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## Short Communication

## Learning approaches: Associations with Typical Intellectual Engagement, intelligence and the Big Five

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## ABSTRACT

Learning approaches, i.e. students' learning strategies and motives, predict academic performance but it is not clear how much variance they share with intelligence and personality. Here, the relationship of the Big Five personality traits, intelligence, and Typical Intellectual Engagement (TIE) with *deep*, *achieving* and *surface* learning was explored in a sample of 579 British undergraduate students. A structural equation model showed that (a) intelligence was negligibly associated with learning approaches; (b) TIE was strongly related to all three types of learning approaches; (c) deep learning shared the greatest amount of variance with TIE, while (d) achieving learning was best explained by Extraversion, Openness to Experience, and Conscientiousness. Only 25% of the variance in surface learning was accounted for by intelligence and personality. Thus, personality traits and learning approaches share much variance but not enough to dismiss either construct as redundant.

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## 1. Introduction

Students differ in their preferred learning strategies and motives, and these differences are thought to be associated with academic performance outcomes (e.g. Chamorro-Premuzic & Furnham, 2008; Duff, 2004; Furnham, 2011). Learning motives concern *why* students learn; they precede learning strategies that refer to *how* students learn (Biggs, 1987). Together motives and strategies inform learning approaches, which are unrelated to intelligence (e.g. Chamorro-Premuzic & Furnham, 2008) but overlap with personality traits (e.g. Duff, Boyle, Dunleavy, & Ferguson, 2004; Furnham, Monsen, & Ahmetoglu, 2009). While their relationship with academic performance is multilayered (Haggis, 2003), it is unknown to what extent learning approaches are explained by personality traits and intelligence.

Typically, three learning approaches are differentiated: *deep*, *achieving* and *surface* learning (Biggs, 1987). Deep learners seek to explore a topic to the greatest possible extent, aiming for a better understanding of the subject matter and its wider context. Achieving learners study to obtain the rewards that are attached to high academic results, such as a prestigious job offer or monetary rewards. Surface learners only learn those facts that are indispensable to pass, thereby applying minimum but highly targeted

study efforts (cf. Biggs, 1987). In line with this, research studies have shown that deep and achieving learning lead to better grades while surface learning tends to precede lower marks (e.g. Chamorro-Premuzic & Furnham, 2008; Duff, 2004; Furnham et al., 2009). However, the empirical evidence for the association between learning approaches and academic performance is often inconsistent (Haggis, 2003).

Learning approaches overlap conceptually and empirically with broad personality traits, i.e. the Big Five that span Neuroticism, Extraversion, Openness to Experience, Agreeableness and Conscientiousness, with shared variances ranging from 25% to 45% (e.g. Duff et al., 2004; Zhang, 2003). A recent review showed that Neuroticism is positively related to surface learning and negatively to deep learning; Extraversion and Conscientiousness are positively associated with deep and achieving learning; and Openness is strongly linked to deep learning (Chamorro-Premuzic & Furnham, 2009). However, some data have challenged these associations, especially with regard to Extraversion (Chamorro-Premuzic & Furnham, 2009). Beyond the Big Five, deep and achieving learning have been shown to be positively correlated with Typical Intellectual Engagement (TIE), a trait that describes intellectual curiosity (Goff & Ackerman, 1992). Conversely, surface learning is negatively associated with TIE (e.g. Furnham et al., 2009). TIE refers to individual differences in *typical* intelligence or investment, that is, the desire to engage with and understand the world or the need to know (Goff & Ackerman, 1992), which is conceptually very similar to deep learning.

It is unclear to what extent variances in learning approaches are accounted for when considering the Big Five, TIE and intelligence

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simultaneously. Based on previous evidence (Chamorro-Premuzic & Furnham, 2008, 2009), we hypothesized that (1) surface learning is negatively associated with Openness and TIE but positively with Neuroticism; (2) deep learning is positively related to Extraversion, Openness, TIE and Conscientiousness, and negatively to Neuroticism; (3) achieving learning is positively associated with Extraversion and Conscientiousness and not meaningfully with Openness or TIE; (4) Agreeableness and intelligence are unrelated to learning approaches; (5) and personality traits and ability account for the majority of variance in learning approaches.

## 2. Methods

### 2.1. Sample

Data of 707 undergraduate psychology and computer science students was available, collected from seven UK universities<sup>1</sup> over the time span of 2 years. Not all students completed all measures and data were missing at random. Cases without intelligence test score were omitted, resulting in a final sample of  $N = 579$  (330 females). Age ranged from 17 to 41 years ( $M = 19$ ;  $SD = 1.63$ ).

### 2.2. Measures

#### 2.2.1. Study process questionnaire (SPQ; Biggs, 1987)

This 42-item questionnaire assesses three learning motives, i.e. why students learn, as well as three learning strategies, i.e. how students learn. These are divided into surface (a reproduction of what is taught to meet the minimum requirement), deep (a real understanding of what is learned), and achieving learning (aiming to maximize the grade). Thus there are six subscales (surface motive, surface strategy, deep motive, deep strategy, achieving motive, and achieving strategy) with seven items each. The measure has good re-test reliability (Fox, McManus, & Winder, 2001). Example items are “I test myself on important topics until I understand them completely”. for deep learning; “I generally restrict my study to what is specifically set as I think it is unnecessary to do anything extra”. for surface learning; and “I believe that society is based on competition and schools and universities should reflect this”. for achieving learning.

#### 2.2.2. NEO Five-Factor Inventory (NEO-FFI; Costa & McCrae, 1992)

This is a 60-item, untimed, self-report inventory, which assesses the five broad personality traits: Neuroticism, Extraversion, Openness to Experience, Agreeableness and Conscientiousness. Trait scales have internal consistencies between .68 and .86 (Costa & McCrae, 1992).

#### 2.2.3. Typical Intellectual Engagement (TIE; Goff & Ackerman, 1992)

TIE is a 59-item, self-report inventory that requires participants to rate on a six-point Likert-type scale the extent to which they seek, engage in, and enjoy, intellectual activities. Internal consistencies are around .85 (e.g. Goff & Ackerman, 1992; von Stumm, Hell, & Chamorro-Premuzic, 2011).

#### 2.2.4. Wonderlic Personnel Test (Wonderlic, 1992)

This 50-item intelligence-test is administered in 12 min. Scores can range from 0 to 50. Items include word and number comparisons, disarranged sentences, serial analysis of geometric figures, and mathematical and logical problems. The test correlates at  $r = .92$  with the WAIS-R (Wechsler, 1981; Wonderlic, 1992).

### 2.3. Procedure

Students were tested in quiet lecture theatres under exam conditions in groups of 20–100, depending on the university. They first completed tests of ability, and then measures of personality and learning approaches. The order of tests was the same across universities. Students took voluntarily part in the study or in exchange for course credit; all participants were debriefed after the testing.

### 2.4. Analysis

The analyses were conducted using SPSS 19 and AMOS 19. For the Big Five, unit-weighted composite scores were computed, adjusted for the number of items. For TIE, the first unrotated component was retained as regression score (cf. Goff & Ackerman, 1992). After computing correlations, a structural equation model was fitted to examine the variables' inter-relations. From the learning motive and strategy scales, a respective latent factor was extracted for each learning approach. The Big Five, TIE and intelligence were modeled as exogenous variables with direct paths to each of the latent learning approaches. Learning approaches were allowed to freely correlate, and so were all independent variables. The model was fitted to two independent sub-samples ( $N = 281$  and  $N = 308$ ), as well as the overall sample to compare estimates and confirm model solutions. Full information maximum likelihood estimation was employed to avoid omission of cases with missing data (Arbuckle, 1996).

## 3. Results

Table 1 reports the descriptive, coefficient alpha values and correlations for all study variables. Intelligence was significantly and negatively associated with surface and achieving strategy with coefficients of  $r = -.13$  and  $r = -.12$ , respectively ( $p < .01$ , in all cases here and below). No other significant associations of intelligence with learning strategies or motives were observed. Learning approaches correlated significantly with personality: Conscientiousness was positively associated with deep and achieving strategy ( $r = .16$  and  $r = .23$ , respectively), and with achieving motive ( $r = .17$ ), while Openness was negatively related to surface strategy ( $r = -.18$ ). There were no other significant correlations between learning approaches and the Big Five. TIE was significantly correlated with intelligence and all motives and strategies with coefficients ranging from  $-.36$  (with surface strategy) to  $.56$  (deep motive); overall, TIE showed the greatest overlap with learning approaches.

Models fitted to the subsamples and the overall sample did not differ notably. Estimates from the full sample model are reported, which proved an adequate fit to the data ( $\chi^2$  (df = 27) = 75.69; CFI = .967; TLI = .890; RMSEA .056; Confidence Interval of 90% from .041 to .071).

TIE was significantly associated with all learning approaches: negatively with surface learning, and positively with deep and achieving learning with path parameters of  $-.47$ ,  $.71$  and  $.24$ , respectively (Fig. 1). Intelligence was negatively, significantly related to deep learning with a path parameter of  $-.10$ , and had no other meaningful associations. Achieving learning was the only approach that was significantly associated with Big Five personality traits, namely Openness, Extraversion, and Conscientiousness. Here, associations between achieving learning and Extraversion and Openness were negative ( $-.67$ , and  $-.20$ , respectively), while Conscientiousness was positively related (.24). The exogenous variables accounted for 24.5%, 48.4% and 30.4% in surface, deep, and achieving learning, respectively.

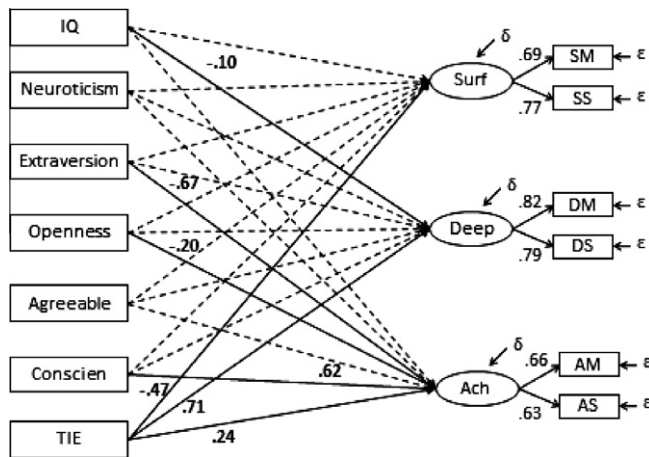
<sup>1</sup> These included University College London; Goldsmiths University of London; City University of London; University of Manchester; Bath Spa University; University of Sussex; and University of Westminster.

**Table 1**  
Study variables' descriptives and inter-correlations.

		N	Min	Max	M	SD	$\alpha$	1	2	3	4	5	6	7	8	9	10	11	12	
1	IQ	579	12.00	44.00	28.19	5.62	–	–												
2	SM	537	1.43	4.86	3.44	0.62	.61	–.11	–											
3	DM	543	1.43	4.71	3.24	0.58	.60	.00	.00	–										
4	AM	542	1.71	5.00	3.55	0.63	.71	.00	.33*	.34*	–									
5	SS	537	1.29	5.00	3.17	0.58	.62	–.13*	.54*	.03	.34*	–								
6	DS	538	1.14	4.86	3.30	0.59	.76	.01	–.03	.64*	.31*	–.05	–							
7	AS	545	1.00	4.86	3.06	0.76	.80	–.12*	.15*	.38*	.42*	.21*	.42*	–						
8	N	354	1.25	4.50	2.60	0.64	.84	.04	–.02	–.01	.14	.03	–.02	.01	–					
9	E	225	1.17	4.67	2.75	0.93	.93	.08	–.13	.04	–.08	.01	.17	.00	.26*	–				
10	O	367	1.25	4.00	2.69	0.55	.77	–.04	–.01	.07	–.10	–.18*	.07	–.08	–.17*	–.34*	–			
11	A	413	1.33	4.25	2.71	0.43	.63	–.01	–.03	–.02	–.01	.00	–.03	–.04	.24*	.09	.11	–		
12	C	282	1.08	4.67	2.58	1.00	.94	.17*	–.12	.12	.17*	.06	.16*	.23*	.37*	–.40*	–.01	.02	–	
13	TIE	472	–3.36	2.97	0.00	1.00	–	.12*	–.30*	.56*	.13*	–.36*	.52*	.27*	–.04	.24*	.25*	.07	.08	

Note: Sample sizes for correlations range from 181 to 579 due to missing data points. Key: IQ = Wonderlic score; SM = Surface motive; DM = Deep motive; AM = Achieving motive; SS = Surface strategy; DS = Deep strategy; AS = Achieving strategy; N = Neuroticism; E = Extraversion; O = Openness to Experience; A = Agreeableness; C = Conscientiousness; TIE = Typical Intellectual Engagement.

\*  $p < .01$ .



**Fig. 1.** Associations of the Big Five, TIE and IQ with latent traits of learning approaches. Note: Correlations exogenous of variables and correlations of endogenous variables have been omitted to sustain graphical clarity. Dashed paths represent non-significant associations ( $p > .05$ ).  $\epsilon$  denotes observed variable's error terms, and  $\delta$  denotes latent traits' disturbance terms. Key: Conscientiousness; TIE = Typical Intellectual Engagement; SM = Surface motive; DM = Deep motive; AM = Achieving motive; SS = Surface strategy; DS = Deep strategy; AS = Achieving strategy; Agreeable = Agreeableness.

#### 4. Discussion

The current study tested the associations of the Big Five, TIE and intelligence with learning approaches. Confirming some of our hypotheses (cf. Artech, Chamorro-Premuzic, Ackerman, & Furnham, 2009; Furnham et al., 2009), TIE was positively associated with deep and achieving learning and negatively with surface learning. It accounted for about 6% of the variance in achieving and for 22% of the variance in surface learning respectively, while it explained 48% – that is, almost all of its currently explained variance – in deep learning. Conversely, the associations of intelligence and the Big Five with learning approaches were not completely in line with previous findings (Chamorro-Premuzic & Furnham, 2008, 2009). Thus, Extraversion, Openness and Neuroticism were not associated with surface and deep learning, which had a small, negative relation with intelligence. Achieving learning was the only learning approach that was associated with personality traits other than TIE (i.e. Extraversion, Openness and Conscientiousness), and they accounted for 26% of its variance. It appears that an achieving learning relates to a more diverse personality profile than deep and surface learning approaches do. In line with

our hypothesis, Agreeableness was not meaningfully associated with any learning approach.

Overall, the current results support TIE as a close relative of learning approaches, suggesting that associations of the Big Five with learning approaches are attenuated by TIE, at least for deep and surface learning. Indeed, TIE is correlated with Openness and Conscientiousness (von Stumm et al., 2011) that were previously found to be related to learning approaches but not here (Chamorro-Premuzic & Furnham, 2009).

Our study is limited by its single-wave nature and the lack of a concrete outcome variable (e.g. exam grades). Also, the Wonderlic test may not be an ideal measure of intelligence. Nonetheless, the findings suggest that learning approaches share much of variance with the Big Five and TIE but not enough to dismiss the construct as redundant. Furthermore, learning approaches differ in the extent of variance that was accounted for by personality and intelligence. Specifically, only 25% of the variance in surface learning were accounted for, suggesting that additional variables cause students to invest minimally in their studies, for example the necessity of part-time employment. Finally, this study emphasized the conceptual and empirical overlap of TIE and deep learning, which appear to constitute important determinants of academic achievement (cf. von Stumm et al., 2011).

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