Investigating The Complexities Of Academic Success: Personality Constrains the Effects of Metacognition.

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Abstract

Metacognition refers to thinking about thinking, reflecting self-awareness about one's cognitive abilities. Metacognition has long been considered a core element of academic success because higher metacognitive ability allows individuals to be efficient learners. In reality, however, developments in our understanding of metacognition have not been adequate to support changes in educational practice. Theoretical models typically focus on two facets; knowledge and regulation. Critically, these models do not consider how individual differences, such as personality, impact on learning – despite a robust body of research indicating that personality also influences academic performance. The current paper asks whether there is a relationship between metacognition, personality and academic success. To address this issue we carried out a pilot study exploring the hypothesis that metacognition and personality interact to influence academic success. One hundred and twenty five university students completed the Metacognitive Awareness Inventory (MAI) and the NEO-Five Factor Inventory. Participants also provided demographic information including age, gender, year and area of study. Findings support the importance of both metacognition and personality for learning outcomes, but importantly, suggest a significant interaction between metacognition and conscientiousness. Our data provide a novel insight into the role of metacognition in successful academic performance: personality constrains the

value of metacognition – only when students are high in conscientiousness does

metacognition predict academic grades.

Keywords: Metacognition, Personality, Academic Success, Higher Education.

Introduction

Factors influencing academic success have been well researched and documented. For

example, intelligence (Ridgell & Lounsbury, 2004), approaches to learning (Canno, 2005),

metacognition (Pintrich & De Groot, 1990) and personality (Chamorro-Premuzic &

Furnham, 2003) have all been linked to successful learning. To date, however, relatively

little is known about how these independent factors interact to improve academic

performance. Research findings have revealed relationships between metacognition and

intelligence (Cornoldi, 2010), as well as metacognition and approaches to learning (Case &

Gunstone, 2002). By contrast, to our knowledge, no research has explored the relationship

between metacognition and personality. Here, in the current paper, we first briefly discuss

evidence that suggests academic success is influenced by both metacognition and personality

independently. We then introduce the current study, which was designed to examine the

relationship between these constructs.

Metacognition has been defined as the awareness and regulation of our cognitive processes

(Flavell, 1970; Brown, 1977). Recent metacognitive models have defined two main facets;

metacognitive knowledge and metacognitive regulation. Whilst metacognitive knowledge

incorporates the understanding of how, when and where we use knowledge, regulation refers

to the behaviours we put in place to achieve our goals. Research into the impact of

metacognition on academic performance is abundant and consistently demonstrates a

significant relationship between the two (Coutinho, 2007; Pintrich & De Groot, 1990; Vrugt

& Oort, 2008). Put simply, higher levels of metacognition are associated with better grades –

across a range of subjects, ages and types of academic test. In comparison with other factors

that influence academic performance, however, the relationship between metacognition and

personality has been less explicitly explored, despite Veenman (2006) highlighting the importance of individual differences in metacognitive ability.

Personality is often discussed as a single construct. In practice, however, research typically explores personality by examining personality traits as independent factors. Importantly, a number of personality traits have been linked independently to academic performance. Conscientiousness is the factor that is linked most consistently to academic success (Conrad, 2005; Paunonen, 2007). Other personality factors including agreeableness and openness to experience (Poropat, 2009) have also been linked to academic performance, but less consistently than for conscientiousness. Importantly, there are also some facets of personality that have been shown to have a negative effect on personality, most notably neuroticism (Komarraju & Karau, 2005).

To date, little is known about what causes the discrepancies between personality traits. Why should some factors be observed as significantly impacting on academic performance in some studies, but and not in others? One possible explanation is differences found in personality measurement. The relationship between conscientiousness and academic performance is supported by a wide range of different measurements, including the NEO-Five Factor Inventory and NEO-PI-R (Costa & McCrae, 1992), the Big Five Inventory (John, Donahue & Kentle, 1991), the Personal Style Inventory (Lounsbury & Gibson, 1998) and the 5PFT (Elshout & Akkerman, 1975). By contrast, the relationship between academic performance and other personality factors seems to be dependent on the specific personality measurement used. For example, whilst Gray and Watson (2002) found a significantly positive relationship between agreeableness and GPA using the Five Factor Inventory, Rothstein, Paunonen, Rush and King (1994) found a significantly negative relationship between the same factors when using the Personality Research Form (Jackson, 1984).

The strength of evidence linking metacognition and personality to academic success raises the question of whether these apparently distinct cognitive factors interact. In some respects, personality and metacognition appear largely orthogonal: personality is a trait, whereas metacognition describes a set of processes. Nonetheless, there are clear similarities between the kinds of behaviour associated with personality and metacognition (e.g., behavioural variability in time management and organisational skills are expressed in both contexts). Equally, given that metacognition is highly variable between individuals, one strong possibility is that personality acts as a filter or constraint on the expression and/or use of metacognition. The purpose of the current study is to address this issue, examining both metacognition and personality within a single large cohort. We ask whether metacognition and personality are really two independent predictors of academic success.

Method

Participants

One hundred and twenty five undergraduate students were recruited from the University of Stirling. Four participants were excluded from the results as they did not give consent to access their grades, and 32 were excluded due to lack of completion. Participants were aged between 16 and 50, with the majority aged between 16 and 25. Of these participants, 74 were female. All participants provided informed consent, consistent with the University Of Stirling Division Of Psychology Ethics Committee.

Procedure

Participants were asked to complete a questionnaire through an email link disseminated through university administrators. The questionnaire was delivered via Qualtrics software (Version 2009, copyright 2016 Qualtrics) and consisted of demographic information, the

Metacognitive Awareness Inventory (Schraw & Dennisoun, 1994), and the NEO-Five Factor Inventory (Costa & McCrae, 1992).

Metacognitive Awareness Inventory: The Metacognitive Awareness Inventory (MAI) is a 52 item scale measured on a five point Likert scale. The inventory is used to measure metacognitive awareness, and can be divided to measure the two components of metacognition: knowledge and regulation. The scale includes items such as "I ask myself periodically if I am meeting my goals" and "I think of several ways to solve a problem and choose the best one". The reliability and validity of the MAI has been assessed as being an appropriate measurement of metacognition (Schraw & Dennison, 1994).

Neo-Five Factor Inventory: The NEO-Five Factor Inventory (NEO-FFI) is a revised and shortened version of the NEO PI-R. The NEO-FFI consists of 60 items on a five point Likert scale, used to measure the Big Five personality traits; Openness to Experience, Conscientiousness, Extraversion, Agreeableness and Neuroticism.

Demographic Information was also requested, including the age of participant, nationality, country of previous education, current year of study and gender. Participants were asked to give consent for the researcher to access their grades. Averages of the participants' final semester grades were used as a measurement of academic performance. The average grades were a combination of final coursework and exam grades of each participants' 3 core modules. Participants were asked to consent in the event of a follow-up study.

Results

Table 1 below demonstrates the means and standard deviations of the Big Five personality traits, metacognition and academic performance. Pearson's Product Moment correlations were carried out to determine the relationships between the variables.

** Table 1 inserted here**

Metacognition Personality and Academic Performance

As predicted on the basis of previous findings, a significant relationship was found between metacognition and academic performance (r = .292, n=87, p<.01). A similar relationship was reported between personality and academic performance. Conscientiousness was found to be significantly correlated with students' average grades from previous semesters (r = .323, n=87, p<.01). The table also reveals significant relationships between year of study and both metacognition and academic performance. In addition, Table 1 reveals significant correlation between personality factors – specifically, between extraversion and both agreeableness and neuroticism.

The findings demonstrated above confirm that there are significant relationships between academic performance and both metacognition and one aspect of personality. More importantly, Table 1 also provides evidence for a relationship between metacognition and conscientiousness. A statistically significant positive correlation was found between metacognition and conscientiousness (r = .504, n=93, p <.01). In addition, as for metacognition and academic success, the personality factor of conscientiousness correlated with year of study – reflecting increases across the course of the degree. By contrast, no other significant relationships were found between metacognition and the other personality traits, or between other personality traits and year of study.

Regression

The findings provide clear evidence of relationships between metacognition, conscientiousness and academic performance. Our key aim was to determine whether metacognition and conscientiousness interact to influence academic performance, or reflect

independent sources of influence. To investigate this question we submitted the data to a multiple regression analysis, demonstrating that the combined effect of metacognition and conscientiousness explains a significant amount of variance in academic performance *(F $_{(2,622.737)}$ = 6.126, p= .003, R^2 = .127, R^2$_{Adjusted}$=.107)*. Importantly, and contrary to the earlier correlation analysis, the multiple regression results also reveal that within this model, metacognition is not a significant predictor of academic performance by itself *(β = .174, t=1.483, p=.142)*. Conscientiousness, however, was still supported as a significant predictor *(β =.236, t=2.01, p=.048)*.

One possibility within our data is that year of study has an important influence over the pattern of results. As degrees develop and get both harder and more specialised it may be that later years provide a clearer picture of the relationship than can be seen in earlier years when many students perform well. To investigate this question we submitted the data to an additional stepwise regression analysis, allowing us to determine whether both metacognition and conscientiousness are necessary to predict academic performance when year of study was controlled for. When broken down, conscientiousness was still found to be a significant predictor of academic performance *(β = .276, t = 2.674, p= .009)*, whilst metacognition was not found to be a significant predictor, and did not enter into the second step of the equation *(t=1.51, p > .05)*.

Finally, to further understand how conscientiousness impacts on the effectiveness of metacognition, we carried out an additional follow up analysis, examining whether the relationship between metacognition and academic performance differed as a function of the personality variable. We first separated the participants into two groups – high and low in conscientiousness – based on a median split. We then examined the relationship between metacognition and academic success using regression; for high conscientiousness participants the results revealed a significant relationship between metacognition and academic success *(β = 0.340. t= 2.582, p =.013)*. By contrast, no equivalent significant effect was found in low conscientiousness participants *(β=0.008, t=0.042, p=.967)*.

Discussion

In this study we explored the relationship between two putatively independent constructs; metacognition and personality. Evidence suggests that both metacognition and personality are important for academic performance – we examined whether these factors were truly independent. The findings support previous research in demonstrating a significant relationship between metacognition and academic performance. The findings also support the relationship between conscientiousness and academic performance, the only personality trait to be consistently linked with improved academic success within previous literature (Lievens et al, 2002; Bauer & Laing, 2003; Hair & Hampson, 2006). More importantly, when examined together, findings revealed a significant relationship between metacognition and conscientiousness – together these two factors account for 13% of the variance in academic outcome measured here. Whilst the contribution of these two factors is relatively high, one important observation that follows is that many other factors must also be influencing academic performance – including factors already known to be related to academic performance such as intelligence, and unknown variables such as genetic and environmental factors – all of which warrant investigation. Nonetheless, a combined effect of 13% suggests that metacognition and consciousness play an important role in academic success.

Whilst the results of our study are novel – in showing a combined effect of personality and metacognition – they also raise a significant question. When broken down in detail, the multiple regression analysis strongly suggests that conscientiousness constrains the relationship between metacognition and academic success. Whilst a significant relationship exists between metacognition and academic success when examined in isolation, the relationship was no longer significant in the context of the multiple regression model.

Instead, the role that metacognition plays depends on personality: when conscientiousness is high, metacognition does predict academic success, but when conscientiousness is low, metacognition is no longer a significant predictor of academic success. In essence, our results suggest that only if someone is conscientious will they engage metacognitive behaviours to enhance academic performance. The findings raise an interesting question about the relationship between conscientiousness and metacognition. Why do the factors interact in this way? It is possible that people who are more conscientiousness engage in metacognitive behaviours routinely (automatically or unconsciously), simply because they are an inherent part of their personality? And, by contrast, might individuals who are not as conscientious, need to engage with these behaviours more strategically (effort fully and consciously) in order for them to influence academic success?

Whilst the finding presented here inform our view of the relationship between metacognition and academic success, it is important to acknowledge the limited resolution of the data. Metacognition is not a unitary construct and can be divided into subcomponents – at minimum, distinguishing between knowledge and regulation (Schraw & Moshman, 1995). It remains possible, therefore, that a more detailed examination of the subcomponents of metacognition may reveal a more complex picture of the relationship between metacognition and personality. One important possibility is that students' metacognitive knowledge develops over time, but that their willingness to regulate behaviour is less malleable – and more closely related to differences in personality.

The absence of a relationship between metacognition and the other personality traits could reflect limitations in our assessment tools. The MAI focuses on study behaviours, specific to academic performance. By contrast, aspects of the Five Factor Inventory, such as extraversion or agreeableness, focus heavily on social experience. In broad terms metacognition is often linked with learning from social situations, and yet this social element cannot easily be assessed through the use of questionnaires designed to examine study

behaviours within academic settings. Metacognition has already been incorporated into social constructs such as emotional and cultural intelligence (Morley & Cerdin, 2010; Ang, Dyne & Koh, 2006), suggesting that future research should not focus solely on study behaviours. Investigations of metacognition should be expanded to incorporate the role of social learning in academic performance, including the effect of peer assisted learning on metacognitive behaviours.

Conclusion

This study provides the first investigation of the relationship between metacognition, personality and academic success. Both metacognition and personality were found to be significant predictors of academic performance, consistent with previous literature. More importantly, our data showed that the role metacognition plays depends on the personality trait of conscientiousness. Put simply, conscientiousness constrains the effect that metacognition has on academic success. Whilst our findings are novel, it is important to recognise that we have only examined one small area of academic performance – individual grades. In addition, other factors such as social interaction and peer learning are not taken into account in the present study, which could explain the lack of correlation between metacognition and the more socially oriented personality factors. The regression also highlights that whilst the two factors were significant predictors of academic performance, a relatively small amount of the total variance in academic performance was accounted for and other factors need to be taken into consideration. Whilst the present results require further investigation, our data carry a clear and significant implication for educational practice: a single approach to improving academic success is unlikely to be effective for all students.

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Table 1: Pearson Product-Moment Correlations Demonstrating Significant Relationships between Metacognition, Academic Performance and Big Five Personality Traits.

	Mean	S.D.	1	2	3	4	5	6	7
1.Metacognition	3.66	.40							
2.Academic Performance	64.24	10.67	.292**						
3.Openness to Experience	47.78	6.97	.183	-.038					
4.Conscientiousness	41.38	7.72	.504**	.323**	-.122				
5. Extraversion	37.88	6.47	.132	-.032	.014	.113			
6. Agreeableness	43.06	6.28	-.102	-.062	.082	.046	.233*		
7. Neuroticism	40.51	10.08	-.023	-.201	.260*	-.153	-.431**	-.102	
8. Year of Study	-	-	.254*	.272*	.095	.222*	.114	-.043	-.012

** Values are significant at .01 p value, * values are significant at .05 p value.