Title: Distal and proximal associates of academic performance at secondary level: A mediation model of Personality and Self-efficacy.

Abstract – The predictive map for personality-related measures has evolved into distal, proximal and immediate associates of academic performance. This study used distal (Five Factor Model) and proximal (Academic Self-efficacy, ASE) associates with GPA (a specific facet of academic performance) at two time points with secondary level students at sixth form college (N = 106, average age 17 and evenly balanced by gender). Openness, Conscientiousness and ASE were associated with GPA at weak to moderate levels. In a path analysis with ASE as the mediator, the three constructs explained 17% variance on academic performance at time 1 and 42% at time 2 when a direct effect from GPA1 to GPA2 was introduced, with Openness and ASE remaining statistically significant when controlling for GPA1, and all three constructs provided significant indirect effects. Findings demonstrate the salient value of Openness and Conscientiousness, when configured with ASE as the mediator. Findings are applied to the approaches that facilitate learning pathways and support ability processes in achievement.

Key words: Self-efficacy; Five Factor Model; Grades; Mediation Model

1. Introduction

1.1 *Remit for the study*

The volume of non-intellective constructs associated with academic performance has expanded in recent years (Richardson, Abraham and Bond, 2012) and they have been increasingly applied to research in secondary level education (Di Giunta, Allesandri, Gerbino, Kanacri, Zuffiano & Caprara, 2013). This study included the Five Factor

Model (Poropat, 2009), especially with reference to the two prominent associates of learning and achievement, Openness and Conscientiousness (Richardson et al., 2012). Another central covariate within the predictive space is Academic Self-efficacy (Komarraju & Nadler, 2013) and is therefore included within the present study, both because of its direct effects on Academic Performance and its role as a mediator for Openness and Conscientiousness (Caprara, Vecchione, Alessandri, Gerbino, & Barbaranelli, 2011). In addition this study adds previous grades as a predictor of subsequent grades, not only because it is deemed to be the strongest single predictor of achievement (Cleland, Milne, Sinclair and Lee, 2008), and therefore provides a good test of incremental validity with reference to the personality-related constructs. Given that researchers must select from at least 50 predictors of academic performance (Richardson et al., 2012), this paper will present the rationale for the use of the constructs selected from the range for this study with reference to their theoretical, empirical and pedagogical value.

1.2 Personality optimises ability and performance

There is a consensus in Higher Education research (Deary, Strand, Smith & Fernandes, 2007; Laidra, Pullman & Allik, 2007) that although intelligence is a strong predictor of academic performance (AP), substantial residual variance remains unexplained by cognitive ability alone. Rhode and Thompson (2007) have underlined this point by concluding that cognitive ability and academic performance do not perfectly predict each other. Researchers have therefore turned to other individual difference variables to augment and complement the predictive validity associated with IQ (Chamorro-Premuzic & Furnham, 2009). It is concluded that AP is a combination of ability and effort (Gagné & Peréz, 2001), and there has been steady exploration of the non-

intellective factors that contribute to productive outcomes (Duff, Boyle, Dunleavy & Ferguson, 2004). This study will include non-intellective constructs that highlight the behavioural mechanisms that mark out the pathway and processes that lead to academic achievement – factors that enable students to nurture their potential, express their ability and optimise their achievement (Bratko, Chamorro-Premuzic and Saks, 2006).

Although the present study did not include a direct measure of cognitive ability it did include a measure of previous performance which as noted above is deemed to be a combination of ability and effort (e.g. Gagné & Peréz, 2001). Also, given that inherent ability is arguably the least malleable of the individual difference constructs (Cooper, 1999), and that personality has been demonstrated to change to a greater extent over time than intelligence (Poropat, 2014), there is therefore value from the pedagogical perspective in focusing on the constructs than can make a difference to the support of learning, facilitate the expression of ability and the enhancement of achievement. Also cognitive ability within this review provides a reference point and a broader context for the place of this study within predictive space (Richardson et al., 2012).

A steady stream of research around the Five Factor Model (FFM) has built up since the turn of the Millenium that has been applied at secondary (Zuffiano et al., 2013) and tertiary levels of education (Richardson et al., 2012). Clear trends in the predictive validity of the FFM have emerged (Wagerman & Funder, 2007), especially in relation to Conscientiousness and, to a lesser extent, Openness (Poropat, 2009). However, researchers have developed the potential of the FFM by applying the factors to broader outcome criteria than academic performance to include behaviours that are implicated in the process and pathways that lead to achievement by an exploration of more

immediate sources of impact such as attendance and homework behaviours (Lubbers, Van Der Werf, Kuyper, Hans & Hendriks, 2010). Furthermore, the impact of the FFM on intermediate constructs, such as self-efficacy is also beginning to be explored (Caprara et al., 2011). However, the predictive validity of self-efficacy is optimised when specific rather than general measures are employed (Bandura, 1997; Pajares, 1996), such as the Academic Self-efficacy measure used in this study (Mcilroy, Bunting & Adamson, 2000; Mcilroy & Bunting, 2002).

1.3 Conscientiousness and Openness: complementary constructs for learning and achievement

The two broad factors from the FFM most likely to impact on attainment are Conscientiousness and Openness as noted (Richardson et al., 2012). Conscientiousness supports and optimises achievement because its operational content includes promptness, consolidation, planning, organisation, sustained effort and motivation, and Conscientious students use their time and opportunities well and are more likely to stay the course (De Feyter, Caers, Vigna & Beings, 2012). Although Conscientiousness has the primacy in predictive validity from the FFM, Openness to Experience is the factor that directly relates to cognitive ability (Harris, Vernon & Jang, 2005). Laidra et al. (2007) found that Openness predicts AP, and others have reasoned that the operational mechanisms associated with it, such as curiosity, exploration and critical thinking facilitate academic success (Lounsbury, Welsh, Gibson & Sundstrom, 2005). However, other studies found no association between Openness and AP (Conard, 2006), and it may be that Openness is optimised in learning environments that facilitate individuality and independence (Duff et al., 2004).

In relation to the other factors of the FFM, the evidence is inconsistent and inconclusive (O'Connor & Paunonen, 2007), and may depend on the subject being studied, the level of the student or the method of assessment (Poropat, 2009). Moreover, within the educational context personality may contribute advantageously to the student experience in other ways apart from AP, such as through social and communication skills (Bracket, Rivers, S. & Salovey, 2011) and by good rapport with teachers and peers (Richardson & Abraham, 2009).

1.4 Academic Self-efficacy: agency, mastery and self-regulation in learning

Within the educational literature, Self-efficacy has emerged as complementary to the FFM because it predicts academic performance (Odaci, 2011), but also because its operational content identifies pathways that lead to improved performance and successful outcomes (Diseth, 2011), in that it pinpoints specific goal setting, regulated behaviours, investment of effort, persistence and resilience in effort and processing previous mastery experiences within the academic setting. Successive reviews have demonstrated that Self-efficacy is a consistent predictor of AP (Multon, Brown & Lent, 1991; Chemers, Hu & Garcia, 2001; Chen, 2008), and is defined as "belief in one's capabilities to organise and execute courses of action required to produce given attainment" (Bandura, 1997, p. 3). It emphasises the role of the individual as an agent of change (Caprara, Fida, Vecchione, Bove, Vecchio, Barbaranelli & Bandura, 2008), and has the concept of mastery at its heart (Britner & Pajares, 2006). Moreover, it is embodied within the framework of Social Cognitive Theory which postulates that behaviours come through learning experience (Bandura, Barbaranelli, Caprara, & Pastorelli 2001)**.**

Evidence indicates that Self-efficacy demonstrates statistical robustness by offering unique variance in relation to AP when used alongside other constructs (Wolfe & Johnson, 1995; Bandura, 2012), and incremental variance when controlling for previous performance (Zuffiano et al., 2013). Furthermore, Chemers, Hu & Garcia (2001) found that AP increased with students' Self-efficacy beliefs. Although it is argued that Self-efficacy beliefs pitched at unrealistic levels is likely to be counterproductive, positive Self-efficacy beliefs are generally deemed to be adaptive to good performance (Turner, Chandler & Heffer, 2009), and low levels have the opposite effect (Capara et al., 2008).

The positive relationship between self-efficacy and academic grades has been well established for some time and continues to be reported in recent times (Zuffiano et al., 2013). However, recent studies have focused on specific rather than general self-efficacy (Di Giunta et al., 2013), and on the role of self-efficacy as a mediator in predicting performance (Caprara et al., 2011), and also on the operational content of the construct with reference to its role in self-regulation (Di Giunta et al., 2013). According to Komarraju and Nadler (2013), non-ability related factors that impact on AP include motivation, self-regulation, goal setting, mastery experience, effective coping etc., and many of these are embodied within the Self-efficacy construct. In contrast students with low Self-efficacy are likely to give up easily, invest less effort and see tasks as more difficult than they are (Britner & Pajares, 2006).

1.5 Academic Self-efficacy: postulated as a mediator of personality in performance

Academic Self-efficacy is specifically designed to tap academically relevant behaviours and approaches to learning (Mcilroy, Bunting & Adamson, 2000; Mcilroy & Bunting, 2002) in contrast to the FFM which was not designed primarily for this purpose

(Ackerman, Chamorro-Premuzic & Furnham, 2011). Given that Academic Self-efficacy is specific, it is construed to be proximal to performance (Di Giunta et al., 2013), whereas the five factors of personality are seen as distal (Bidjerano & Dai, 2007), there is a good justification for postulating Academic Self-efficacy as a mediator for the FFM, especially the two factors most implicated in performance (Openness and Conscientiousness). This approach sets Academic Self-efficacy in the pivotal role suggested by the literature (Komarraju & Nadler, 2013) and allows Conscientiousness and Openness to have a unique and combined effect on academic performance by both direct and indirect effects.

Studies such as those cited above (Ackerman, et al., 2011; Caprara et al., 2011; Di Giunta et al., 2013; Komarraju & Nadler, 2013) have recognised an empirical link between Conscientiousness, Openness and Self-efficacy. However, the potential mechanisms through which these may occur are worthy of further exploration to enhance their pedagogical value and to provide encouragement for further empirical exploration. For example both Conscientiousness and Self-efficacy have common features such as motivation and self-regulation (Richardson & Abraham, 2009; Zimmerman, 2002), and Openness and Self-efficacy have converging points such as identifying goals, exploration and embracing the challenge of problem-solving (Komarraju & Nadler, 2013; Rolfus & Ackerman, 1999). Self-efficacy is seen as an internal resource that can make use of general traits by translating them into specific behaviours in an academic setting.

In a series of studies set within the Italian culture (Caprara et al., 2011; Di Giunta et al., 2013; Zuffiano et al., 2013), an adaptation of a children's Academic Self-efficacy

measure (Pastorelli, Caprara, Barbaranelli, Rola, Rozsa & Bandura, 2001) was used in a longitudinal study that tracked children's performance from early to late-teenage years. In addition to Self-efficacy and the Five Factor Model these researchers controlled for a range of factors including Cognitive Ability, Self-esteem and Socio-Economic Status. Although the present study is more limited in scope compared to these studies it builds on them by applying some elements of their study to a different culture and to a group of secondary students (average age 17) toward the end of their non-compulsory (UK) phase of their secondary education. Also the two times points for academic performance were spanned by one year whereas in the Italian studies the time span was 3 years (at 13 and 16 years old), and Laidra et al. (2007) has observed that differences in time span between predictor and criterion variables may translate into differences in outcomes. Furthermore, in the present study actual GPA was used both retrospectively and prospectively whereas in the Italian studies self-reported GPA was used in the second wave of the study. The limitations of this are discussed by Komarraju and Nadler (2013) and not least of these is the fact that the study is not truly predictive in the strictest sense.

1.6 Grades as the strongest predictor of subsequent grades

Academic grades are seen as the combination of ability and effort (Gagné, & Perés, 2001), or as composites of personality and ability (Conard, 2006). Given this comprehensive scope of what grades embody, they are deemed to be the best predictor of subsequent grades (Cleland, Milne, Sinclair & Lee, 2008). It would therefore be important to include an indicator of grades when this is available, as in the present study, with the expectation of a strong positive association between the two. This gives the advantage of testing grades as a covariate with personality and Self-efficacy and

also testing the incremental validity of the personality-related measures controlling for past performance. Although no measure of cognitive ability was included in this study, the use of previous grades was a satisfactory alternative given that grades are judged to be a mixture of ability and effort (Gagné & Peréz, 2001). However, cognitive ability is briefly reviewed in this study because of its implicit association with grades (in this case previous performance) and its role in the predictive space context (Richardson et al., 2012).

1.7 Summary and aims

The strengths of the present study include the fact that it integrates two major theoretical orientations (Personality and Social Cognitive Theory) to test strategically selected non-intellective constructs at distal and proximal levels within predictor space (Bidjerano & Dai, 2007; Caprara et al., 2011). Moreover constructs (especially Conscientiousness and Academic Self-efficacy) whose statistically consistent predictive validity is established through meta-analyses (Richardson, et al., 2012) are used. Furthermore, the model is configured in a manner suggested by previous research (Caprara et al., 2011; Di Giunta et al., 2013) with ASE postulated as the mediator and the factors of the FFM set as the distal predictors. It was expected that Conscientiousness, Openness and Academic Self-efficacy would positively predict AP but that Self-efficacy would be the strongest predictor (Di Giunta et al., 2013). Although this study has similarities with the Italian studies conducted by Caprara et al. (2011), Di Giunta et al. (2013) and Zuffiano et al. (2013), it was with a group of secondary students toward the end of their extended (i.e. beyond 16) secondary education and set within a different culture. This study aimed to augment previous research by an exploration of the mediational role of Academic Self-efficacy and with

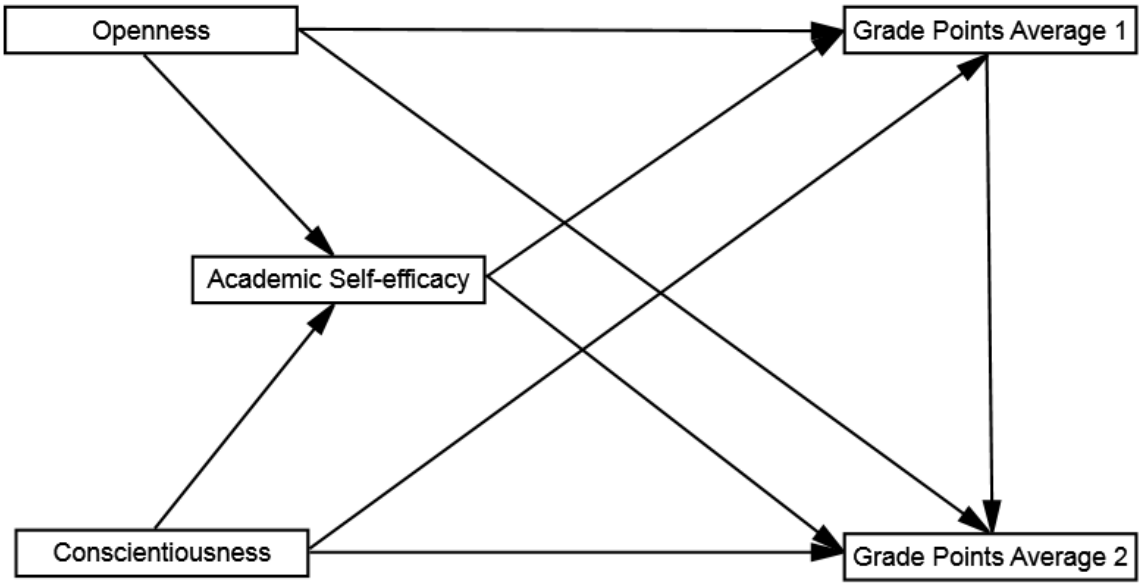
discussion of the theoretical, empirical and pedagogical outcomes that stem from the findings. Finally, it was expected that grades would be the best predictor of subsequent grades (Cleland, Milne, Sinclair & Lee, 2008), and that the psychological constructs would impact on GPA at two time points and would explain unique variance when controlling for grades at time 1. A conceptual summary of the model is presented in Figure 1 below with the arrows indicating the pathways to be tested.

The originality of the study lies in the use of the triad of individual difference constructs (Conscientiousness, Openness and Academic Self-efficacy) set up as a mediation model to test their relationship with academic performance both retrospectively (GPA1) and prospectively (GPA2). The sample used was 17 year old students toward the end of their secondary education (the non-compulsory stage beyond 16 for UK students) and therefore on the threshold of transition to tertiary level education. The use of specific Academic Self-efficacy (rather than general Self-efficacy) followed a pattern initiated in recent Italian studies but the present study was in a different culture, and an adult measure of Academic Self-efficacy that had been previously validated on university samples (Mcilroy, Bunting & Adamson, 2000; Mcilroy & Bunting, 2002) rather than a children's version (Pastorelli, Caprara, Barbaranelli, Rola, Rozsa, & Bandura, 2001). Also in the Caprara et al. (2011) and Di Giunta (2013) studies students' own self-reported academic performance was used at the end of the senior high school phase and although this practice is deemed to be acceptable and reliable (Noftle & Robins, 2007) and is now commonly accepted practice (e.g. Szfranski, Barrera, & Norton, 2012), it does introduce a potential source of measurement error (Komarraju & Nadler, 2013). The latter researchers, although using self-reported grades themselves, acknowledge the limitations of using these scores and recommend both obtaining students' consent and

accessing GPAs from official records so as to reduce potential inflation error. The use of self-reported GPA also means comparisons with other measures taken simultaneously are retrospective rather than prospective. In the present study actual rather than self-reported GPA is used at both time points and this provides strong reliability for this aspect of the study. Finally, the focus on the combination of the three constructs within the mediation models allows for the exploration not only of the empirical links but also of the pedagogical processes that mark out the pathway to achievement.

In summary the goals of the study are: to demonstrate the unique and shared value of Openness and Conscientiousness in the educational context in conjunction with Academic Self-efficacy as their mediator; to examine the predictive validity of this triad of constructs with reference to GPA controlling for previous GPA when actual rather than self-reported grades are used at both GPA time points; to evaluate the model presented with reference to its theoretical, empirical and pedagogical implications.

Figure 1: Conceptual diagram to illustrate personality-related pathways to academic performance



2. Method

2.1 Design

This study employed a within-participant repeated measures design (i.e. with performance indicators at two time points, and the self-report measures were completed between these two time points), using a quantitative approach, by means of a cross-sectional survey (with self-report measures). The Dependant Variable was AP (previous and current, giving a longitudinal dimension to the study). The Independent Variables were self-report measures consisting of two aspects: Five Factor Model and Academic Self-efficacy.

2.2 Participants

The sample (*N* = 106) was an evenly balanced by gender (males = 53, females = 53) group of secondary level students (mean = 17.31, sd = .54) who were studying at a college in the North West of England. The participants were opportunistically sampled because of their consent to participate in the study and the availability of their data at two time points, and they represented almost the entire cohort of the college at this level.

2.3 Measures

2.3.1 Five Factor Model (Goldberg, Johnson, Eber, Hogan, Ashton, Cloninger, & Gough, 2006).

This is a 50-item item version of the FFM with 5 subscales - e.g. “I am the life of the party” (Extraversion), “I feel others’ emotions” (Agreeableness), “I follow a schedule” (Conscientiousness), “I get upset easily” (Emotional Stability) and “I have a vivid imagination” (Openness to Experience) - presented with a 5-point Likert response format with anchor points ranging from 1 = Very Inaccurate to 5 = Very Accurate.

Some items were reversed to avoid response set bias. There are 10-items in each of the 5 factors and higher scores are aligned to each factor label, and the potential range for each factor is 10 to 50 with 30 as the midpoint. Each of the five subscales elicited high reliabilities (α = 0.87, 0.86, 0.82, 0.91 & 0.92) for Openness, Emotional Stability, Conscientiousness, Agreeableness and Extraversion respectively. The validity of this version of the FFM has been demonstrated with three different adult samples (*N* = 906), with justification for a five factor solution (Gow, Whiteman, Pattie, & Deary, 2005), and with good concurrent validity with other personality inventories.

2.3.2 The Academic Self-efficacy Measure (McIlroy, Bunting & Adamson, 2000).

This Academic Self-efficacy Measure has 10-items, such as "I am confident that I can achieve good exam results if I really put my mind to it", and "I fear that I may do poorly in my end-of-semester exams". Participants responded on a 7-point Likert format ranging from 1 = Very Strongly Agree, to 7 = Very Strongly Disagree. The measure was constructed to reflect Self-efficacy beliefs and behaviours exclusively within the domain of academia. Seven of the ten items are reverse scored and the higher scores represent higher levels of perceived academic competence. The measure had previously demonstrated excellent internal consistency, with a high reliability of 0.87, and predictive validity of r = 0.37 (i.e. for subsequent academic performance, and that is also supported by the associations with performance reported later in the present study – see table 1 and figure 1). Cronbach's alpha demonstrated acceptable internal consistency in the present sample (α =.85), and the scale parameters allow a range of 10 to 70 with a midpoint of 40.

2.3.3 General Certificate of Secondary Education (GCSE) performance (GPA1)

GCSE performance was classified by the participants' Grade Point Average (GPA) in English, Maths, Science, Music, History and Geography in addition to vocational subjects. The GCSE's were assessed by a combination of examination (tests) and coursework. GCSE is a widely used assessment across the UK and was coded in grades from 1 = highest etc. The GCSE grading system is from A* through to G for each individual subject (8 grades in total: A*, A, B, C, D, E, F & G, with A* as the highest). Students in this study sat 8 GCSE subjects with English, Maths and Science as core curriculum subjects and a choice from the rest. The GPA is comprised of the score of the composite of all these (scale range = 8-64) divided by 8 and then converted into a metric of 1 as highest and 5 as lowest.

2.3.4 AS level performance (GPA2)

AS (Advanced Subsidiary) Level in the UK is the next stage of formal assessment at secondary level education after GCSE. GCSE is normally sat around the age of 16, and AS level is normally taken around 17. The AS level data were based upon subjects such as English, Maths, Science, ICT and Psychology (each assessed by examination [tests] and coursework). AS level is a widely used assessment across the UK (although students may leave secondary education after GCSE is completed), and was coded in grades from 1 = highest etc. The AS system is graded as A to G (and U as unclassified), and thus has 8 grades with A as highest for each individual subject (A, B, C, D, E, F, G & U). Students in this study sat 4 AS level subjects with the GPA calculated from the composite of all five scores (scale range = 4-32) divided by 4 and then converted into a metric with 1 as highest and 5 as lowest.

2.4 Procedure

Participants completed the self-report measures during a scheduled teaching session at the college, and although no time limit was imposed most students completed the exercise in around 20 minutes. Instructions for completion were given both in verbal and written forms. All participants signed consent forms after reassurance of confidentiality and the project was also approved by the researchers' institution. After the students completed the self-report measures the data were later aligned to their performance data.

2.4.1 Analysis Strategy: The data were explored by descriptive statistics to ascertain patterns in mean responses and measures of dispersion, and the quality of the data was supported by high reliabilities and low levels of skewness and kurtosis (all univariate analyses < 1: kurtosis range: -.91 to .37; skewness range: -.54 to .26). Values of skewness were within the acceptable -1 to +1 range (Kline, 2005; Lei & Lomax, 2009), and multivariate normality, tested in AMOS 20, was confirmed by the multivariate kurtosis test statistic (1.24, $p > .05$), as a prerequisite for using the maximum likelihood approach. The study's hypotheses were tested by zero order correlations followed by a path model to test the distal and proximal effects of Openness, Conscientiousness and Self-efficacy through direct and indirect pathways (with Self-efficacy as the mediator) to Academic Performance at two time points (GPA1 and GPA2). In addition a direct effect was introduced between GPA1 and GPA2 that allowed for: testing the impact of the personality-related constructs when controlling for the effects of GPA1, and for exploring indirect effects both to GPA1 and GPA2. This led to an acceptable model fit as suggested by the low χ^2 (df = 1) (0.5, $p > .05$), and low SRMR (0.022) - the latter is deemed to be a good index of fit for small samples (Hu & Bentler, 1999). Bootstrapping

was introduced using 95% confidence intervals to test direct and indirect effects (no correction for non-normality was needed) and this procedure is preferable to the Sobel Test when small samples are involved (Preacher & Hayes, 2004).

3. Results

3.1 Table 1.

Correlation coefficients for self-reports and GPA at two levels

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	GPA1	GPA2	Cons	Open	Extra	E. Stab	Agree	ASE
GPA1	1							
GPA2	.57**	1						
Cons	-.35**	-.27**	1					
Open	-.09	-.33**	.40**	1				
Extra	.17	.12	.01	.31**	1			
E. Stab	.06	.05	.06	.08	.24*	1		
Agree	.01	.05	.18	.08	.45**	.06	1	
ASE	-.34**	-.41**	.38**	.28**	.13	.15	.04	1
Mean	2.36	2.33	31.58	36.37	34.49	29.45	37.77	48.17
sd	0.79	0.78	7.26	7.47	9.01	8.40	8.77	9.80
Alpha	-	-	0.83	0.87	0.91	0.90	0.86	0.85
Skewness	0.26	0.02	0.11	-0.54	-0.52	-0.06	-1.10	0.42
Kurtosis	-0.33	-0.91	-0.05	0.26	-0.17	-0.57	0.70	0.37

Key: GPA = Grade Point Average; Cons = Conscientiousness; Open = Openness (to experience); Extra = Extraversion; E. Stab = Emotional Stability; Agree = Agreeableness; ASE = Academic Self-Efficacy. *p<.05 , **p<.01.

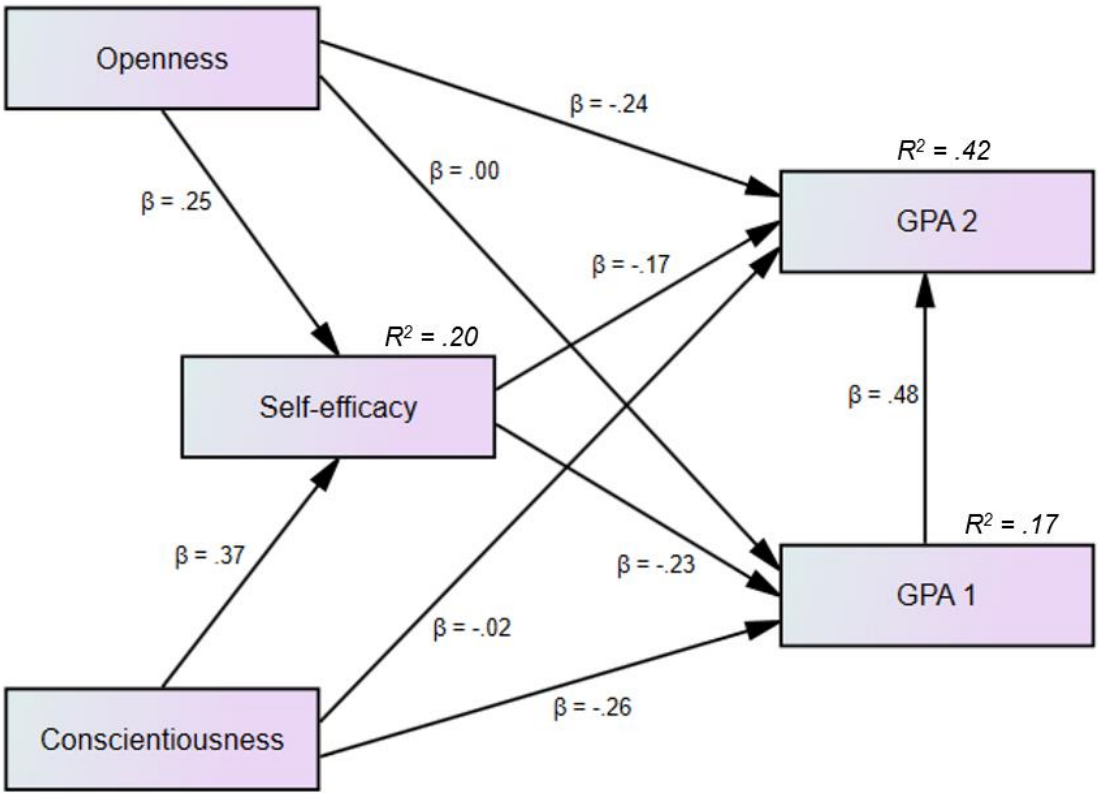
With reference to the self-report measures presented in Table 1, the mean scores suggest a positive orientation for Academic Self-efficacy and Openness (above scale midpoints), whilst Conscientiousness and Emotionality Stability are nested above or almost on the midpoint of 30, with participants endorsing Extraversion and Agreeableness at levels that were markedly higher. However, in all three measures, and on the two GPA measures, the standard deviations are substantial with reference to the parameters of each scale, showing evident individual differences. Moreover, reliabilities are high on each self-report measure (α = 0.83 to 0.91) and skewness and kurtosis at -1 to +1 are low and well within an acceptable range.

GPA at times 1 and 2 are moderately and positively associated with each other as expected (r = .57, p < .01). Conscientiousness and Self-efficacy are moderately correlated with GPA1 in the expected positive direction (r = - .35 & -.34, p < .01, respectively) – the negative sign here and throughout is because higher achievement in GPA is denoted by a lower number. At GPA2, a similar pattern of associations is observed, but this time Openness is included: r's = -.27, -.33 and -.41 (p < .01) for Conscientiousness, Openness and Self-efficacy respectively. The correlations in general support the study's hypotheses in that the two academic performance indicators are positively associated with each other and with the three psychological constructs, and all these associations are moderate with the exception of Openness and GPA1 (non-significant) and Conscientiousness with GPA2 (r = -.27, p < .01). Although Emotional Stability, Extraversion and Agreeableness demonstrated high reliabilities, low levels of

skewness and kurtosis, and clear individual differences in dispersion, they were not, as tentatively expected, associated with GPA at either time point (i.e. retrospectively and prospectively).

3.2 Figure 2

Path analysis: GPA1 and GPA2 regressed on Openness and Conscientiousness with Academic Self-efficacy as the mediator.



It can be observed in the path analysis presented in figure 2 and from table 2 that Openness and Conscientiousness combine to explain 20% variance on Self-efficacy. Each has a weak to moderate significant direct effect on Self-efficacy and both are significant in the multiple regression as shown by the weak to moderate beta weight

path coefficients (β = .25 & .37, $p < .01$) for Openness and Conscientiousness respectively. From the theoretical understanding that these two factors are broad general traits, and as the two variables from the FFM that are salient in the educational context (Di Giunta et al., 2013), it would be expected that they should impact on the development of academic self-efficacy beliefs and behaviours.

When the two FFM constructs are viewed individually within the analysis it can be seen that Conscientiousness has a weak to moderate direct effect on GPA1 (β = -.26) but not on GPA2, but with Openness the converse is true: Openness has a direct effect on GPA2 (β = -.24, $p < .01$) but not on GPA1. In this study personality was measured at one point in time, but applied retrospectively to GPA1 and prospectively at GPA2. At time 1 (GPA1) Conscientiousness emerged as statistically significant (but not Openness), but at time 2 (GPA2) it was Openness that emerged as statistically significant. When the direct and indirect effects are taken together it is evident that Openness and Conscientiousness impact statistically at GPA1 retrospectively and GPA2 prospectively and therefore neither is redundant at either point.

This conclusion is supported by the finding reported in table 2 that Conscientiousness has an indirect effect on GPA1 through Self-efficacy ($p < .05$), and an indirect effect through the same variable on GPA2 ($p < 01$). At a bivariate level, Conscientiousness, although only measured at one point in time between the two performance indicators, was related to them both at moderate to weak levels (GPA1 and GPA2: *r*'s = -.35 & -.27, $p < .01$ respectively). The indirect effects obtained through Bootstrapping therefore indicate that Conscientiousness is partially mediated by Academic Self-efficacy at GPA1 and completed mediated by it at GPA2, given that the former remains

statistically significant whilst the latter does not. However, in relation to Openness, no mediation can be claimed at time 1, given that the relationship was not significant to begin with (Preacher & Hayes, 2009) although there is still an indirect effect through Academic Self-efficacy ($p < .05$) as noted in table 2. In contrast, the relationship between Openness and GPA2 was statistically significant in zero order correlation ($r = -.33$, $p < .01$) and although reduced in the path analysis ($\beta = -.24$) remained statistically significant at a weak to moderate level. Therefore Academic Self-efficacy provides an indirect effect between Openness and GPA2 and also acts as a partial mediator for Openness.

3.3 Table 2

Direct, indirect and total effects for the path model presented in Figure 2.

Outcome	Determinant	Standardised estimates		
		Direct	Indirect (CI's 95%)	Total
GPA 2 (R^2 = 0.42)	GPA1	0.48**	------	0.48**
	Open	- 0.24**	-0.07 (-.18 to .03)*	-0.31**
	Cons	-0.02	-0.23 (-.36 to -.12)**	-0.25**
	Self-efficacy	-0.17*	-.11 (-.24 to -.02)*	-0.28**
GPA1 (R^2 = 0.17)	Open	-0.00	-0.09 (-.17 to -.02)*	-0.09
	Cons	-0.26*	-0.09 (-.18 to -.09)*	-0.35**
	Self-efficacy	-0.23*	------	-0.23*
Self-efficacy (R^2 = 0.20)	Open	0.25*	------	0.25*
	Cons	0.37**	------	0.37**

*p < .05. ** p < .01. CI's = Confidence Intervals (95% Upper and Lower Boundaries)

Openness, Conscientiousness and Academic Self-efficacy combine to explain 17% variance on GPA1 and this indicates that personality-related constructs have a substantial impact on academic performance during mid-adolescence. Further, although the strongest association with GPA2 is GPA1 (β = .48, p < .01), Openness and Academic Self-efficacy also have direct effects on GPA2, and both Openness and Conscientiousness have indirect effects through Academic Self-efficacy as noted. The

indirect effects are generally not strong with four of the five reported at the $p < .05$ level, with Conscientiousness the strongest at GPA2 ($p < .01$). This suggests that these two general FFM traits may be advantageous in the development of adaptive self-efficacy beliefs and behaviours in the academic setting. At the heart of Self-efficacy is personal agency (Komarraju & Nadler, 2013) and this may act as an additional catalyst to the two variables, Openness and Conscientiousness, already implicated in the process and product of academic achievement. Furthermore, the 42% variance on GPA2 is not only explained by GPA1 but also by the incremental variance added by the personality-related measures. This can be clearly seen by reference to the total effects presented in Table 2 with respect to GPA2. Although the total effect for GPA1 is 0.48, the effects for Openness, Conscientiousness and Self-efficacy are approximately moderate at -0.31, -0.25 and -0.28 respectively (all at $p < .01$), demonstrating that each one of the latter three has a unique regression effect alongside the effect of GPA1. The rank order of their statistical impact evidenced by the beta weightings is GPA1, Openness, Self-efficacy and Conscientiousness. There is little difference between the three personality-related factors, demonstrating both their independent and shared value as covariates. Moreover, it should not be forgotten that that the impact of personality is already present within grades at time 1, as grades are concluded to be attained by a combination of personality, effort and ability (Conard, 2006; Gagné & Perés, 2001).

Furthermore, it should be observed that Academic Self-efficacy is not only a mediator of Conscientiousness and Openness but is also itself mediated by GPA1 in relation to GPA2. In the zero order correlations, Academic Self-efficacy was moderately related to GPA2: $r = -0.41$, $p < .01$, but this was reduced to a weaker level in the path analysis to, $\beta = -.17$, $p < .05$ (although the latter is a multiple regression effect). Therefore

Academic Self-efficacy is partially mediated by GPA1 and contributes uniquely to GPA2 both by direct and indirect effects.

At GPA1 the variance explained (17%) is a composite of Conscientiousness: 7% (R^2 = .07) and Academic Self-efficacy: 5% (R^2 = .05) with the remaining 5% explained by the indirect effects through Academic Self-efficacy from Openness and Conscientiousness. At GPA2, the 42% variance is a composite explained by the direct pathway from GPA1: 23% (R^2 = .23), and therefore with the residual from 42% (i.e. 19%) explained by the direct effects from Openness: 6% (R^2 = .06) and Academic Self-efficacy: 3% (R^2 = .03) with the remaining 10% explained by the indirect effects through Academic Self-efficacy. So the impact of the personality-related measures clearly explains unique variance on GPA2 when controlling for the effects of GPA1.

Finally, the associations reported at the $p < .05$ level should be interpreted with caution to allow for the possibility of type 1 errors although all effects in the path analysis are regression effects and the overall effect sizes (R^2) reported are 20%, 17% and 42% and are therefore non-trivial.

4. Discussion

Findings from this study corroborate previously reported results that endorse the value of exploring the relationship between personality-related measures and AP in adolescents (Caprara et al., 2011; Zuffiano et al., 2013). However, the strongest relationship found in the present study was the relationship between grades at time 1 and time 2.

According to Gagné, & Perés (2001) grades encompass the combination of ability and effort, and if their conclusion is valid then this study has captured both ability and effort at time 1 (GPA1) with reference to testing the impact of the personality-related constructs `at time 2 (GPA2) when controlling for the effects of performance at time 1. From the results reported in this study it is clear that previous grades are the strongest predictors of subsequent grades, as reported in tables 1 & 2, and this supports previous findings (Cleland, Milne, Sinclair & Lee, 2008; Kuncel, Hezlett & Ones, 2004). However, the personality-related measures provide unique variance when previous performance is controlled, and this also supports previous research (Wolfe & Johnson, 1995). According to Martin, Montgomery and Saphian (2006) grades are often the only available index of student performance and are the most important and readily quantifiable criterion. Rolfus and Ackerman (1999) concluded that grades are the best predictor of subsequent grades and this study included grades at two time points and supported this hypothesis with a moderate to strong association observed at zero order level, as presented in table 1. The reported finding that AP is a mixture of ability, effort and personality implies that the impact of all these factors is already present within obtained grades (Conard, 2006), so studies controlling for past performance should take account of this in evaluating findings. An added strength of this study is the comparison

between actual grades at two time points rather than self-reported grades with the associated limitations (Komarraju & Nadler, 2013).

Richardson et al. (2012) found that there are 50 conceptually distinct correlates of GPA and divided these into five categories, but it is likely that some constructs such as Self-efficacy will overlap their suggested categories, given that it encapsulates at least two of Richardson et al.'s categories: motivation and self-regulation (Zimmerman, 2000). Although this study has followed a parsimonious approach with constructs at distal and proximal positioning (Caprara et al., 2011; Dai & Bidjerano, 2007), the three constructs are salient in education and were augmented by previous grades. Attempts to integrate the complex predictive map will always be challenging because variations between reported findings may be attributable to varying sample sizes, time lapses between predictor and criterion variables and use of different personality measures and different criteria for academic success (Laidra et al., 2007). Although Chamorro-Premuzic and Furnham (2008) have asserted that the uniqueness of each construct must be demonstrated, very small effect sizes may disappear in controlled studies and may not be replicable across samples (Richardson et al., 2012).

This study has used major constructs that are established as unique predictors through meta-analyses that are replicable across samples (Richardson et al., 2012). Moreover, the levels of variance accounted for range from 17% to 42%, was shown in figure 2 and table 2, with each of the three psychological constructs demonstrating unique effects. Also, the model used is conceptually and theoretically rational and the discussion that follows will also highlight the theoretical, empirical and pedagogical value of using these constructs to explain the process and product of academic achievement.

From the FFM, Conscientiousness and Openness have emerged as the primary associates of AP, and although Conscientiousness is the most consistent in meta-analyses (Poropat, 2009; Richardson et al., 2012), it is often accompanied by Openness, and Laidra et al. (2007) concluded that both have been consistently identified as relevant to achievement.. As observed in table 1, both constructs were related to GPA (Conscientiousness at GPA1 and Openness at GPA2). When these were entered into the path analysis, Conscientiousness was significant with performance at time 1 (retrospectively), and Openness with performance at time 2 (prospectively). Importantly, both had an indirect effect on performance at time 1 and time 2 through Self-efficacy. In addition to their relationship with AP, Chamorro-Premuzic & Furnham (2008) reviewed and discussed the clear relationships and facilitative role that Openness and Conscientiousness play in relation both to learning approaches and cognitive ability.

According to Bidjerano and Dai (2007), although broad traits are postulated as distal, they still have a pervasive influence on an individual's school functioning. That implies that there are intermediate constructs and it is asserted that within predictor space Self-efficacy is postulated in the middle of the hierarchy with the broad personality traits at the top (Pintrich, 2000). Di Giunta et al. (2013) have concluded that Self-efficacy operates as a knowledge structure at an intermediate level by turning traits into specific behaviours. As demonstrated in figure 2 and table 2, the findings from the present study support this configuration as Conscientiousness and Openness combined to explain 20% variance on Self-efficacy with significant positive beta weights for both constructs.

In addition to the various associations of Openness and Conscientiousness to other educationally-related variables, the two factors are frequently related to each other (as reported in table 1) and to Self-efficacy (Di Giunta, 2013). There is therefore a clear

case for the valuable role of these two factors in the educational context and that is supported in the present study in which they explain unique and combined variance in performance at two time points by direct and indirect effects, suggesting that they may facilitate the development of adaptive self-efficacy beliefs. As noted in the Introduction both Conscientiousness and Openness may share some commonalities and converging points with Self-efficacy such as motivation, goal setting and persistence (Richardson & Abraham, 2009; Rolfus & Ackerman, 1999), and Self-efficacy may serve as the internal resource (Komarraju & Nadler, 2013) that acts as an additional impetus to translate the general traits into specific behaviours as argued by Di Giunta et al. (2013). Openness and Conscientiousness were already implicated as the two most salient FFM factors in the academic context (Laidra et al., 2007) and the findings in this study have underlined that by tracing the mediational role of Self-efficacy and by suggesting the practical links to academic performance through goal setting. This reinforces the message that distal constructs are not redundant even if their direct predictive validity for academic performance is limited as they are likely to play an important role in the development of a specific behavioural repertoire (in the context of education in this instance).

It is evident that Self-efficacy is pivotal in the model presented and its effects on GPA retrospectively and prospectively at times 1 and 2, and this is traceable through tables 1 and 2 and in figure 2. Although the effects are not strong and should be treated with caution, allowing for the possibility of type 1 errors, they are nevertheless regression effects and therefore control for other covariates. Di Giunta et al. (2013) concluded that Academic Self-efficacy can be taken as a proxy for self-regulation (cf. Zimmerman, 2002), and the construct has also been linked to motivation (Richardson et al., 2012; Zimmerman, 2000), and to mastery experiences (Zuffiano et al., 2013). Also, Britner and Pajares (2006) found that Self-efficacy is related to course choice, continuation and

completion. However, Bandura (1997) concluded that Self-efficacy beliefs are malleable and therefore are potentially susceptible to fluctuations across the semester as students receive continuous performance feedback with higher performance students reporting high self-confidence and greater value for their learning (Zusho & Pintrich, 2003). One of the ways in which Self-efficacy, as a crucial internal resource, appears to be linked indirectly to achievement is through the process of goal setting along with effort regulation (Komarraju & Nadler, 2013). Given that Self-efficacy is concluded to be pivotal in the educational context, the findings within this study corroborate that conclusion and therefore present the Self-efficacy construct as a good framework for challenge and change.

Although Academic Self-efficacy is one of the most consistent predictors of academic achievement (Caprara et al., 2011; Di Giunta et al., 2013: Richardson et al., 2012), results in the present study may suggest links to underlying traits as a stable source of its development. Moreover, the literature reviews suggest that adaptive Self-efficacy beliefs also appear to rely on retrospective performance, current feedback and prospective confident, motivated goal setting. In the zero order correlations presented in table 1, Academic Self-efficacy was the strongest and most consistent associate with GPA1 and GPA2. Also the young students generally endorsed their academic self-efficacy beliefs in the positive parameters of the scale, although individual differences were also evident in the measure of dispersion, as can be observed in table 1.

In summary, firstly from a theoretical perspective, this study is nested within personality theory in the contest of the Five Factor Model (Costa & McCrae, 1992; Goldberg, 2006), and although the FFM was not designed to predict AP, the burgeoning research that has unfolded in recent years has lead to numerous meta-analyses (e.g. O'Connor & Paunonen, 2007; Poropat, 2009; Trapmann, Hell, Hirn & Schuler, 2007;

Wagerman & Funder, 2007). The results reported in the present study show that Openness and Conscientious provide unique and shared variance as well as direct and indirect effects on Academic Performance. Alongside this, the predictive validity of Academic Self-efficacy has been established in the academic context (Britner & Pajares, 2006; Caprara et al., 2011; Zuffiano et al., 2013), as advocated by Bandura (1997). In this study, Academic Self-efficacy emerges as the most consistent construct of the three in terms of its predictive validity when controlling for covariates, and appears to be central and pivotal in the pathway toward achievement. Self-efficacy has been developed within the context of Social Cognitive Theory which emphasises incremental growth and goal setting for individuals (Bandura, 2012).

Secondly, the empirical perspective is what has brought the two theoretical orientations together in research under the non-intellective predictors of academic achievement (Richardson et al., 2012). The present study has anchored and integrated the two perspectives by postulating ASE as a mediator between the FFM and AP and by replicating some similar findings from recent Italian studies (Di Giunta et al., 2013; Zuffiano et al., 2013). This demonstrates the complementary value of the two theoretical models and provides empirical justification for postulating distal and proximal predictors of AP. It is also argued that solid constructs established by meta-analyses are more likely to engender confidence in the authority of the findings by replicable effects. It is evident from this study that the three constructs have worked well together empirically, as each had a unique contribution and in combination they accounted for substantial variance on performance. This does not negate small but non-trivial levels of variance reported in other studies provided by the use of multiple individual difference variables but some of these may be challenging to replicate (Richardson et al., 2012).

From the practical, applied standpoint, the three constructs (Openness, Conscientiousness and Self-efficacy) encompass a spectrum of non-intellective qualities that support learning, augment ability and optimise achievement. The cultivation of Openness brings the use of imagination, initiative, independence, curiosity, lateral thinking and exploration (Duff et al, 2004). The application of Conscientiousness engenders an approach to learning that is methodic and analytic (Di Giunta et al., 2013) and includes achievement striving, promptness, consolidation, organisation and persistence (Costa & McCrae, 1992). Finally, Self-efficacy is a belief system that includes motivation, self-regulation, mastery, goal setting, choice, continuation and completion (Britner & Pajares, 2006; Bandura, 2012). The amalgamation of the three constructs therefore provides an excellent cocktail for teaching and learning and a solid framework for sound pedagogical development.

Finally, from the standpoint of teachers, the development of students' Self-efficacy has been related not only to performance but also to feedback on both achievement and progress (Zusho & Pintrich, 2003), and this could be applied not only to feedback on course work and tests in formal assessment but also to informal scenarios such as supportive verbal reinforcement for responses to questions and participation in classroom discussion. With reference to the role of Openness in independent thinking (Duff et al., 2004), teachers can design and encourage problem-based learning so that their students have scope for deeper learning rather than exclusively by rote memory work. Conscientiousness is arguably the variable that most reflects activities outside the classroom and is likely to be associated with homework behaviours (Lubbers et al., 2010). This is optimal for students who engage in the mechanistic and regulatory behaviours associated with Conscientiousness (Di Giunta et al., 2013) but the challenge for teachers to engage a wider number of students is twofold: to pitch homework tasks

at a level that is manageable but challenging and in a manner that is engaging. Finally, previous grades can be used by teachers both as a benchmark to consolidate good performance and as a challenge to nurture improved performance. Grades are a reminder that these are attained by a combination of ability and personality (Conard, 2006) and therefore highlight the continual challenge of maintaining the climate for learning that facilitates the expression and development of ability.

5. References

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