that Conscientiousness, the most predictive trait, is also the most easily faked.

Apart from affecting the overall validity of results, relying on scores for non-cognitive traits such as Conscientiousness to discriminate between potential University applicants has clear implications: the presence of even a small number of fakers in a population may affect decisions made by admission tutors, and prejudice true responders.

6.4.5 Limitations and Future Directions

Scandell and Wlazelek (1999) criticized the NEO summary sheet used in their study for only having a 3 point scale, leading to loss of sensitivity. They suggested that a wider scale should be used in future studies, but even with the 7 point scale used in the current

study, the range of responses to the ideal profile was still rather narrow. Participants tended to opt for the extreme scores as if portraying the ideal person rather than ideal student. For example, for the trait of Agreeableness, 'scepticism' may be seen as an undesirable personal quality, but a degree of this may well be an asset for some elements of academic work. More detailed participant briefing, or use of a continuous response scale might produce more sensitive data.

The between subject design employed in the current study meant that it was not possible to assess individual variation in faking levels. Douglas et al (1999) claim that individual differences in faking result in a change in rank order of respondents and that this is what leads to reduced validity in faking samples. This could only be confirmed via repeated measures studies, and to date these are few. Studies which have employed this experimental design, however, have shown greater differences in scores between conditions (up to one SD compared to 0.75 SD for between subject studies, Viswesvaran & Ones, 1999).

Further exploration of the effect of test knowledge would be useful, along with the potential effects of coaching on response style. Within subject studies generally administer the honest instructions prior to the fake ones, as it has been found that individuals who provide faked responses first tend to provide honest responses that approximate their initial fake good responses (e.g., Ellingson et al, 1999). This is particularly pertinent within the field of education: if non-cognitive measures are to be employed as part of a selection procedure , ideally they should help identify applicants who may not have performed well academically to date, but who have personal characteristics which would allow them to benefit from, and succeed at Higher Education. However, if these measures are open to coaching and practice effects then they may serve to perpetuate the very inequalities which they aim to dissipate.

6.5 Conclusions

This study has shown that there is a clear stereotype of the 'ideal' student, and that this reflects characteristics possessed by academically successful students. Undergraduate participants were able to fake to this profile. It was found that faking on the measures used in this study reduced their effectiveness in predicting performance, which has clear implications for their potential use within educational settings.

The following areas were identified as worthy of further exploration

- The extent and effect of individual differences in faking ability
- The variation in faking levels across different measures
- The effect of faking on subsequent test performance under 'true' conditions

These areas were explored via a repeated measures follow up study, which is described in Chapter seven.

CHAPTER SEVEN
AN EXPLORATION OF INDIVIDUAL DIFFERENCES IN FAKING ABILITY

7.1 Introduction

The study reported in Chapter six showed that undergraduate participants could fake their responses on non-cognitive measures to a general stereotype of an 'ideal' University applicant. Due to the between-subject design, however, the analysis involved comparison of responses from participants in each respondent group, and it was not possible to explore individual differences in faking ability. Douglas et al (1996) suggested that it is these individual differences that cause the decay in the predictive validity of psychometric measures when participants fake. They proposed that this occurs because individual variation in faking amounts leads to a change in rank order of participant scores. However they were not able to prove this as their study also employed a between subject design.

7.1.1 Faking Ability as a Construct

Several researchers have suggested that faking ability is a construct in itself (e.g. Mersman & Schultz, 1998), but this has proved difficult to measure. Measuring faking ability as the difference between fake and real scores tends to produce negative correlations between faking amount and the construct itself (e.g. McFarland & Ryan, 2000), because participants whose initial scores are low have much greater scope to increase their scores. Mersman and Schultz (1998) tried to overcome this methodological difficulty by using within-subject correlations, and within-subject variance of the difference between honest and fake responses. However this method also has methodological drawbacks because faking responders tend to have a flatter response profile due to a ceiling effect. Pauls and Crost (2005), adjusted the scores in their study by removing honest variance from faking variance, thus producing a faking measure that was independent from the honest score for the construct, but although they did relate faking ability to participants own perception of

the ideal, they did not take into account individual differences in opportunity (scope) to fake.

None of the methods to date seem to have fully embraced the effects of both opportunity *and* individual aims on faking ability. Rating faking ability in terms of how it relates to the maximum score possible for that trait assumes that all participants are faking to the same stereotype, when this may not be the case. Considering the trait of Conscientiousness, for example, it would be incautious to assume that all participants will attempt to fake to increase their scores to the maximum, as this may not reflect their own perception of the ideal. Also, although there is a positive relationship between Conscientiousness and academic performance (e.g. Busato et al, 2000), this does not imply that maximum scores are optimal as this will depend on the interaction with other variables. Individuals high in Neuroticism, for example, may not benefit from extremely high levels of Conscientiousness in terms of producing academic work to deadlines. It has been suggested that in order to assess faking ability, an evaluation of what it is participants are faking towards is necessary (Martin et al, 2002), thus faking ability would be better assessed by comparison of each participant's faked score to their own perception of the ideal profile, rather than to a general stereotype. Placing too much emphasis on honest scores when assessing faking ability may also distort results: if we are assessing participants' abilities to fake towards a particular score, then their initial scores may be irrelevant.

Several studies have suggested that faking ability may be related to other 'abilities'. Mesrman and Schultz (1998), showed a correlation of 0.27 between g and faking ability on Conscientiousness. However, as discussed above, measuring faking ability as the difference between fake and true scores, inevitably leads to a negative relationship between faking ability and the construct itself. There is a well documented negative relation between Conscientiousness and intelligence (e.g. Moutafi et al, 2004) and so Mesrman and Schultz (1998)'s results may simply represent a methodological artifact: participants with high g scores will generally have lower scores for Conscientiousness, and therefore have greater scope to increase their scores on this construct by faking. It is interesting to note that

researchers do not always report correlations between faking ability and the underlying personality constructs.

Different results have been obtained when faking ability is expressed as the within subject correlation between honest and faked scores and the within-subject variance of the difference between honest and faked responses (thus reducing the impact of the construct itself): Mersman & Schultz, (1998) showed that faking ability was not related to g in this instance. Pauls and Crost (2005), however, having also produced a faking measure that was independent from the honest score for the construct (by removing honest variance from faking variance) showed correlations of 0.3 between a composite measure of g and faking ability. The relationship between faking ability and other constructs is thus likely to be affected by the method used to compute the faking index. The current study aimed to address some of the methodological issues highlighted above by calculating faking ability as a function of both intention and opportunity.

7.1.2 Effects of Test Practice and Coaching

Analysis of the results of the study described in Chapter six indicated that further exploration of the effect of test knowledge would also be useful, in particular the potential effects of coaching on subsequent test performance. This is pertinent for the use of non-cognitive measures in academic settings: if these were introduced as part of University application it is inevitable that coaching would occur, which would potentially create further inequality between applicants. Previous within subject studies have tended to apply the true conditions followed by fake condition, because it has been shown that individuals who enhance their responses to non-cognitive measures then tend to produce answers that approximate their initial fake good responses in subsequent test sessions, even if then asked to respond truthfully (Ellingson et al, 1999). However, if non-cognitive tests were introduced as part of University application procedure, it is reasonable to expect that some applicants would be coached to respond in an enhanced manner – i.e. under faking conditions. If applicants were then to complete their measures under 'true' conditions their scores may well be higher than those competing under naive conditions. The current study

aimed to use a cross-over repeated-measures design to explore the effect of test order as well as different instructional sets.

On the basis of previous results the independent variables were reduced to those which had proved most predictive of academic performance, namely Openness, Conscientiousness, and the deep and strategic approaches to learning (see chapter four). The two personality traits were of particular of interest as they have shown to be respectively the most difficult, and easiest of the Big Five factors to fake (Furnham, 1990). Grays' silent reading test (GSRT) was also included, to explore the hypothesis that differences in faking ability may be related to verbal comprehension. The rationale for this was that in order to fake effectively participants must have good test item comprehension.

The main research questions were:

- What is the effect of test practice under various instructional sets on subsequent test performance?
- Are there individual differences in extent of faking, and is faking ability a separate construct?
- Is this construct related to other cognitive or non-cognitive factors?

7.2 Methods

7.2.1 Participants

Ninety one first year Psychology undergraduates (83 women, 7 men, 1 unspecified) took part in the study. Sixty six percent of participants had entered University directly from school, 22 % had taken one year out, 2% two years out, and the remainder three or more (thereby classed as mature students). Participants received research credits for participating.

7.2.2 Measures

The following measures were completed, in the following format:

'True' respondents (n = 54) *	'Fake' respondents (n = 37)
• Demographic Information (see appendix I)	• Demographic Information
• Raven's Progressive Matrices (20 minutes)	• Raven's Progressive Matrices (20 minutes)
	• Self-assessment / Ideal profile measures
• NEO (respond truthfully)	• NEO (respond as applicant)
• ASSIST (respond truthfully)	• ASSIST (respond as applicant)
• Self-assessment measure	
15 minute break	
• GSRT (20 minutes)	• GSRT (20 minutes)
• Self-assessment / Ideal profile measures	
• NEO (respond as applicant)	• NEO (respond truthfully)
• ASSIST (respond as applicant)	• ASSIST (respond truthfully)
	• Self-assessment measure

**Throughout this chapter, 'True' respondents refer to those who completed the measures under true conditions first, whereas 'fake' respondents are those who completed the measures under applicant conditions first.*

Gray's Silent Reading Test

The GSRT consists of 13 developmentally sequenced reading passages with five multiple-choice questions. Following the test producers' recommendations and normed data, this sample completed passages 8 to 13 only (passages 1 -7 are applicable to younger age groups).

Academic Performance

This was assessed using end of first year results, retrieved as previously described in Chapter four.

7.2.3 Procedure

Participants were briefed as outlined in previous chapters, with a separate briefing for each instructional set.

Scoring

The raw data were screened and scored as described in previous chapters. Two outliers were identified on the faking index for Openness and one the faking index for Conscientiousness causing skewness. These were adjusted to one data point to the most extreme score within the normal distribution, and data re-examined to confirm normality.

Faking Ability

The faking index was designed to account for both intention and opportunity to fake.

Intention to fake was defined as the ratio of ideal score to self rating (i.e. how much each participant would seek to increase their rating on this trait in order to become 'ideal').

The 'target score' for each participant was calculated as a product of their true score on the NEO-FFI score and their intention to fake (as defined above)

Target score = FFI score * (ideal score / self rate score) **Equation 1**

The target score was capped at 75, which was the maximum attainable score.

Extent of faking was calculated as the ratio of fake FFI score to target score:

Extent of faking = Fake FFI score / target score **Equation 2**

The faking index was calculated on a scale from 0 to 1, where 0 represented no faking, and 1 represented maximum faking. For participants whose extent of faking was within this range, no adjustment was required to their faking ability scores. For participants whose extent of faking exceeded 1 (due to their fake score being greater that their target score) scores were re-defined in terms of the proximity to the maximum e.g. an 'extent of faking' of 1.3 would yield a faking index of 0.7. This ensured that under and over faking were rated equally.

For comparison purposes, a simple measure of faking ability was also calculated, as follows:

Faking amount = fake score – true score **Equation 3**

7.3 Results

7.3.1 What is the effect of test practice under various instructional sets on subsequent test performance?

Between group differences

Table 7.1 shows the differences in scores according to whether participants completed the measures under true or applicant (fake) conditions first. There were no significant differences for any of the measures of academic achievement or mental ability, confirming group equivalence in terms of cognitive skills. Regarding non-cognitive measures, there were no differences in true scores, but significant differences were evident for the fake scores for all approaches to learning: participants who competed these

measures under true conditions first scored significantly higher on deep and strategic approaches and lower on surface approach scores when subsequently briefed to respond as applicants (all $p < 0.01$) compared to participants who completed these as applicants in the first instance. This implies that having already experienced the test items once, participants faked their responses to a greater extent than if seeing the test items for the first time.

Table 7.1: Descriptive and inferential statistics for relevant study variables as a function of respondent group.

Variable (unit)	'True' responders (n = 54)	'Fake' responders (n = 37)	Combined	*t* value	Effect size
	M (*SD*)	M (SD)			(d)
Best 3 A levels	305.2 (22.8)	295 (38.4)	301.2 (20)	1.51	.16
End of year mark (%)	57.30 (7.4)	54.51 (10.0)	56.16 (8.6)	1.53	.16
Raven's Matrices (score)	49.50 (4.7)	48.97 (4.6)	49.29 (4.7)	.53	.06
GSRT (score)	52.91 (6.50)	52.78 (9.3)	52.86 (6.8)	.09	.01
Openness (T-score)	57.35 (8.4)	55.38 (9.4)	56.55 (8.8)	1.05	.11
Conscientiousness (T-score)	39.00 (11.0)	39.51 (8.6)	39.21 (10.1)	-.24	-.03
Deep learning approach	58.54 (10.5)	58.24 (11.6)	58.42 (10.9)	.13	.01
Strategic learning approach	68.57 (13.4)	72.68 (12.5)	70.24 (13.2)	-1.47	-.15
'Fake' Openness (T-score)	54.52 (7.2)	54.43 (8.0)	54.48 (7.5)	.05	.01
'Fake' Conscientiousness (T-score)	55.59 (9.0)	53.73 (10.0)	54.84 (9.4)	.93	.10
'Fake' Deep learning approach	69.51 (6.76)	58.50 (9.7)	65.06 (9.67)	5.90**	.55
'Fake' Strategic learning approach	91.40(6.69)	76.11 (10.1)	85.21(11.13)	7.98**	.67

* $p < 0.05$ ** $p < 0.01$

Differences in responses according to respondent group

Table 7.2 shows that for participants who were first briefed to respond truthfully, all scores were significantly different when they repeated the measures under applicant conditions. Scores for Conscientiousness, deep and strategic approaches were all increased (all $p <$

0.01) whereas scores for Openness were decreased ($p < 0.01$). These results concur with the findings reported in Chapter six, apart from the reduction in Openness scores.

Table 7.2: Descriptive and inferential statistics for relevant study variables as a function of response condition

Variable (unit)	Instructional set 1: 'True' conditions	Instructional set 2: Applicant conditions	*t value*	Effect size
	M (SD)	M (SD)		(d)
True responders				
Openness (T-score)	57.35 (8.4)	54.52 (7.2)	-2.21*	-0.18
Conscientiousness (T-score)	39.00 (11.0)	55.59 (9.0)	8.76**	0.64
Deep learning approach	58.54 (10.5)	69.51 (6.76)	9.25**	0.53
Strategic learning approach	68.57 (13.4)	91.40(6.69)	13.96**	0.73
	Instructional set 1: Applicant conditions	Instructional set 2: 'True' conditions		
Fake responders				
Openness (T-score)	54.43 (8.0)	55.38 (9.4)	.731	0.05
Conscientiousness (T-score)	53.73 (10.0)	39.51 (8.6)	-6.75**	-0.61
Deep learning approach	58.50 (9.7)	58.24 (11.6)	-.77	-0.01
Strategic learning approach	76.11 (10.1)	72.68 (12.5)	-2.77**	-0.15

* $p < 0.05$ ** $p < 0.01$

For participants who first responded as applicants, subsequent scores when briefed to respond truthfully showed a decrease in scores for Conscientiousness and the strategic learning approach, and an increase in surface learning approach (all $p < 0.01$). The differences between scores are smaller than for the first groups. On first glance this would seem to confirm previous claims that participants who fake on psychometric measures will then produce true scores which approximate the fake scores when subsequently required to respond under true conditions (Ellingson et al, 1999). However, consideration of these results together with the data presented in table 7.1 suggests that the main difference according to the order of instructional set was not in the true scores, but the fake scores: participants who first completed the measures under 'true' conditions faked to a greater

extent when they subsequently completed the measures under applicant conditions, compared to 'fakers' who had no previous experience of the measures.

To explore the effect of faking on self perception, self ratings for Openness and Conscientiousness completed before and after the measures were completed under the first instructional set were compared (see Appendix III for self-rating forms). Table 7.3 shows the difference in self assessment for these traits. It can be seen that participants who completed the measures under applicant conditions first, subsequently rated themselves higher for Conscientiousness than their initial assessment ($p < 0.01$), which implies that impression management can lead to changes in self perception.

Table 7.3: Mean Self Ratings for Conscientiousness and Openness before and after completing measures under 'fake' conditions

	Openness 1	**Openness 2**	**Wilcoxon sign**
True respondents (true condition first)	5.39 (1.3)	5.36 (1.3)	-.36
	Conscientiousness 1	**Conscientiousness 2**	
	4.74 (1.4)	4.80 (1.4)	-.69
	Openness 1	**Openness 2**	
Fake respondents (applicant condition first)	5.38 (1.0)	5.41 (1.2)	-.16
	Conscientiousness 1	**Conscientiousness 2**	
	4.62 (1.3)	5.19 (1.2)	-3.79**

* $p < 0.05$ ** $p < 0.01$

The figures in parentheses after the mean values are standard deviations.

Predictive Validity

To explore the effect of faking on predictive validity of the measures for academic performance, correlations between test scores and end of first year results were explored for

both groups of respondents, and under each instructional set. Table 7.4 shows the correlation between non-cognitive measures and 1st year marks for both respondent groups. For the participants who responded under true conditions first, it can be seen that Conscientiousness and strategic approach both correlated with academic performance ($r = 0.28$, $p < 0.05$ and $r = 0.32$, $p < 0.01$ respectively). When briefed to respond as applicants, the strategic approach was still predictive, but the correlation with Conscientiousness was no longer significant. The deep approach was also predictive in this condition ($r = 0.29$, $p < 0.01$).

For the participants initially briefed to respond as applicants, Conscientiousness was the only trait to show a significant correlation with the criterion variable ($r = 0.49$, $p < 0.01$). The effect decreased when participants were briefed to respond truthfully, and was no longer significant. These results imply that test practice under different instructional sets affect the predictive validity of the measures.

7.3.2 Are there individual differences in extent of faking?

Paired rank-order correlations were carried out to explore the hypothesis that the decay in predictive validity when participants fake is due to changes in the rank order of participant scores (see table 7.5). High correlations between pairs would suggest that although participant scores may differ according to response conditions, the rank order was not greatly affected, i.e. that all scores had increased or decreased by the same amount. Conversely, low correlations would suggest greater changes in the rank order of participant scores. Moderate to strong paired correlations were evident in both groups (range $r = 0.31$, $p < 0.05$ to $r = 0.81$ $p < 0.01$) with the exception of Conscientiousness. This suggests that faking did affect the rank order of participant scores to varying extents, and that this was greater when the fake condition followed the true condition. This implies that there were individual differences in faking ability, and that the extent of these differences varied according to the construct, with the greatest individual differences for Conscientiousness, and the least for the deep learning approach.

Table 7.4: Pearson correlations between non-cognitive measures and end of first year results for both instructional sets

'True' responders (n = 54)	Instructional set 1: 'True' conditions	Instructional set 2: Applicant conditions
Openness (T-score)	.10	-.10
Conscientiousness (T-score)	.28*	.12
Deep learning approach (score)	.17	.29*
Strategic learning approach (score)	.32**	.43**
Fake' Responders (n = 37)	Instructional set 1: Applicant conditions	Instructional set 2: 'True' conditions
Openness (T-score)	.05	-.23
Conscientiousness (T-score)	.49**	.32
Deep learning approach (score)	-.25	-.29
Strategic learning approach (score)	.02	-.09

* $p < 0.05$ ** $p < 0.01$

Table 7.5: Spearman's Rank Paired Samples Correlations according to Response Condition

'True' respondents (n=54)	Openness	.31*
	Conscientiousness	-.01
	Deep	.50**
	Strategic	.43**
'Fake' respondents (n=37)	Openness	.54**
	Conscientiousness	-.02
	Deep	.81**
	Strategic	.65**

* $p < 0.05$ ** $p < 0.01$

7.3.3 Is faking ability a separate construct?

Faking indexes were calculated as described in the methodology. Table 7.6 shows descriptive statistics for these variables, once outliers had been adjusted. Both data sets fulfilled the criteria for normal distribution.

Table 7.6: Descriptive Statistics for Faking indexes for Openness and Conscientiousness

	Mean (SD)	Skewness	Kurtosis
Openness Fake Index	.79 (.13)	-.26	-.67
Conscientiousness Fake Index	.73 (.22)	-.99	.16

7.3.4 Is this construct related to other cognitive and non-cognitive scores?

Correlations with non-cognitive factors

Pearson's correlations were used to explore if the faking indexes were related to other cognitive and non-cognitive constructs (table 7.7). The simple measure of faking amount used in previous studies was also included. The fake index for Openness showed positive correlations with both the deep and strategic approaches to learning, ($r = 0.29$, $p < 0.05$ and $r = 0.32$, $p < 0.05$, respectively). The correlation with Openness itself was non-significant, which, combined with the relationship to approaches to learning implies that the ability to fake in Openness is not related to the construct itself. Conversely the measure off faking amount used in previous studies showed a negative correlation with the Openness factor ($r = -0.68$, $p < 0.05$), implying that participants high in openness faked the least.

The faking index for Conscientiousness showed a positive correlation with the construct itself ($r = 0.50$, $p < 0.01$) and also with true strategic scores and deep scores ($r = 0.35$, $p < 0.05$, $r = 0.44$, $p < 0.01$) respectively. Thus faking ability on Conscientiousness shares 25% of the variance in the underlying construct, and is also related to applied non-cognitive constructs. The measure of faking amount used in previous studies again showed

a negative correlation with the construct itself ($r = -0.77$, $p < 0.05$), implying that participants high in Conscientiousness faked the least.

Of interest is the small, non-significant correlation ($r = 0.13$) between the faking indexes for the two traits, which implies that faking ability is not a single generalisable trait, but may differ according to the trait under consideration.

Correlations with Cognitive Factors

There were positive correlations between Ravens scores, GSRT scores and both faking indices but these were not significant. There was, however, a significant correlation between the fake index for Conscientiousness and end of year performance. This was greater (ns) than the correlation between Conscientiousness and end of year performance ($r = 0.37$ compared to $r = 0.28$) which suggests that the effect is not simply due to the impact of the underlying personality construct.

Table 7.7: Pearson Correlations between faking indexes, faking amount and other study variables

	FI C	O	C	Deep approach	Strategic approach	ravens	GSTR	End marks
FI for Openness	.13	.23	.15	.29*	.32*	.15	.12	-.10
FI for Conscientiousness		.21	.50**	.35*	.44**	.10	.13	.37**
Faking amount O		-.68**	-.04	-.18	.00	-.11	-.14	-.17
Faking amount C			-.77**	-.18	-.41**	.19	-.09	-.15

* Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

Does faking ability have a predictive effect?

To explore if the faking index on Conscientiousness made any unique contribution to the variance in end of year performance, a hierarchical regression was conducted (see table 7.8), with forced entry of all variables that correlated with the dependent variable in the following order

1. Academic factors (entered as a set)
2. Conscientiousness
3. Strategic learning approach
4. Conscientiousness faking index

Table 7.8: Regression of predictor variables on academic performance

Step	Variable(s)	Dependent variable:	1st year marks	
		Multiple R	R^2	R^2 change
1	Academic factors	.60*	.36	.36*
2	Conscientiousness	.61	.37	.02
3	Strategic learning approach	.63	.40	.03
4	Fake index - Conscientiousness	.69*	.47	.07*

** Correlation is significant at the 0.01 level (1-tailed).

* Correlation is significant at the 0.05 level (1-tailed).

The regression table shows that for this sample, the fake index for Conscientiousness was the only non-cognitive variable to make a significant contribution to the variance in academic performance.

7.4 Discussion

7.4.1 What is the effect of test practice under various instructional sets on subsequent test performance?

Previous research has suggested that that individuals who enhance their responses to non-cognitive measures tend to produce answers that approximate their initial fake good responses in subsequent test sessions, even if then asked to respond truthfully (Ellingson et al, 1999). However this was not seen in the current study: there were no significant differences in 'true' responses to any of the measures according to whether the true condition preceded or followed the applicant (fake) condition. The responses to the approaches to learning measures under the applicant condition were, nevertheless, significantly higher when participants had already completed these measures truthfully. This suggests that test familiarity / practice may give participants an insight into the psychometric aims of the measure, and subsequently enhance their capacity to fake. This effect was not apparent for the personality factors Conscientiousness and Openness. The ASSIST has high face validity, and therefore may allow greater scope for faking.

Participants who completed the measures under applicant conditions first, increased their self evaluation scores for Conscientiousness when asked to repeat this exercise at the end of the testing session, but this was not reflected in their scores on the NEO-FFI. This confirms that the measure is robust and does measure trait rather than state characteristics. Participants were not requested to provide self –evaluations for their approaches to learning scores in this study, and so it was not possible to relate questionnaire responses to self evaluation on these constructs.

7.4.2 Are there individual differences in extent of faking, and is faking ability a separate construct?

It has been suggested that faking results in changes the rank order of participant scores - i.e. that not all individuals fake equally (Douglas et al, 1996). For participants who

completed the measures under true conditions first, correlations between true and fake responses were low to moderate. There was no significant correlation between Conscientiousness scores obtained under each response condition, and other factors showed various degrees of correlation ranging from 0.31 for Openness to 0.50 for the deep approach. This would support the view that faking affects the validity of measures by altering the rank order of participant scores. Interestingly, for the group who completed the measures under applicant conditions first and were then briefed to respond truthfully, the correlations for all variables except Conscientiousness were greater. This implies that if participants fake first, the subsequent changes in rank order are not as extreme. Thus participants who first completed the measures truthfully, not only engaged in greater amounts of faking, but their fake scores bore less relation to their original responses than when the measures were completed in reverse order. There is no obvious reason for this, other than that participants who have had a 'dry run' at responding may be bolder when re-presented with the same measures under applicant conditions.

Regarding the predictive validity of measures, for the group who firstly completed the measures under true conditions, scores for Conscientiousness and the strategic approach correlated with first year marks ($p < 0.05$, $p < 0.01$ respectively). Conscientiousness has been shown to be a consistent predictor of academic performance (e.g. Busato et al, 2000; Chamorro-Premuzic & Furnham, 2003). This is also true for the strategic approach (e.g. Newstead, 1992; Sadler-Smith,1997), although in the study described in Chapter four the relationship was only statistically significant in the high ability group. It is interesting to note that the academic profile of the current cohort was significantly higher than for the sample in the previous study, (best 3 A- level mean score of 300 tariff points compared to 282 for the previous sample, representing a mean increase of one grade) which could explain why the strategic approach is more influential. When participants repeated the measures under applicant conditions, the effect of the strategic approach increased slightly to $r = 0.43$, and there was also a relationship with the deep approach ($r = 0.29$, $p < 0.01$). The correlation between Conscientiousness and academic performance decreased and was no longer significant. These results confirm that faking does not have a uniform effect on

scores, which has implications for the predictive validity of measures used under different instructional sets.

For the reverse condition group, under their initial applicant condition, only Conscientiousness correlated with academic performance ($r = 0.49$, $p < 0.01$). When they repeated the measures under true conditions, this relationship decreased to $r = 0.32$, which was again non-significant for this sample size. There were no other significant relationships in this group, indicating that completing the measures under faking conditions decreases their predictive ability when participants are subsequently briefed to respond truthfully. This has implications for the potential use of non-cognitive measures for educational purposes: Zickar and Robie (1999) showed that extent of faking was further increased if participants also received coaching and it is reasonable to assume that University applicants would receive coaching if non-cognitive measures were used as part of an application procedure. This could then affect the validity of the measures when these are completed under 'true' conditions, when respondents are likely to temper their responses due, for example, to a faking warning being issued.

7.4.3 Is faking ability related to other cognitive or non-cognitive factors?

Some researchers have suggested that faking ability is a separate construct, which may be linked to other cognitive skills such social intelligence, or general mental ability (McGarland & Ryan, 2000; Pauls & Crost, 2005). If this was the case, one would expect high correlations between the faking indexes: this hypothesis was not supported by the results of the current study. The correlation between the faking indexes for Conscientiousness and Openness was small and non-significant supporting previous suggestions that extent of faking varies not only between individuals, but also across measures (McFarland & Ryan, 2000; Zickar et al, 2004). The faking index for Conscientiousness showed a shared variance of 25% with the trait itself, and also significant relationships with some of the approaches to learning scores, implying that ability to fake, at least for this construct, may be a learned facet of the underlying personality trait. The nature of the faking index for Openness was less clear - this showed

little correlation with the construct itself, but again varying relations with the approaches to learning data. Openness to Experience has been consistently shown to be the least fakeable of the personality factors (e.g. Furnham.1997) and further exploration is required before any firm conclusions are drawn.

When the simple measure of faking amount which has been employed in previous studies (fake score minus true score) was used, there were moderately strong negative correlations between faking ability and the underlying constructs. It would be easy to conclude from this that participants high in Openness and Conscientiousness are poor at faking, or choose not to. However, as previously discussed, this is more likely due to a methodological artifact: participants who have high 'true' scores have limited scope to increase these under faking conditions due to a ceiling effect, and so participants whose initial scores are low will seem to be better at faking. This highlights the importance of adjusting for both scope and intention when computing faking indexes, and that care is needed in interpreting the results of studies that have used over simplified definitions and calculations of faking.

Most of the correlations between both faking indexes and cognitive factors were small and non-significant, although it would be interesting to repeat the study with a larger data set. There was, however, a significant relationship between the faking index for Conscientiousness and academic performance. Regression analysis showed that the former made a significant and unique contribution of 7% to the total variance in academic performance, and was more influential than any other non-cognitive factor.

Exploring the relationship between Conscientiousness and the faking index for this construct has highlighted some interesting points:

1. Conscientiousness is the most consistent non-cognitive predictor of academic performance.
2. It is highly fakeable.
3. Faking on Conscientiousness is not uniform, as evidenced in changes in the rank order of participant scores.

4. Conscientiousness retains a predictive effect in faking conditions.
5. The ability to fake on this construct is in itself predictive of academic performance.

Why the ability to fake Conscientiousness should have a stronger predictive effect than the construct itself is of great interest. Ability to fake may indicate an understanding of the construct and may reflect a quality of self-knowledge. Individuals who have a high understanding of the nature of Conscientiousness may be able to apply this more strategically in their work.

7.5 Conclusions

The within subject design of this study allowed further exploration of the nature of faking on psychometric measures in an educational setting. The results confirmed that faking alters the predictive validity of non-cognitive measures, and that this may be due to changes in the rank order of participant scores when measures are completed under applicant conditions. This indicates that there are individual differences in extent of faking, but it seems that these differences are not consistent across measures. The results of this study further indicate that faking ability is not a completely separate construct, but is possibly a facet of the underlying personality trait. The faking index for Conscientiousness provided unique predictive information regarding academic performance. The characteristics linked to the ability to fake warrant further exploration as they may indicate qualities such as self – knowledge which may be important indicators of potential to succeed within educational settings.

CHAPTER EIGHT
OVERVIEW AND CONCLUSIONS

8.1 Introduction

The studies described in previous chapters have explored predictors of academic performance in Higher Education, with particular emphasis on the implications within a Widening Participation context.

Two main themes have been presented:

1. Analysis of cognitive and non-cognitive predictors in various participant groups
2. The extent and effect of faking on non-cognitive measures.

8.2 Analysis of cognitive and non-cognitive predictors

The results reported herein have confirmed earlier research that previous academic results are at best modest predictors of academic success at University. It was shown that non-cognitive predictors can provide additional information, although for some of the traditional non-cognitive predictors, such as personality traits, more information may be gained by going beyond the broad traits to look at the impact of second order factors.

The relative ability of cognitive and non-cognitive factors to predict academic performance depends on initial aptitude – this is partly due to range restriction effects at the top end of the distribution but also because low achieving students may need additional personal qualities in order to overcome their intellectual shortcomings. What is not easy to establish is the extent to which these qualities are inherent in students destined to succeed, and the degree to which they can be developed.

Certain trends became evident throughout the study, and four key predictive strands are suggested.

- General analytic academic ability, characterised by GCSE grades, in particular Science

- Subject specific knowledge and interest, characterised in this study by Psychology A-level

- Deep processing ability, characterised by the deep learning approach, Openness to external experience, and to some extent, intrinsic motivation

- Applied Conscientiousness , characterised by the strategic approach to learning and Conscientiousness

It was noted that certain aspects of emotional intelligence were also implicated: although this trait did not seem to actively improve performance, emotional instability may have a debilitating effect on academic progress.

To explore this hypothesis, four new variables were created, based on data collected from all participants who had completed the measures under 'true' response conditions (n = 198). Subject specific knowledge was defined by Psychology A-level. Factor analysis of all other key predictive variables, extracting eigenvalues over 1, resulted in a model which explained 73% of the total variance (see table 8.1). The total Openness scores were used: openness to external experience scores were only available for a small data set.

Three factors were identified which confirmed the initial hypothesis, and were named as follows:

1. Strategic Conscientiousness
2. General academic ability
3. Deep / Open processing

Table 8.1: Rotated component matrix for exploratory factor analysis of relevant variables

	Component *(eigenvalues)*		
	1 *(2.10)*	**2*(1.70)***	**3 *(1.23)***
Openness	-.156	.151	**.868**
Conscientiousness	**.911**	.090	-.062
Deep approach	.375	.011	**.786**
Strategic approach	**.907**	-.047	.180
English GCSE	.091	**.610**	.185
Maths GCSE	-.087	**.826**	-.014
Science GCSE	.036	**.852**	.014

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

On the basis of the results to the study described in Chapter four it was further hypothesised that academic performance for a broad sample of participants would be predicted by a combination of all four variables: initial low achievers would show improved performance if they had higher scores for Deep / Open processing and subject-specific skills, whereas for participants already achieving a high academic level, Strategic Conscientiousness would become more influential. Correlation between these predictor variables and first year performance for each participant group confirmed these hypotheses (see table 8.2)

Table 8.2: Correlation between predictor variables and 1st year marks, according to A-level achievement

	Psychology A level	General academic ability	Deep / Open processing	Strategic Conscientiousness
Total sample (n = 160)	**.43**** (n = 121)	**.21***	**.23****	**.35****
Low achievers (n = 46) (≤ 260 tariff points)	.37 (n = 23)	.27	**.39***	.21
High achievers (n = 80) (≥ 300 tariff points)	.22 (n = 69)	.05	.12	**.31****

** Correlation is significant at the 0.01 level

* Correlation is significant at the 0.05 level

8.2.1 A Model for Predicting Academic Performance

The proposed model suggests that predictors of academic performance follow a developmental hierarchy. Academic success hinges on developing Deep / Open processing skills, but students may achieve these skills at different times. Only at a certain level of achievement does Strategic Conscientiousness become of benefit.

It is likely that the relationship is cyclic. Once students tap into or acquire Deep / Open processing skills, their performance will improve allowing them to develop these skills further until they reach a point at which the relationship stabilises. Depending on their level of academic achievement at this point, they may then be able to optimise performance further by Strategic application of Conscientiousness (see figure 8.1).

8.2.2 Implications of the model

For general University selection (where applicants have a broad range of academic profiles), there may be little to gain by inclusion of non-cognitive measures as part of the application procedure. There are no specific non-cognitive predictors of performance across a wide range of abilities, and incorporation of a broad battery of measures is unlikely to be justifiable on a cost – benefit basis.

For low achievers, a measure of Deep / Open processing skills may help identify those students more likely to succeed at Higher Education

Deep processing skills can be linked to the following Fair Enough criteria:

- Reads independently outside set texts
- Does preparatory work outside the classroom
- Demonstrates engagement with studies
- Interest in subject area
- Takes advantage of learning opportunities on offer outside the curriculum

Thus assessment of these qualities either by psychometric measures, or interview, or preferably through a combination of both these methods would help identify students who may have personal characteristics which would enable them to succeed in Higher Education despite having a weak academic profile. Further to this, students who are low achievers in their first year at University may benefit from receiving assistance in developing these skills through tutorial support and formative assessments. Multiple choice format questions, popular for 1st year studies in many institutions because they are less demanding in terms of tutor time, will not benefit these students. Rather than requiring greater evidence of analysis and evaluation in assignments as students progress through their studies, it may be more beneficial to support students in acquiring these skills as early as possible in their academic career.

For high achievers e.g. for further selection of 'straight A' applicants, non-cognitive measures of Strategic Conscientiousness may allow further selection. Traits which indicate success in elite performers are linked to the following Fair Enough criteria:

- Keeps to course work hand in deadlines
- Follows assignment deadlines
- Focuses on answering questions set in assignments
- Learns from and acts on feedback
- Puts effort into work

Identification of high levels of these traits may help distinguish the 'cream' of elite academic performers. In intervention terms, these are the aspects that should be encouraged at University to maximise performance of high-achievers. However, investment in the right tail of the distribution does raise the ethical question of what exactly are Universities trying to achieve? Should success at University be defined by academic results alone? Before implementing strategies to enhance output of high achievers it may be prudent to explore performance beyond University and redefine success in terms of wider accomplishments.

The studies reported in this thesis were designed to explore ways of increasing opportunities for students whose access to Higher Education may be limited. The ethics of selection are complex – the more one selects the more one also de-selects. University funding is affected by performance and attrition, but selection must be in the student's interest as well as the University's. It may also be more than a simple matter of acceptance or not, but of also recommending the most appropriate courses, both in terms of subject matter, and also in terms of structure and organisation. Anecdotal evidence suggests that when applicants fail to achieve the grades required to enrol on a specific course, they are offered a place on an alternative course which has lower entry requirements. Rarely does this take into account the appropriateness of that course for the student. Use of non-cognitive measures may help channel students in the right direction.

8.3 The extent and effect of faking responses on non-cognitive measures

Two main questions arose:

1. If non-cognitive tests were used in University selection would this lead to test coaching, practice and /or faking?

2. Would this matter?

The answer to the first question is probably 'yes'. It was found that undergraduates had a clear stereotype of an ideal student, matched in part by tutor expectations. Experimental participants were able to fake to this profile without specific briefing. Explicit test preparation and coaching would most probably develop and refine faking ability to an even greater effect. Test items are expensive, so it is likely that demographically disadvantaged students would have less opportunity to practice. As fakers were found to rise to the top of a sample comprised of fakers and non-fakers, it is likely that if only a proportion of applicants received test preparation, and consequently deliberately enhanced their

responses, they would rise to the top of the applicant pool. This would place more naïve applicants at a disadvantage.

In terms of the effects, whilst faking reduced the predictive validity of most factors, Conscientiousness retained its predictive effect even when participants faked. Further to this, the ability to fake on Conscientiousness was in itself predictive. On first glance it would therefore seem that it is of little consequence if participants fake, as those who fake successfully are more likely to do well academically anyway. However the implementation of long term coaching may create a different effect, especially on specific measures. The NEO FFI, for example, is a 60 item measure – it would not be difficult to memorise a complete set of responses in order to portray a specific profile.

The predictive effect of ability to fake Conscientiousness implies that knowledge of the construct may be as helpful as the construct itself. This supports the link between Conscientiousness and the strategic study approach: indiscriminate Conscientiousness may not be beneficial, whereas strategic application of this construct has a greater effect. It may be that understanding the nature of constructs (characterised by the faking index) has a synergistic effect on their impact. Further research could usefully determine if faking ability is a separate construct or a facet of personality.

8.4 Final Thoughts

The aim of the project was to explore predictors of academic performance at HE within a Widening Participation context. In terms of practical application, the aim was to suggest a strategy to identify students who may not progress to University following traditional selection systems, but who may have characteristics that indicate potential to succeed.

It was observed in Chapter one that the criteria for academic success identified in the Fair Enough project are somewhat subjective - they nevertheless proved to be a useful starting point for the current study. It certainly seems that possessing attributes linked to some of the criteria, notably those linked to Deep processing and Openness to external experiences can give an additional advantage to students with a weak academic profile. It would be useful to conduct a long term prospective study to explore how and when these skills are acquired, and the extent to which they can be developed by intervention strategies and use of formative assessments.

The studies have confirmed that non-cognitive factors can yield useful incremental predictive information. However the effect of test practice and the ease by which students were able to fake their responses does raise certain issues regarding long term implementation of these measures as part of an application procedure. Also the ethics of effectively discriminating on the grounds of personality are questionable. Despite the fact that the whole point of psychometrics is to standardise and quantify behaviour, formal academic results somehow seem more objective.

Ideally, non-cognitive measures should be used to increase opportunities for University applicants – to select rather then de-select. However this is not logistically possible as HE places are limited at most institutions, and so for every low achieving applicant offered a place on the basis of positive non-cognitive qualities, another applicant will be rejected. Also although non-cognitive measures are widely used in industry, for example for recruitment purposes, they are rarely used in isolation but usually to highlight

areas for discussion at interview. Time pressures mean that very few Universities now interview prospective students, and in any case, it is possible that these, too, would be discriminatory.

Further to this, use of psychometric assessment in industry usually follows a cost-benefit analysis to ensure that the extra expenditure will lead to an increase in work productivity and output. It is hard to envisage how this could be assessed in Higher Education. There is still much debate regarding how academic success should be assessed, and in Widening Participation terms, measuring success in terms of final degree grade is simply not good enough. Much as grades achieved at A-level are poor predictors of success at University there is little research to explore the relationship between degree grades and success in the work place. The latter would be equally difficult to define: for some individuals, success equates to earnings, for others status, job-satisfaction, freedom from stress- related illnesses, or attainment of further qualifications.

Perhaps the focus should not be solely on exploring predictors of academic performance at University, but should also embrace what exactly the HE experience aims to offer different entry groups, and the extent to which this is achieved.

REFERENCES

Abad, F. J., Colom, R., Juan-Espinosa, M., & Garcia, L. F. (2003) Intelligence differentiation in adult samples. *Intelligence,* 31, 157 – 166.

Ackerman, P. L., & Heggestad, E. D. (1997). Intelligence, personality and interests: evidence for overlapping traits. *Psychological Bulletin, 121,* 219 – 245.

Allik, J. & Realo, A. (1997). Intelligence, academic abilities, and personality. *Personality and Individual Differences, 23,* 809-814.

Aluja, A., García, O., Rossier, J., & García, L. F. (2005). Comparison of the NEO-FFI, the NEO-FFI-R and an alternative short version of the NEO-PI-R (NEO-60) in Swiss and Spanish samples. *Personality and Individual Differences, 38,* 591-604.

Ames, C. (1992) Classrooms: Goals, structures, and student motivation, *Journal of Educational Psychology, 84,* 261–271.

Anastasi, A. (1988). *Psychological testing* (6th ed.). New York: Macmillan.

Austin, E. J., Evans, P., Goldwater, R., & Potter, V . (2005). A preliminary study of emotional intelligence, empathy and exam performance in first year medical students. *Personality and Individual Differences, 39,* 1395 – 1405.

Austin, A. J., Deary, I. J., & Gibson, G.J. (1997) Relationships between intelligence and personality: three hypotheses tested. *Intelligence, 25,* 49 – 70.

Austin, A. J., Deary, I. J., Whiteman, M. C., Fowekes, F. G. R., Padersen, N. L., Rabbitt, P., et al (2002) Relationships between ability and personality: does intelligence contribute positively to personal and social adjustment? *Personality and Individual Differences, 32,* 1392 – 1411.

Bagby, R. M., & Marshall, M. B. (2003). Positive impression management and its influence on the revised NEO personality inventory: a comparison of analog and differential prevalence group designs. *Psychological Assessment, 15,* 333-339.

Baker, T. J., & Bichsel, J. (2006). Personality predictors of intelligence: differences between young and cognitively healthy older adults. *Personality and Individual Differences, 41,* 861 – 871.

Bandura, A. (2001) A guide to self-efficacy scales, retrieved 10 September 2005 from www.des.emory.deu/mpf/self-efficacy.html#effguide

Bandura, A. (1989) The Multidimenasional self-efficacy scales, unpublished test, Stanfrod Univesity, Stanford, CA

Bandura, A. (1986). *Social foundations of thought and action: a social cognitive theory.* Englewood Cliffs, NJ: Prentice Hall.

Bandura, A. (1997). *Self-efficacy: the exercise of control.* New York. Freeman.

Barchard, K. A. (2003). Does emotional intelligence assist in the prediction of academic success? *Educational and Psychological Measurement, 63,* 840 – 858.

Baron, J., & Norman, M. F. (1992). SATs, achievement tests, and high-school class rank as predictors of college performance. *Educational and Psychological Measurement, 52,* 1047-1055.

Bar-On, R. (1997). *Bar-On emotional quotient inventory: technical manual.* Toronto: Multihealth Systems.

Barron, K. E., & Harackiewicz, J. M. (2001). Achievement goals and optimal motivation: Testing multiple goal models. *Journal of Personality and Social Psychology, 80,* 706-722.

Barrick, M. R., & Mount, M. K. (1996). Effects of impression management and self-deception on the predictive validity of personality constructs. *Journal of Applied Psychology, 81,* 261–272.

Barrick, M. R., & Mount, M. K. (1991). The big five personality dimensions and job performance: a meta analysis. *Personnel Psychology, 44,* 1 – 26.

Barrick, M. R., Mount, M. K., & Judge, T. A. (2001). Personality and performance at the start of the new millennium: what do we know and where do we go next? *International Journal of Selection and Assessment, 9, 9* – 30.

Bastian, V. A., Burns, N. R., & Nettelbeck, T. (2005). Emotional intelligence predicts life skills, but not as well as personality and cognitive abilities. *Personality and Individual Differences, 39,* 1135 – 1145.

Bates, T. C., & Shieles, A. (2003). Crystallized intelligence as a product of speed and drive for experience: the relationship of inspection time and openness to g_f and g_c. *Intelligence, 31,* 275 – 287.

Biderman, M. D., & Nguyen. N. T. (2004). Structural equation models of faking ability in repeated measures designs. Paper presented at the 19th Annual Society for Industrial and Organizational Psychology Conference, Chicago, IL, retrieved 10 September 2004,

<http://oneweb.utc.edu/~Michael-Biderman/RecentPapers/BidermanAndNguyen031114.doc>

Biggs, J. B. (1993). What do inventories of students' learning processes really measure? A theoretical review and clarification. *British Journal of Educational Psychology, 63,* 3 – 19.

Blickle, G. (1996). Personality traits, learning strategies, and performance. *European Journal of Personality, 10,* 337-352.

Block, J. (1995). A contrarian view of the five-factor approach to personality description. *Psychological Bulletin, 117,* 187-215.

Bong, M. (1996).problems in academic motivation research and advantages and disadvantages of their solutions. *Contemporary Educational Psychology, 21,* 149 - 165.

Bouffard-Bouchard, T. (1990). Influence of self-efficacy on performance in a cognitive task. *Journal of Social Psychology, 130,* 353-363.

Brackett, M.A., & Mayer, J.D. (2003) Convergent, discriminant, and incremental validity of competing measures of emotional intelligence, *Personality and Social Psychology Bulletin, 29,* 1147–1158.

Breen, R., & Lindsay, R. (2002). Different disciplines require different motivations for Student Success. *Research in Higher Education, 43,* 693-725.

Brown, R.D., & Cothern, C. M. (2002). Individual differences in faking integrity tests. *Psychological Reports, 91,* 691 -702.

Brown, R., & Barrett, P. (1999) Differences between applicant and non-applicant personality questionnaire data: some implications fro the creation and use of norm tables. BPS Test User Conference Proceedings, 17 – 86. Leicester: British Psychological Society

Brown, R. D., & Harvey, R.J. (2003). Detecting personality test faking with appropriateness measurement: fact or fiction? Paper presented at the 2003 Annual Conference of the Society for Industrial and Organizational psychology Orlando, retrieved 02 September 2004 <http://harvey.psyc.vt.edu/Documents/BrownHarveySIOP2003.pdf>

Bruinsma, M. (2002). Motivation, cognitive processing and achievement in Higher Education. Paper presented at AERA.

Burton, N. W., & Wang, M. (2005). Predicting long-term success in graduate school: a collaborative study. GRE Board Research Project No 99-14R, retrieved 12 September 2005 < http://www.ets.org/Media/Research/pdf/RR-05-03.pdf>

Busato, V.V., Prins, F. J., Elshout, J. J., & Hamaker, C. (1999). The relationship between learning styles, the big five personality traits, and achievement motivation in higher education. *Personality and Individual Differences, 26,* 129 – 140.

Busato, V.V., Prins, F.J., Elshout, J.J. & Hamaker, C. (2000). Intellectual ability, learning style, personality, achievement motivation and academic success of psychology students in higher education. *Personality and Individual Differences, 29,* 1057-1068.

Calvin, A. (2000). Use of standardized tests in admissions in postsecondary institutions of higher education. *Psychology Public Policy and Law, 6,* 20 – 32.

Cassidy, S., & Eachus, P. (2000). Learning style, academic belief systems, self-report student proficiency and academic achievement in Higher Education. *Educational Psychology, 20,* 310 – 322.

Cattell, R. B. (1987). *Intelligence. Its structure, growth, and action.* New York. Elsevier Science Pub Co.

Chamorro-Premuzic, T., Moutafi, J., & Furnham, A. (2005). The relationship between personality traits, subjectively-assessed and fluid intelligence .*Personality and Individual Differences, 38,* 1517-1528.

Chamorro-Premuzic, T., & Furnham A. (2004). A possible model for understanding the personality–intelligence interface. *British Journal of Psychology, 95,* 249-264.

Chamorro-Premuzic, T., & Furnham, A. (2003). Personality predicts academic performance: Evidence from two longitudinal university samples. *Journal of Research in Personality, 37,* 319-338.

Chapman, K. (1996). Entry qualification, degree results and value added in UK universities. *Oxford Review of Education, 22,* 251-64.

Chemers, M. M., Hu, L., & Garcia, B. (2001). Academic Self-efficacy and first-year college student performance and adjustment. *Journal of Educational Psychology, 93,* 55-64.

Clare, J. (1999). SAT –a simple way to grade students. *The Daily Telegraph (Education).*10 November, 25

Clarke, C (2003). The future of Higher Education, retrieved 02 September 2004 <http://www.dfes.gov.uk/hegateway/strategy/hestrategy/foreword.shtml>

Cognitive Abilities Test (2001). nferNelson Publishing Company Ltd.

Colom, R., Escorial, S., & Rebollo, I. (2004). Sex differences on the progressive matrices are influenced by sex differences on spatial ability. *Personality and Individual Differences, 37,* 1289–1293.

Conard, M. A. (2006). Aptitude is not enough: how personality and behavior predict academic performance. *Journal of Research in Personality*, 40, 339 – 346.

Costa, P. T., & McCrae, R.R. (1985). *The NEO Personality Inventory manual.* Odessa, FL: Psychological Assessment Resources.

Costa, P. T. & McCrae, R. R. (1992*). NEO PI-R: Professional manual: Revised NEO PI-R and NEO-FFI,* Psychological Assessment Resources, Inc, Florida.

Covington, M. V. (2000). Goal theory, motivation an school achievement: an integrative review. *Annual Review of Psychology, 51,* 171 – 200.

Cronbach, L. J. (1990*). Essentials of psychological testing* (5th ed.) New York: Harper and Row.

Dalen, L. H., Stanton, N. A, & Roberts, A.D. (2001). Faking personality questionnaires in personnel selection. *Journal Of Management Development, 20,* 729 – 741.

Davies, M., Stankov, L. & Roberts, R. D. (1998). Emotional intelligence: In search of an elusive construct. *Journal of Personality and Social Psychology, 75,* 989-1015.

Dawda, D. (1997). Personality or Factor-analytically Developed, Lay Person, Self-reported, Single-word, Adjectival Descriptors of Global Characteristics of Personality Structure: The NEO Five Factor Model and Skimming the Surface of the Wetlands of Personality, retrieved 02 September 2004 <http://www.sfu.ca/~wwwpsyb/issues/1997/summer/dawda.htm>

Dawda, D., & Hart, S., D. (2000). Assessing emotional intelligence: reliability and validity of the Bar-On Emotional Quotient Inventory (EQ-i) in university students, *Personality and Individual Differences, 28,* 797–812.

Deary. I.J. (2000). *Looking down on human intelligence: from psychometrics to the brain.* Oxford University Press.

Deary, I. J. (2001). Human intelligence differences: a recent history. *Trends in Cognitive Science, 4,* 127 – 130.

Deci, E. L. & Ryan, R.M. (1985). *Intrinsic motivation and self-determination in human behavior,* Plenum, New York

De Fruyt, F. & Mervielde, I. (1996). Personality and interests as predictors of educational streaming and achievement. *European Journal of Personality, 10*, 405-425.

De Raad, B., & Schouwenburg, H. C. (1996). Personality in learning and education: a review. *European Journal of Personality, 10,* 303-336.

Deary, I. J., Egan, V., Gibson, J. G., Austin, E. J., Brand, C. R., & Kellaghan, T. (1996). Intelligence and the differentiation hypothesis. *Intelligence, 23*, 105 – 132.

Derksen, J., Kramer, I., & Katzko, M. (2002). Does a self-report measure for emotional intelligence assess something different than general intelligence? *Personality and Individual Differences, 32,* 37–48.

Diseth, A. (2003). Personality and approaches to learning as predictors of academic achievement. *European Journal of Personality, 17,* 143 – 155.

Diseth, A., & Martinsen, O. (2003). Approaches to learning, cognitive style, and motives as predictors of academic achievement. *Educational Psychology, 23*, 195 – 207.

Douglas, E. F., McDaniel, M. A., & Snell, A. F. (1996). The validity of non-cognitive measures decays when applicants fake. Paper presented at the annual conference of the Academy of Management, retrieved 10 April 2006 from < http://www.ipmaac.org/files/noncog.pdf>

Duff, A., Boyle, E., Dunleavy, K., & Ferguson, J. (2004). The relationship between personality, approach to learning and academic performance. *Personality and Individual Differences, 36,* 1907 – 1920.

Dweck, C. S., & Leggett, E.L. (1988). A social-cognitive approach to motivation and personality. *Psychological Review, 95,* 256–273.

Egan, V., Deary, I., & Austin, E. (2000). The NEO-FFI: Emerging British norms and an item-level analysis suggest N, A, and C are more reliable than O and E. *Personality and Individual Differences, 29*, 907–920.

Ellingson, J. E., Sackett, P. R., & Hough, L. M. (1999). Social desirability corrections in personality measurement: issues of applicant comparison and construct validity. *Journal of Applied Psychology, 84*, 155–166.

Elliot, A. J. (1999). Approach and avoidance motivation and achievement goals, *Educational Psychologist, 34,* 169–189.

Entwistle, N. J., Hanley, M., & Hounsell. D. (1979). Identifying distinctive approaches to learning . *Higher Education, 8,* 365 – 380.

Entwistle, N. J.(1998). Understanding academic performance at university: a research retrospective. In D. Shorrocks-Taylor (Ed) *Directions in educational psychology* (p 106 – 127) London, England: Whurr publishers

Entwistle, N. J. (1997). Contrasting perspectives on learning. In F. Marton, D. J. Hounsell and N. J. Entwistle (Eds.). *The experience of learning,* 2nd edition. Edinburgh: Scottish Academic Press, 3 – 22.

Entwistle, N, J., & Tait, H (1996). Approaches and Study Skills Inventory for Students. Centre for Research on Learning and Instruction. University of Edinburgh

Entwistle, N. J. Tait, H., & McCune, V. (2000) Patterns of response to an approaches to studying inventory across contrasting groups and contexts. *European Jopurnal of Psychology of Education, 15,* 33 – 48.

Entwistle, N. J., & Waterston, S. (1988). Approaches to studying and levels of processing in university students. *British Journal of Educational Psychology, 58,* 258 – 265.

Escorial, S., Garcia, L. F., Cuevas, L., & Juan-Espinosa, M. (2006). Personality level on the big five and the structure of intelligence. *Personality and Individual Differences, 40,* 909 – 917.

Everson, H. T. (2003). Innovation and Change in the SAT: A design framework for future college admissions tests, retrieved 30 March 2004, <http://www.collegeboard.com/prod_downloads/about/association/academic/sat_innovation.pdf

Fairchild, A. J., Horst, S. J., Finney, S. J., & Barron, K. E. (2005). Evaluating existing and new validity evidence for the Academic Motivation Scale. *Contemporary Educational Psychology, 30,* 331-358.

Farsides, T., &. Woodfield, R. (2003). Individual differences and undergraduate academic success: The roles of personality, intelligence, and application, *Personality and Individual Differences, 33,* 1225–1243.

Fincher, C. (1990) Trends in the predictive validity of the scholastic aptitude test (ETS Research Report) Princeton, NJ: Educational Testing Service.

Fleming, N. D., & Mills, C. (1992).VARK a guide to learning styles. Retrieved April 11th 2005 from <http://www.vark-learn.com/English/index.asp>

Furnham, A. (1986). Response bias, social desirability and dissimulation. *Personality and Individual Differences, 7,* 385–400.

Furnham, A. (1990). Faking personality questionnaires: Fabricating different profiles for different purposes. *Current Psychology Research and Reviews, 9,* 46–55.

Furnham, A. (1997). Knowing and faking one's five-factor personality score. *Journal of Personality Assessment, 69*, 229–243.

Furnham, A. (1991). Personality and learning style: a study of three instruments. *Personality and Individual Differences, 13,* 429 – 438.

Furnham, A., & Mitchell, J. (1991). Personality, needs, social skills and academic performance: a longitudinal study. *Personality and Individual Differences, 12*, 1067–1873.

Furnham, A., Chamorro-Premuzic, T., & McDougall, F. (2003). Personality, cognitive ability, and beliefs about intelligence as predictors of academic performance. *Learning and Individual Differences, 14*, 49-66.

Furnham,A., Jackson, C. J., & Miller, T. (1999). Personality, learning style and work performance. *Personality and Indicvidual Differences, 27,* 1113- 1122.

Gardner, H. (1993). *Multiple Intelligences: The Theory in Practice*. New York, NY: Basic Books.

Geiser, S., & Studley, R. (2001). UC and the SAT: Predictive Validity and Differential Impact of the SAT I and SAT II at the University of California, retrieved 30 March 04 from http://www.ucop.edu/sas/research/researchandplanning/pdf/sat_study.pdf

Gignac, G. E. (2005). Openness to experience, general intelligence and crystallized intelligence: a methodological extension. *Intelligence , 33,* 161 -167.

Gignac, G. E., Stough, C., & Loukomitis, S. (2004). Openness, intelligence, and self-report intelligence. *Intelligence, 32,* 133 – 143.

Green, S. (2003). Reflections on Psychology. BBK, 13 , retrieved 21 March 2004 from http://www.bbk.ac.uk/news/bbkmag/15/reflect.html

Griffin, B., & Hesketh, B. (2004). Why openness to experience is not a good predictor of job performance. *International Journal of Selection and Assessment, 12,* 243 – 251.

Goff, M., & Ackerman, P. (1992). Personality-intelligence relations: assessment of typical intellectual engagement. *Journal of Educational Psychology, 84*, 537-552.

Goldberg, L. R. (1990). An alternative description of personality: the big five factor structure. *Journal of personality and Social Psychology, 59,* 1216 – 1229.

Goleman, D. (1995). *Emotional Intelligence: Why it can matter more than IQ.* London: Bloomsbury.

Goleman, D. (1998). *Working with Emotional Intelligence.* London: Bloomsbury

Goodwin, G (2005). New study to gauge the impact of Aptitude Tests for university entrance, retrieved 10 March 2006 from < http://72.14.203.104/search?q=cache:Q-fN8ukshWsJ:www.nfer.ac.uk/latest-news/press-releases/new-study-to-gauge-the-impact-of-aptitude-tests--for-university-entrance.cfm+sutton+trust+sat&hl=en&gl=uk&ct=clnk&cd=3>

Gow, A. J., Whiteman, M. C., Pattie, A., & Deary, I. J. (2005). The personality-intelligence interface: insights from an ageing cohort. *Personality and Individual Differences, 39,* 751 – 761.

Halamandaris, K. F., & Power, K. G. (1999). Individual differences, social support and coping with theexamination stress: a study of the psychosocial and academic adjustment of first year home students. *Personality and Individual Differences, 26,* 665–685.

Harackiewicz, J. M., Barron, K. E, Tauer, J. M., & Elliot, A. J. (2002). Predicting success in college: a longitudinal study of achievement goals and ability measures as predictors of interest and performance from freshman year through graduation. *Journal of Educational Psychology, 94,* 562 – 575.

Harackiewicz, J. M., Barron, K. E., Pintrich, P. R., Elliot, A. J., & Thrash, T. M. (2002) Revision of achievement goal theory: necessary and illuminating, *Journal of Educational Psychology, 94,* 638–645.

Harackiewicz, J. M., Barron, K. E., Tauer, J. M., Carter, S. M., & Elliot, A. J. (2000). Short-term and long-term consequences of achievement goals in college: predicting continued interest and performance over time. *Journal of Educational Psychology, 92,* 316-330.

Hardy, S. A., Zamboanga, B. L., Thompson, R. A., & Reay, D. (2003). Student background and course involvement among first year college students in introduction to psychology: implications for course design and student achievement. *Psychology Teaching and Learning, 3,* 6 – 10.

Harris, J. A. (2004). Measured intelligence, achievement, openness to experience, and creativity. *Personality and Individual Differences, 36,* 913 – 929.

Heinstrom, J. (2000). The impact of personality and approaches to learning on information behaviour, Information Research, 5, Retrieved 3 March 2006 from http://www.informationr.net/ir/5-3/paper78.html

Herrnstein, R., & Murray, C. (1994). *The bell curve: intelligence and class structure in american life.* New York:The Free Press.

Holland, D. C., Dollinger, S.J., Holland, C. J., & MacDonald, D. A. (1995). The relationship between psychometric intelligence and the five factor model of personality in a rehabilitation sample. *Journal of Clinical Psychology,* 51, 79 – 88.

Honey, P., & Mumford, A. (1982). *Manual of learning styles.* London: P. Honey.

Hoskins, S., Newstead, S., & Dennis, I. (1997) Degree performance as a function of age, gender, prior qualifications and discipline studied. *Assessment and Evaluation in higher Education, 22,* 317 – 328.

Hurtz, G. M. & Donovan, J.J. (2000). Personality and job performance: the big five revisited. *Journal of Applied Psychology, 6,* 869 – 879

Huws, N. & Talcott, J. B. (2006). Faking it: how effective are students at impression management onn personality and approaches to learning questionnaires, and how does this affect their ability to predict academic performance? Poster presented at the Psychology Learning and Teaching conference, York.

Huws, N., Reddy, P., and Talcott, J. (2006). Predicting university success in psychology: are subject-specific skills important? *Psychology Learning and Teaching, 5,* 35 -42.

Jackson, C., & Lawty – Jones (1996). Explaining the overlap between personality and learning style. *Personality and Individual Differences, 20,* 293 – 300.

Jacona, J. J., Keehn, B. J., & Corrigan, C. (1987). Predictors of success in R.N. licence examination. *Nursing Papers, 19,* 23–34.

James, D., & Chilvers, C. (2001). Academic and non-academic predictors of success on the Nottingham undergraduate medical course 1970-1995. *Medical Education, 35,* 1056-1064.

Jensen, A.R. (1998). *The g factor: the science of mental ability.* Praeger, Westport, CT

Judge, T. A., Heller, D., & Mount, K. (2002). Five-factor model of personality and job satisfaction: a meta-analysis. *Journal of Applied Psychology, 87,* 530 – 541.

Kolb, D. (1984). *Learning Style Inventory.* Boston, MA: McBer & Company

Kolb, A. Y., & Kolb, D. A. (2005). Learning styles and learning spaces: enhancing experiential learning in Higher Education. *Academy of Learning and Education, 4,* 193 – 212.

Komarraju, M., & Karau, S. J. (2005). The relationship between the big five personality traits and academic motivation. *Personality and Individual Differences, 39,* 557-567

Kuncel, N. R., Hezlett, S. A., & Ones, D.S. (2004). Academic performance, career potential, creativity, and job performance: can one construct predict them all? *Journal of Personality and Social Psychology, 1,* 148 – 161.

Lane, J. and Lane, A. M. (2001) Self-efficacy and academic performance. *Social Behaviour and personality, 29,* 687 – 694.

Lee, S. & Klein, H. J. (2002) Relationships between conscientiousness, self-efficacy, self-deception, and learning over time. *Journal of Applied Psychology, 87,* 1175 – 1182.

Levine, S.B., Knecht, H. G., & Eisen, R. G. (1986). Selection of physical therapy students: interview methods and academic predictors. *Journal of Allied Health, 15,* 143- 151.

Lopes, P. N., Salovey, P., & Straus, R (2003). Emotional intelligence, personality, and the perceived quality of social relationships. *Personality and Individual Differences, 35,* 641 – 658.

Lounsbury, J. W., Sundstrom, E., Loveland, J. M., & Gibson, W. (2003). Intelligence, "big five" personality traits, and work drive as predictors of course grade. *Personality and Individual Differences, 35,* 1231 – 1239.

Lounsbury, J. W., Welsh, D. P., Gibson, L. W., & Sundstrom, E. (2005). Broad and narrow personality traits in relation to cognitive ability in adolescents. *Personality and Individual Differences, 38,* 1009 – 1019.

Low, G., Lomax, A., Jackson, M., & Nelson, D. (2004). Emotional intelligence: a new student development model. A paper presented at the 2004 National Conference of the American College Personnel Association in Philadelphia Pennsylvania, retrieved 28 August 2005 from http://education.tamuk.edu/eiconf/ACPA04.pdf

Luciano, M., Wainwright, M. A., Wright, M. J., & Martin, N. G. (2005). The heritability of conscientiousness facets and their relationship to IQ and academic achievement. *Personality and Individual Differences, 40,* 1189 – 1199.

Lyons, J. B. & Schneider, T. R. (2005). The influence of emotional intelligence on performance. *Personality and Individual Differences, 39,* 693 – 703.

Mackintosh, N. J., & Bennett, E. S. (2005). What do Raven's Matrices measure? An analysis in terms of sex differences . *Intelligence, 33,* 663-674.

Mahar,D., Coburn, B., Griffin, N., Hemeter, F., Potappel, C., Turton, M., & Mulgrew, K. (2006). Stereotyping as a response strategy when faking personality questionnaires. *Personality and Individual Differences, 40,* 1375 – 1386.

Mahar, D., Cologon, J., & Duck, J. (1995). Response strategies when faking personality questionnaires in a vocational selection setting. *Personality and Individual Differences, 18,* 605 – 609.

Maranon, R. C., & Andres-Pueyo, A. (2000). The study of human intelligence: a review at the turn of the millennium. *Psychology in Spain, 4,* 167 – 182.

Martin, J.H., Montgomery, R. L., & Saphian, D. (2006). Personality, achievement test scores, and high school percentile as predictors of academic performance across four years of coursework. *Journal of Personality in Research,* in press

Martin, B.A., Bowen, C. C., & Hunt, S.T. (2002). How effective are people at faking on personality questionnaires? *Personality and Individual Differences, 32,* 247-256.

Marton, F., & Saljo, R. (1976) On qualitative differences in learning – I: outcomes and processes. *British Journal of Educational Psychology, 46,* 4 – 11.

Mayer, J. D., Caruso, D. R., & Salovey, P. (1999). Emotional intelligence meets traditional standards for an intelligence, *Intelligence , 27,* 267–298.

Mayer, J.D & Salovey, P. (1997). What is Emotional Intelligence? In P. Salovey and D.J. Sluyter (Eds.) *Emotional development and emotional intelligence: Educational implications.* Basic Books.

Mayer, J. D., Salovey, P., & Caruso, D. (2000). Models of Emotional Intelligence. In R.J. Sternberg (Ed.) *Handbook of Intelligence.* Cambridge: Cambridge University Press.

McCrae, R. R., Costa, P. T., Terracciano, A., Parker, W. D., Mills, C. J., De Fruyt, F., & Mervielde, I. (2002). Personality Trait Development From Age 12 to Age 18: Longitudinal, Cross-Sectional, and Cross-Cultural Analyses. *Journal of Personality and Social Psychology, 83,* 1456-1468.

McCrae, R. R., & Costa, P. T. (2004). A contemplated revision of the NEO Five-Factor Inventory. *Personality and Individual Differences, 36,* 587–596.

McCrae, R. R. (1994). Openness to experience: expanding the boundaries of factor V. *European Journal of Personality, 8,* 251 – 272.

McCrae, R. R., & John, O. P. (1992). An Introduction to the Five-Factor-Model and its applications. *Journal of Personality, 60,* 175-215.

McDonald, A. S., Newton, P. E. Whetton, C. & Benefield, P. (2001a). Aptitude Testing for University Entrance: A Literature Review. *National Foundation for Educational Research.*

McDonald, A. S., Newton, P. E. & Whetton, C. with an appendix by Samantha E. Higgs, (2001b). A Pilot of Aptitude Testing for University Entrance. *National Foundation for Educational Research.*

McFarland, L. A., & Ryan, A.M. (2000). Variance in faking across non-cognitive measures. *Journal of Applied Psychology, 85,* 812-821.

McKenzie, K., & Gow, K. (2004). Exploring the first year academic achievement of school leavers and mature-age students through structural equation modeling. *Learning and Individual Differences, 14,* 107 – 123.

McLaurin, W.A., & Farrar, W. S. (1973). Validities of the progressive matrices against IQ and grade point average. *Psychological Reports, 32,* 803 -806.

McManus, I. C., Smithers, E., Partridge, P., Keeling, A., & Fleming, P. R, (2003). *British Medical Journal, 327,* 139 – 142.

Mellanby, J., Martin, M., & O'Doherty, J. (2000). The 'gender gap' in final examination results at Oxford University. *British Journal of Psychology, 91*, p. 377–390.

Mersman, J. L., & Shultz, K. S. (1998). Individual differences in the ability to fake on personality measures. *Personality and Individual Differences, 24*, 217–227.

Miller, A. (1991). Personality types, learning styles and educational goals. *Educational Psychology, 11,* 217 – 238.

Mills, C. J., & Tissot, S. L. (1995). Identifying Academic Potential in Students from Under-Represented Populations: Is Using the Ravens Progressive Matrices a Good Idea? *Education Resources Information Centre, 39,* 209 – 217.

Miserandino, M. (1996). Children who do well in school: individual differences in perceived competence and autonomy in above-average children. *Journal of Educational Psychology, 88,* 203 – 214.

Moffatt, G, K. (1993). The validity of the SAT as a predictor of grade point average for nontraditional college students. Paper presented at the annual meeting of the Eastern Research Association, Florida, 17 – 22 February.

Mone, M. A., Baker, D. D., & Jeffries, F. (1995). Predictive validity and time dependency of self-efficacy, self-esteem, personal goals, and academic performance. *Educational and Psychological Measurement, 55,* 716 – 727.

Moutafi, J., Furnham, A., & Crump, J. (2006).What facets of openness and conscientiousness predict fluid intelligence scores? *Learning and Individual Differences, 16,* 31 – 42.

Moutafi, I, J. , Furnham, A., & Tsaousis, I. (2006). Is the relationship between intelligence and trait neuroticism mediated by test anxiety? *Personality and Individual Differences, 40,* 587 – 597.

Moutafi, I, J., Furnham, A., & Paltiel, L (2005). Can personality factors predict intelligence? *Personality and Individual Differences, 38,* 1021 -1033.

Moutafi, I, J., Furnham, A., & Paltiel, L (2004). Why is conscientiousness negatively correlated with intelligence? *Personality and Individual Differences, 37,* 1013 - 1022.

Neisser, U., Boodoo, G., Bouchard Jr., T. J., Boykin, A. W., Brody, N., Ceci, S. J., Halpern, D. F., Loehlin, J. C., Perloff, R., Sternberg, R. J. & Urbina, S. (1996). Intelligence: knowns and unknowns. *American Psychologist, 51,* 77 – 101.

Newsome, S., Day, A. L., & Catano, V. M. (2000). Assessing the predictive validity of emotional intelligence. *Personality and Individual Differences, 29,* 1005–1016.

Newstead, S. E. (1992). A study of two "quick-an-easy" methods of assessing individual differences in student learning. *British Journal of Educational psychology, 62,* 299-312.

Ones, D. S., Viswesvaran, C. (1998). The effects of social desirability and faking on personality and integrity assessment for personnel selection. *Human Performance, 11,* 245 – 269.

Ones, D. S., Viswesvaran, C., & Reiss, A. D. (1996). Role of social desirability in personality testing for personnel selection: The red herring. *Journal of Applied Psychology, 81,* 660–679.

Oswald, F.L., Schmitt, N., Kim, B.H., Ramsay, L.J., & Gillespie, M.A. (2004). Developing a biodata measure and situational judgement inventory as predictors of college student performance . *Journal of Applied Psychology, 89,* 187 -207.

Pajares, F. (2002).Current Directions in Self-efficacy Research In M. Maehr & P. R. Pintrich (Eds.). *Advances in motivation and achievement.*Volume 10, (pp. 1-49). Greenwich, CT: JAI Press.

Pajares, F., & Miller, M. D. (1994). The role of self-efficacy and self-concept beliefs in mathematical problem- solving: a path analysis. *Journal of Educational Psychology, 86,* 193 – 203.

Parker, D. A., Creque, R. E., Barnhart, D. L., Harris, J. I., Majeski, S. D. A., Wood, L. M., Bond, B. J., & Hogan. (2004a). Academic achievement in high school: does emotional intelligence matter? *Personality and Individual Differences. 37, 1321 –* 1330.

Parker, J. D. A., Summerfeldt, L. J., Hogan, M. J., & Majeski, S. A. (2004b). Emotional intelligence and academic success: examining the transition from high school to university. *Personality and Individual Differences, 36*, 163-172.

Paulhus, D. L., Harms, P. D., Bruce, N., & Lysy, D. C. (2003). The over-claiming technique: measuring self-enhancement independent of ability. *Journal of Personality and Social Psychology, 84,* 890 – 904.

Paulhus, D. L. (1984). Two component models of socially desirable responding. *Journal of Personality and Social Psychology, 46,* 598 – 609.

Paulhus, D. L., Bruce, M. N., & Trapnell, P. D. (1995). Effects of self-presentation strategies on personality profiles and their structure. *Personality and Social Psychology Bulletin, 21*, 100–108.

Pauls, C. A., & Crost, N. W. (2004). Effects of faking on self-deception and impression management scales. *Personality and Individual Differences*, 37, 1137–1151.

Pauls, C. A., & Crost, N. W. (2005). Effects of different instructional sets on the construct validity of the NEO-PI-R. *Personality and Individual Differences*, *39*, 297-308.

Pauls, C. A., & Crost, N. W. (2005).Cognitive ability and self-reported efficacy of self-presentation predict faking on personality measures. *Journal of Individual Differences, 26,* 194 – 206.

Paunonen, S. V., & Ashton, M. C. (2001a). Big Five Predictors of academic achievement. *Journal of Research in Personality, 35*, 78 – 90.

Paunonen, S. V., & Ashton, M. C. (2001b). Big five factors and the prediction of behaviour. *Journal of Personality and Social Psychology. 81,* 524 – 539.

Peers, I. S., & Johnston, M. (1994). Influence of learning context on the relationship between A level attainment and final degree performance: a meta – analytical review. *British Journal of Educational Psychology, 64*, 1-18.

Peeters, H., & Lievens, F. (2005). Situational judgement tests and their predictiveness of college students' success: the influence of faking. *Educational and Psychological Measurement, 65*, 70 – 89.

Perez, C. (2002). Different tests, same flaws: Examining the SAT I, SAT II, and ACT. *Journal of College Admission,* Fall 2002 retrieved 27 / 02 / 06 < http://www.findarticles.com/p/articles/mi_qa3955/is_200210/ai_n9117158 >

Petrides, K. V., & Furnham, A. (2001). Trait emotional intelligence: psychometric investigation with reference to established trait taxonomies. *European Journal of Personality, 15*, 425-448.

Petrides, K. V., Furnham, A., & Frederickson, N (2004). Emotional Intelligence. *The Psychologist, 17*, 574 – 577.

Petrides, K. V., Frederickson, N., & Furnham, A. (2004). The role of trait intelligence in academic performance and deviant behaviour at school. *Personality and Individual Differences, 36*, 277 – 293.

Pintrich, P. R. (2000). Multiple goals, multiple pathways: The role of goal orientation in learning and achievement. *Journal of Educational Psychology, 92,* 544-555.

Pintrich, P. R., & Schunk D. H. (1996). *Motivation in education: Theory, research, and applications*. Englewood Cliffs, NJ: Merrill/Prentice Hall.

POLAR: A short guide (2005). Retrieved 08 / 07/004 from Higher education Funding Cenre for England at http://www.hefce.ac.uk/widen/polar/guide

Powers, D. E., & Rock, D. A. (1999). Effects of coaching on SAT 1: reasoning test scores. *Journal of Educational Measurement, 36,* 93 – 118.

Ransdell, S. (2001). Predicting college success: the importance of ability and non-cognitive variables. *International Journal of Educational Research, 35*, 357–395.

Raven, J. C. (1938) *Ravens progressive matrices: a perceptual test of intelligence*, H.K. Lewis, London .

Raven, J. C. (1976). *Standard Progressive Matrices.* Oxford: Oxford Psychologist's Press.

Reddy, P. & Moores, E. (2006). Measuring the benefits of a placement year. *Assessment and Evaluation in Higher Education, 31*, 551 - 567

Rindermann, H., & Neubauerb, A. C. (2001). The influence of personality on three aspects of cognitive performance: processing speed, intelligence and school performance. *Personality and Individual Differences, 30*, 829-842.

Robbins, S. B., Lauver, K., Lee, H., Davis, D., Langley, R., & Carlstrom, A. (2004). Do psychosocial and study skill factors predict college outcomes? A meta-analysis. *Psychological Bulletin, 130*, 261-288.

Roberts, R. D., Zeidner, M., & Matthews, G. (2001). Does emotional intelligence meet traditional standards for an intelligence? *Emotion* ,1, 196–231.

Rothstein, M. G., Paunonen, S. V., Rush, J.C., & King, G.A. (1994). Personality and cognitive ability predictors of performance in graduate business school. *Journal of Educational Psychology, 86*, 516 – 530.

Ryan, R. M. & Connell, J. P. (1989). Perceived locus of causality and internalization: examining reasons for acting in two domains. *Journal of Personality and Social Psychology, 57,* 749 -761.

Ryan, R. M., & Deci, E. L. (2000a). Intrinsic and Extrinsic motivations: classic definitions and new directions. *Contemporary Educational Psychology, 25,* 54 -67.

Ryan, R. M., & Deci, E. L. (2000b). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist. 55,* 68-78.

Ryan, A. M., & Sackett, P. R. (1987). Pre-employment honesty testing: fakability, reactions of test takers, and company image. *Journal of Business and Psychology, 1,* 248–256.

Sadler-Smith, E. (1997). "Learning style":frameworks and instruments. *Educational Psychology, 17,* 51 – 63.

Salgado, J. F. (1997). The five factor model of personality and job performance in the European community. *Journal of Applied Psychology, 82,* 30 – 43.

Salovey, P., & Mayer, J. D. (1990). Emotional intelligence. *Imagination, Cognition and Personality, 9,* 185-211.

Saklofske, D.H., Austin, E.J., & Minski, P.S. (2003). Factor structure and validity of a trait emotional intelligence measure. *Personality and Individual Differences, 34,* 707 – 721.

Scandell, D. J., & Wlazelek, B. (1999). The relationship between self-perceived personality and impression management on the NEO-FFI. *Personality and Individual Differences,* 7, 147–154.

Schaeffer, R. (2005) SAT / ACT Optional List Soars to 730 Coleges as more schools find dropping test score requirement enhances equity and academic quality. retrieved, 30 March 2006 from <http://www.fairtest.org/pr/OPT_PR_1105.html>

Schmidt, F. L., & Hunter, J. E. (1998). The validity and utility of selection methods in personnel psychology: practical and theoretical implications of 85 years of findings. *Psychological Bulletin, 124,* 262 – 274.

Schmit, M. J., & Ryan, A. M. (1993). The big five in personnel selection: factor structure in applicant and non-applicant populations. *Journal of Applied Psychology, 78,* 966–974.

Schmitt, N., & Oswald, F. L. (2006). The impact of corrections for faking on the validity of noncognitive measures in selection settings. *Journal of Applied Psychology, 91,* 613 – 621.

Schulte, M. J., Ree, M. J., & Carretta, T. (2004). Emotional intelligence: not more than g and personality. *Personality and Individual Differences, 37,* 1059 – 1068.

Schunk, D. H. (2000). Coming to terms with motivational constructs. *Contemporary Educational Psychology, 25,* 116 – 119.

Schunk, D. H. (1987). Peer models and children's behavioral change. *Review of Educational Research, 57,* 149-174.

Schunk, D. H., & Pajares, F. (2002). The development of academic self-efficacy. In A. Wigfield & J. Eccles (Eds.), Development of achievement motivation (pp. 16-31). San Diego: Academic Press.

Schroeder, C. C. (1997). *New Students - New Learning Styles.* On-line: http://www.virtualschool.edu/mon/Academia/KierseyLearningStyles.html

Sinclair, E. (2003). Fair Enough? Wider access to university by identifying potential to succeed, retrieved 30 March 2004 from <http://www.universitiesuk.ac.uk/fairenough/#report>

Spearman, C. (1904). "General intelligence" objectively determined and measured. *American journal of Psychology, 15,* 201 – 293.

Spearman, C. E. (1946). *Theory of the general factor, British Journal of Psychology, 36,* 117–131.

Spitzer, T. M. (2000). Predictors of college success: a comparison of traditional and nontraditional age students. *NASPA Journal, 38,* 82 – 98.

Tabachnick, B. G., & Fidell, L.S. (2001). *Using Multivariate Statistics.*Allyn & Bacon,USA.

Thorndike, E. L. (1920). Intelligence and its uses. *Harper's Magazine, 14,* 227 – 235.

Tomlinson, M. (2003). The interim report of the Working Group on 14-19 Reform, retrieved 20 July 2004 from < http://www.14-19reform.gov.uk/>

Topping, G. D., & O'Gorman, J. G. (1997). Effects of faking set on validity of the NEO-FFI. *Personality and Individual Differences, 23,* 117–124.

Vallerand, R. J., Pelletier, L. G., Blais, M. R., Brière, N. M. Senécal, C., & Vallières, E. F. (1992). The academic motivation scale: A measure of intrinsic, extrinsic, and amotivation in education, *Educational and Psychological Measurement, 52* , 1003–1017.

Viswesvaran, C., & Ones, D. S. (1999). Meta-analyses of fakability estimates: Implications for personality measurement. *Educational and Psychological Measurement, 59,* 197–210.

Wong, J., & Wong, S. (1999) Contribution of basic sciences to academic success in nursing education. *International Journal of Nursing Studies, 36,* 345- 354.

Wolf , M. B., & Ackerman, P. L. (2005). Extraversion and Intelligence: a meta-analytical investigation. *Personality and Individual Differences, 39,* 531 – 542.

Wolfe, R. N., & Johnson, S. D. (1995). Personality as a predictor of college performance. *Educational and Psychological Measurement, 55,* 177 – 185.

Zhang, L. (2003). Does the big five predict learning approaches? *Personality and Individual Differences, 34,* 1431 – 1446.

Zeidner, M., Shani-Zinovich, I., Matthews, G., & Roberts, R. D. (2005). Assessing emotional intelligence in gifted and non-gifted high school students: outcomes depend on the measure. *Intelligence, 33,* 369-391.

Zeidner, M., Matthews, G., & Roberts, R. D. (2004). Emotional intelligence in the workplace: a critical review. *Applied Psychology: an International Review, 53,* 371 – 399.

Zeidner, M., Roberts, R., & Matthews, G. M. (2002). Can Emotional Intelligence be schooled? A critical review. *Educational Psychologist, 37,* 215 – 231.

Zeidner, M., & Matthews, G. (2002). Intelligence and personality. In Sternberg, R. (Ed). Handbook of Intelligence (pp 581 – 610). New york, NY, US: Cambridge University Press.

Zickar, M.J., & Robie,C. (1999). Modeling faking good on personality items: an item-level analysis. *Journal of Applied Psychology, 84,* 551 – 563.

Zickar, M. J., Gibby, R. E., & Robie, C. (2004). Uncovering faking samples in applicant, incumbent, and experimental data sets: an application of mixed-model item response theory. *Organizational Research Methods, 7,* 168 – 190.

Zimmerman, B. J., & Kitsantas, A. (2005). Homework practices and academic achievement: the mediating role of self-efficacy and perceived responsibility beliefs. *Contemporary Educational Psychology, 30,* 397 – 417.

Zusho, A., Pintrich, P. R., & Cortina, K. S. (2005). Motives, goals, and adaptive patterns of performance in Asian American and Anglo American students. Learning and Individual Differences, 15, 141-158.

APPENDICES

Appendix I: demographic information sheet

Participant: _____

Participant details

Please complete the following by ticking one of the boxes or writing in your answer.

What is your gender? ☐ MALE ☐ FEMALE **What is your date of birth:**_____

Is English your native language? ☐ YES ☐ NO

Academic Details

GCSE results

Subject	Grade
English language	
Maths	
Science	

A levels

Subject	Grade

Other Qualifications (if any)

Subject	Grade / Level

How would you describe your *current* academic performance compared to that of your classmates /peer group?

Poor			Average			Very Good
1	2	3	4	5	6	7

What do you think your *potential* academic performance is compared to that of your classmates/peer group?

Poor			Average			Very Good
1	2	3	4	5	6	7

How happy are you at University?

Not at All Happy			Average			Very Happy
1	2	3	4	5	6	7

Appendix II: paper published in Psychology Learning and Teaching journal

PAGE

NUMBERING

AS ORIGINAL

Appendix III: self assessment and ideal student assessment sheets

Self-assessment of personality traits.

For the following personality traits, circle the number that you feel corresponds best to you.

Trait 1

Nervous, emotional, insecure, apprehensive, anxious			Not particularly one or the other			Calm, relaxed, composed, secure, confident
1	2	3	4	5	6	7

Trait 2

Sociable, active, talkative, person-oriented, outgoing			Not particularly one or the other			Reserved, retiring, detached, task-oriented, quiet
1	2	3	4	5	6	7

Trait 3

Inquisitive, broad interests, creative, original, imaginative,			Not particularly one or the other			Conventional, traditional, down-to-earth, narrow interests, conservative
1	2	3	4	5	6	7

Trait 4

Tolerant, good-natured, trusting, helpful, forgiving,			Not particularly one or the other			Cautious, suspicious, opinionated, irritable, calculating
1	2	3	4	5	6	7

Trait 5

Organised, reliable, self-disciplined, thorough, persevering			Not particularly one or the other			Aimless, inconsistent, careless, easily led, self-indulgent
1	2	3	4	5	6	7

'Ideal' personality traits

For the following personality traits, circle the number that you feel would describe the ideal University applicant / student.

Trait 1

Nervous, emotional, insecure, apprehensive, anxious			Not particularly one or the other			Calm, relaxed, composed, secure, confident
1	2	3	4	5	6	7

Trait 2

Sociable, active, talkative, person-oriented, outgoing			Not particularly one or the other			Reserved, retiring, detached, task-oriented, quiet
1	2	3	4	5	6	7

Trait 3

Inquisitive, broad interests, creative, original, imaginative,			Not particularly one or the other			Conventional, traditional, down-to-earth, narrow interests, conservative
1	2	3	4	5	6	7

Trait 4

Tolerant, good-natured, trusting, helpful, forgiving,			Not particularly one or the other			Cautious, suspicious, opinionated, irritable, calculating
1	2	3	4	5	6	7

Trait 5

Organised, reliable, self-disciplined, thorough, persevering			Not particularly one or the other			Aimless, inconsistent, careless, easily led, self-indulgent
1	2	3	4	5	6	7

Appendix IV: poster presented at Psychology Learning and Teaching conference

Faking it

How effective are students at impression management on personality and approaches to learning questionnaires, and how does this affect their ability to predict academic performance?

N M Huws, J B Talcott

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Introduction

- Part of a HEFCE funded Widening Participation project to explore predictors of University performance
- Can non-cognitive measures provide information over and above previous academic results?
- Is this information valid and reliable?

Previous Research

- Relationships between the Big 5 personality factors and academic performance[1] :
  - positive effect of openness to experience
  - positive effect of conscientiousness
  - negative effects of neuroticism
- Approaches to learning:
  - positive effect deep or strategic approach
  - negative effect of surface approach[2]
- In the workplace, applicant scores have been shown to be higher than non-applicant scores [3]
- Respondents will tend to match their personality profile to a stereotype [4]

Aims

- To compare groups of honest responders with participants briefed to 'fake' on Approaches to Learning and Personality measures

Research Questions

1. Is there a stereotypic profile of the ideal student, and does the profile produced by respondents (potential applicants) differ from that produced by University staff (potential recruiters)?
2. Are participants able to fake to this profile?
3. What are the effects of faking on the predictive validity of the non-cognitive psychometric measures used in this study?

Method

- Data obtained from first year undergraduates in the Psychology and Combined Honours programmes at Aston.
- Data regarding the ideal student profile were also collected from University lecturers and Admissions staff , via an internet survey.

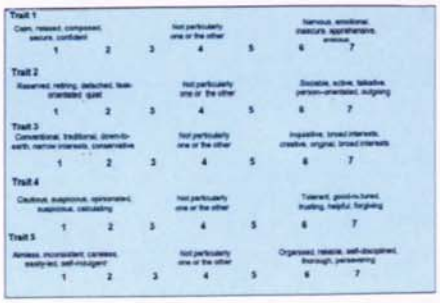
Participants

- University lecturers and admissions tutors (n = 91)
- First year undergraduates (n =164)
- Instructional sets:
  - True –participants briefed to respond as self
  - Fake – participants briefed to respond as if applying to University, and wishing to portray an 'ideal' profile

Measures:

- Demographic information
- Ravens' matrices
- NEO FFI (Five Factor Personality Inventory)
- ASSIST (Approaches to Learning Questionnaire)
- Self Assessment
- 'Ideal' profile

Self assessment and ideal profile assessment sheet



Legend

Trait 1 : Neuroticism

Trait 2: Extraversion

Trait 3 :Openness to experience

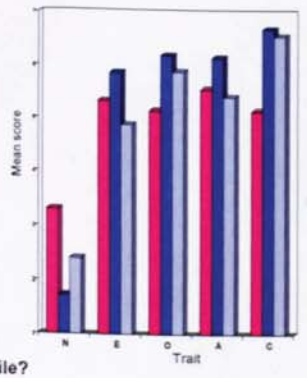
Trait 4: Agreeableness

Trait 5 : Conscientiousness

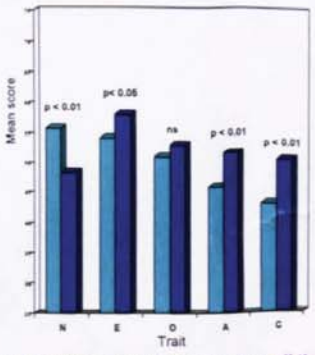
Results

1. Is there a stereotypic profile of the ideal student, and does the profile produced by respondents differ from that produced by University staff?

- **Definitive stereotype revealed of perceived ideal University applicant on Big 5 personality traits**
- **Ideal applicants perceived to achieve low scores for Neuroticism and high scores for all other traits.**
- **Both undergraduates and staff attribute the highest scores to Conscientiousness and Openness**
- **'Ideal' scores significantly different to undergraduate self ratings (minimum Wilcoxon z = 10.28, p<.001)**

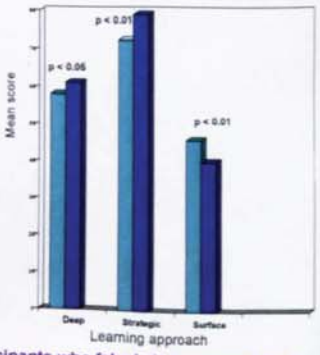


2. Are participants able to fake to this profile?



'True' respondents

'Fake' respondents



Participants were able to 'fake' on all the Big 5 traits, except Openness to experience.

Participants who faked also increased their 'deep' and 'strategic' approaches to learning scores, and decreased their 'surface' scores

3. What are the effects of faking on predictive validity?

Trait	True responders	Fake responders
Neuroticism	.07	-.15
Extraversion	.01	-.11
Openness	.21*	.11
Agreeableness	.15	.09
Conscientiousness	.24*	.36*
Deep learning approach	.27**	.12
Strategic learning approach	.37**	.07
Surface learning approach	-.25**	-.06

** significant at p < 0.01 * significant at p < 0.05

Correlations between non-cognitive variables and end of first year marks as a function of respondent group

Conscientiousness retained its predictive effect regardless of faking, but the correlations between Openness, and approaches to learning seen in the 'true' group was not evident in the faking group

Conclusions

- There is a clear 'ideal student' stereotype
- Participants can fake to this profile
- Faking affected the predictive validity of the measures used in this study
- Students recognise that certain approaches to learning are preferable but don't necessarily use them.

Take home message:

Non-cognitive measures can provide useful predictive information in academic settings, but responses may be affected by instructional set.

References

1. Chamorro-Premuzic, T. & Furnham, A. (2003) *Journal of Research in Personality, 37*, 319-338
2. Sadler-Smith, E. (1997). *Educational Psychology, 17*, 51 – 63.
3. Brown, R. & Barrett, P. (1999) BPS Test User Conference Proceedings, 17 – 86. Leicester: British Psychological Society
4. Furnham, A. (1990). *Current Psychology Research and Reviews, 9*, 46–55

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