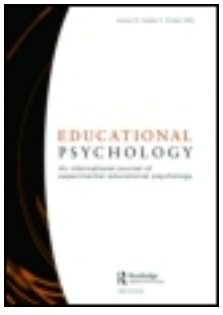

Educational Psychology: An International Journal of Experimental Educational Psychology

Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/cedp20

Typical intellectual engagement as a byproduct of openness, learning approaches, and self-assessed intelligence

Adriane Arteche [a], Tomas Chamorro-Premuzic [b], Phillip Ackerman [c] & Adrian Furnham [d]

[a] Winnicott Research Unit, University of Reading, Reading, UK

[b] Goldsmith College, London, UK

[c] Georgia Institute of Technology, Atlanta, USA

[d] University of London, London, UK

Available online: 18 May 2009

To cite this article: Adriane Arteche, Tomas Chamorro-Premuzic, Phillip Ackerman & Adrian Furnham (2009): Typical intellectual engagement as a byproduct of openness, learning approaches, and self-assessed intelligence, Educational Psychology: An International Journal of Experimental Educational Psychology, 29:3, 357-367

To link to this article: http://dx.doi.org/10.1080/01443410902927833

Educational Psychology
Vol. 29, No. 3, May 2009, 357–367

Routledge
Taylor & Francis Group

Typical intellectual engagement as a byproduct of openness, learning approaches, and self-assessed intelligence

Adriane Arteche[a]*, Tomas Chamorro-Premuzic[b], Phillip Ackerman[c], and Adrian Furnham[d]

[a]*Winnicott Research Unit, University of Reading, Reading, UK;* [b]*Goldsmith College, London, UK;* [c]*Georgia Institute of Technology, Atlanta, USA;* [d]*University of London, London, UK*

(*Received 16 January 2009; final version received 26 March 2009*)

Students (n = 328) from US and UK universities completed four self-report measures related to intellectual competence: typical intellectual engagement (TIE), openness to experience, self-assessed intelligence (SAI), and learning approaches. Confirmatory data reduction was used to examine the structure of TIE and supported five major factors: reading and information seeking, intellectual avoidance, directed complex problem solving, abstract thinking, and intellectual pursuits as a primary focus. These factors were significantly and positively associated with deep learning, openness, and SAI, and negatively related to surface learning. Other correlates of TIE were more factor-dependent. In general, correlations suggested that TIE is related to, but different from, the other intellectual competence constructs examined. Results are discussed in relation to the typical performance approach to intelligence and the importance of TIE with regards to the intrinsic motivation to learn.

Keywords: typical intellectual engagement; self-assessed intelligence, learning approaches; personality; intellectual competence

Although empirical evidence suggests that personality and intelligence are only modestly related (Ackerman & Heggestad, 1997; Chamorro-Premuzic & Furnham, 2005), 'investment' theories of intelligence, such as Cattell's (1987), Ackerman's (1996), and Chamorro-Premuzic and Furnham's (2006a), highlight the importance of inter-individual differences in intellectual curiosity, need for cognition, and typical – as opposed to maximal – levels of intelligence as determinants of adult intellectual development (e.g., crystallised intelligence, academic achievement, and knowledge). Accordingly, cognitive ability tests provide a measure of individuals' learning ability or what they are capable of learning (i.e., how fast, efficiently, and effectively individuals learn to solve novel problems and solve known problems), whereas self-reports of intellectual competence provide a measure of individuals' willingness to learn or what they are motivated to achieve intellectually (i.e., how much effort they invest in the acquisition of new knowledge and the development of novel skills).

Whereas the map of maximal intelligence constructs has been researched extensively and remained relatively undisputed since Carroll's (1993) seminal review of cognitive ability tests, typical intelligence constructs have been examined with some

*Corresponding author. Email: a.xavierarteche@reading.ac.uk

ISSN 0144-3410 print/ISSN 1469-5820 online

DOI: 10.1080/01443410902927833
http://www.informaworld.com

degree of frequency and in the context of a coherent theoretical framework only in the past 10 years (no doubt prompted by the findings of Ackerman and Heggestad's 1997 meta-analysis). Indeed, there are several self-report constructs that assess people's tendencies to invest or engage intellectually in activities that foster the development of skills or acquisition of knowledge independently of maximal intelligence, but few studies of the relationship among these various constructs of intellectual competence.

The present study examines the construct of typical intellectual engagement (TIE; Goff & Ackerman, 1992), which represents the most – and arguably only – explicit attempt to conceptualise typical intelligence and assess individual differences in intellectual investment. TIE was first conceptualised by Goff and Ackerman (1992) in terms of individual differences in typical levels of engagement in tasks that are intellectually taxing (Ackerman, Kanfer, & Goff, 1995). Higher TIE scores are indicative of an expressed desire to engage with and understand the world, an interest in a wide variety of things, a preference for a complete understanding of complex problems, and a general need to know (Ackerman & Heggestad, 1997). Conceptually, this construct has been defined as a mixed measure of personality and intelligence, as it assesses typical and not maximal performance (Chamorro-Premuzic, Furnham, & Ackerman, 2006a).

Despite the conceptual importance of TIE with regard to the personality–intelligence interface (Ackerman, 2000; Woo, Harms, & Kuncel, 2007) and as broad explanatory factor for individual differences in non-ability traits related to knowledge acquisition and intellectual development (Chamorro-Premuzic, Furnham, & Ackerman, 2006a, b), the structure of TIE, as well as its convergent and divergent validity in relation to other investment traits, has been insufficiently explored.

Ackerman and Goff (1994) suggested a three-factor model of TIE, where the factors were problem directed thinking, abstract thinking and reading, whereas Ferguson (1999) identified a five-factor structure, where the factors were abstract thinking, directed complex problem solving, reading and information seeking, intellectual avoidance, and intellectual pursuits as a primary focus. On the other hand, Chamorro-Premuzic et al. (2006a, b) conceptualised TIE as an overall latent factor without primary facets or dimensions. Thus, the current study explores the dimensionality of TIE.

As regards the convergent and discriminant validity of TIE, there is some debate about whether TIE is sufficiently different from the 'Big Five' factor termed 'openness to experience' – a trait covering intellectual curiosity, creativity, aesthetic interests, and liberal political views (Costa & McCrae, 1992). Although Ackerman and Goff (1994) and Ferguson (1999) argued that the facets of TIE were reasonably distinct from openness, large correlations between openness and TIE have been reported (Goff & Ackerman, 1992; Rocklin, 1994), and TIE has also been found to be positively associated with conscientiousness (Chamorro-Premuzic et al., 2006a, b) – a trait covering achievement striving, dutifulness, and order, among other things (Costa & McCrae, 1992). Thus, the current study also examines the associations of TIE with the Big Five personality traits. Given recent calls to examine personality–ability associations at the primary factor level (Chamorro-Premuzic & Furnham, 2003; O'Connor & Paunonen, 2007; Reeve, Meyer, & Bonaccio, 2006), an examination of how the dimensions of TIE correlate with the Big Five is also deemed necessary.

Finally, the current study also explores the relationship of TIE with self-assessed intelligence (SAI; Chamorro-Premuzic & Furnham, 2006a) and learning approaches

(Biggs, 1987), both of which are also assessed via self-report and both of which also tap into dispositional factors that have been associated with higher IQ test scores and academic achievement levels (Chamorro-Premuzic & Arteche, 2008; Chamorro-Premuzic & Furnham, 2006a, b, 2008). Learning approaches define the individual's preferred style for learning and can be classified into three categories: deep (intrinsic motivation, engagement with the subject matter, and desire to know everything about the topic); surface (aim at learning the minimal amount necessary to pass); and achievement (goal-orientated study strategies). A growing number of studies have provided evidence of associations between learning approaches and personality (Chamorro-Premuzic, Furnham, & Lewis, 2007; Duff, Boyle, Dunleavy, & Ferguson, 2004; Zhang, 2003) and between learning approaches and academic performance (Chamorro-Premuzic & Furnham, 2008; Duff, 2004; Duff et al., 2004). SAI has been conceptualised as an indicator of intellectual competence and found to relate to both personality and cognitive ability measures (Chamorro-Premuzic & Furnham, 2006a, b). Conceptually, SAI is related both to 'actual' ability, as people can estimate their intelligence levels with relative accuracy (Ackerman & Wolman, 2007), and to motivation, as people will be more likely to engage in intellectual tasks if they feel competent to do so, and vice-versa.

To recap, the current study examines the dimensional structure of the TIE and how its factors relate to other indicators of intellectual competence, namely the Big Five personality traits (particularly openness and conscientiousness), SAI, and learning approaches. Positive associations of TIE with openness, conscientiousness, SAI, deep learning, and achievement learning are predicted, as well as negative associations of TIE with surface learning.

Method

Sample

Participants were 328 (157 males, 171 females) university students from England (n = 185; 117 males, 68 females) and the United States (n = 143; 40 males, 103 females). Ages ranged from 17 to 47 years with a mean of 19.54 (SD = 3.78). Participants +/-2 SD were checked for outliers but did not differ significantly from the rest of the sample and were therefore included in the analyses.

Measures

Typical intellectual engagement

The TIE scale (Goff & Ackerman, 1992) is a 59-item questionnaire designed to assess the extent to which people seek, engage in, and enjoy intellectual activities (e.g., reading philosophy, analysing complex issues, and solving challenging problems). Respondents are asked to rate each statement on a six-point Likert-type scale (from 1 = 'strongly disagree' to 6 = 'strongly agree'). Evidence for good internal reliability (Cronbach α) has been reported for the overall TIE score (Ackerman, 2000; Ackerman, Bowen, Beier, & Kanfer, 2001; Ackerman & Heggestad, 1997; Ackerman et al., 1995; Ackerman & Rolfhus, 1999; Beier & Ackerman, 2001; Chamorro-Premuzic et al., 2006a, b). In addition, a few studies have explored the instrument's factors (Ackerman & Goff, 1994; Ferguson, 1999).

Self-assessed intelligence

Participants were asked to estimate eight abilities (i.e., cognitive/reasoning, verbal, numerical, emotional, general knowledge, social, creative, and spatial). A normal distribution scale ranging from −3 (mild retardation) to +3 (gifted) was provided as reference, as was a brief description of each ability domain. Cronbach's alpha for the eight abilities was .77, but an α value of .82 was obtained when emotional intelligence was removed. Thus, the arithmetic mean was calculated for seven abilities (excluding emotional intelligence) to compute an overall SAI score for each participant.

Approaches to studying

The Study Process Questionnaire (SPQ; Biggs, 1987) contains 42 items that respondents assess on a five-point Likert-type scale (from 1 = 'never or only rarely true' to 5 = 'always or almost always true') to reveal their approaches to studying, studying styles, and attitudes towards studying. The 42 items are divided into three subscales, namely achievement (A; obtaining good grades in assessments), deep (D; focusing on the meaning of the content) and surface (S; reproduction through rote learning). Each of these subscales consists of two subfactors known as motive and strategy. Overall scores are obtained by summing up scores on the respective motive and strategy subfactors. The reliability coefficients for the present study were .74, .82, and .73 for A, D, and S respectively.

Big Five personality traits

The Neuroticism-Extraversion-Openness Five Factor Inventory (NEO-FFI; Costa & McCrae, 1992) is a 60-item scale designed to assess the five major personality traits. Participants are asked to respond to each statement on a five-point Likert type scale (from 0 = 'strongly disagree' to 4 = 'strongly agree'). Many studies have demonstrated the internal reliability of this measure (Chamorro-Premuzic, 2007; Costa & McCrae, 1992).

Results

TIE factor structure

Confirmatory factor analyses using AMOS 4.0 (Arbuckle & Wothke, 1999) was performed to investigate the data fit for two competitive factor solutions: the five-factor solution suggested by Ferguson (1999) and the three-factor solution proposed by Ackerman and Goff (1994). The models included uncorrelated factors[1] and the results revealed an adequate model fit for the five-factor solution ($\chi^2[5] = 2.72$, $p = .74$; CFI = 1.0; TLI = 1.0, RMSEA = .00; confidence interval [CI] 90% = .00, .05; see Figure 1).[2] Conversely, inspection of the goodness of fit indices did not support the three-factor solution. The chi-square statistic was significant ($\chi^2[1] = 13.13$, $p < .001$), and although the CFI was .95, the RMSEA was very high (.19, CI 90% = .10, .29) and the TLI was low (.87; see Figure 2). Factors 1 (problem-directed thinking) and 2 (abstract thinking) showed high loadings on the latent structure; however, the third factor (reading) showed a very low loading on the latent three-factor structure.

Therefore, supporting Ferguson's (1999) model, the five-factor solution was confirmed, with factors as follows:

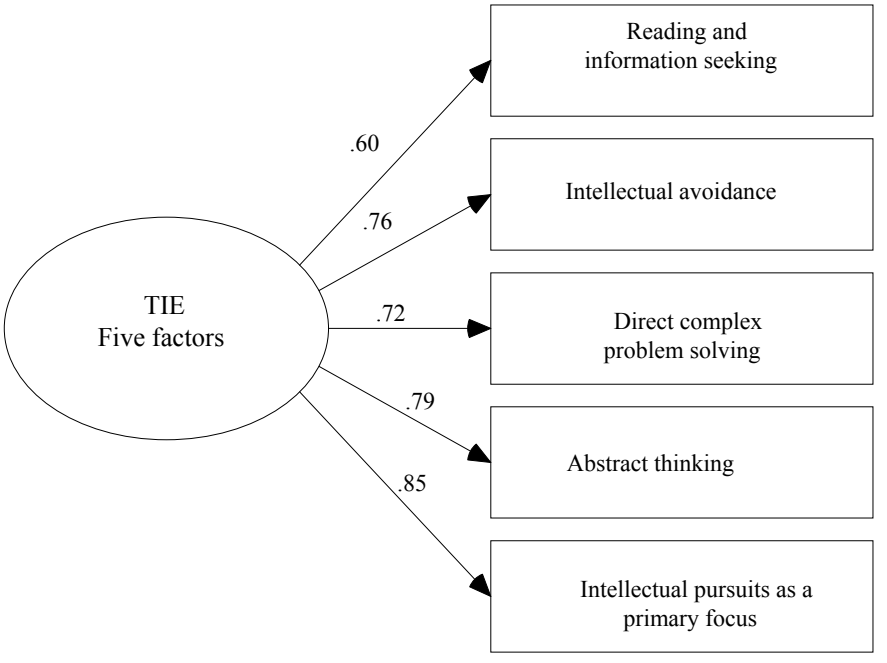

Figure 1. Typical intellectual engagement: confirmatory factor analysis of the five-factor solution.

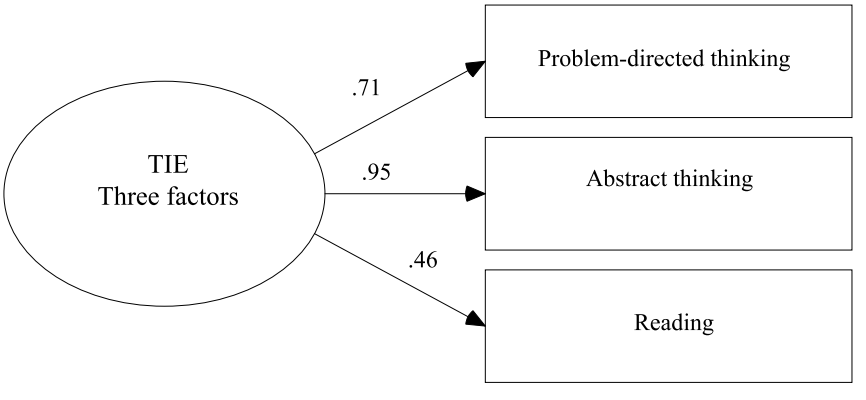

Figure 2. Typical intellectual engagement: confirmatory factor analysis of the three-factor solution.

(1) reading and information seeking (behaviours associated with reading and seeking information from a variety of sources)
(2) intellectual avoidance (desire to avoid learning situations)
(3) direct complex problem solving (enjoyment from solving difficult tasks)
(4) abstract thinking (the act of thinking abstractly)
(5) intellectual pursuits as a primary focus (pursuit of intellectual activity as a main goal).

Table 1. TIE factors' reliabilities and intercorrelations.

	α	2	3	4	5
1. Reading and information seeking	.79	.41**	.43**	.48**	.51**
2. Intellectual avoidance	.73		.56**	.60**	.65**
3. Directed complex problem solving	.74			.56**	.60**
4. Abstract thinking	.77				.66**
5. Intellectual pursuits as a primary focus	.56				

Note: **$p < .01$

Given the heterogeneity of the sample as regards nationality, multi-group analyses were performed in order to investigate the invariance of the TIE structure across British and American participants. Results revealed that the difference between the unconstrained ($\chi^2[10] = 5.36$, $p = .86$) and constrained ($\chi^2[14] = 6.14$, $p = .96$) models was not significant ($\chi^2[4] = .78$, n.s.). Therefore, results confirmed that the TIE five-factor structure holds across the two nationalities investigated.

Next, internal reliabilities and inter-factor zero-order correlations were performed (see Table 1). The results indicated good internal reliability for all factors (range .73–.79), except for intellectual pursuit as a primary focus, which at .56 just failed to reach the .6 level. Nevertheless, all factors were positively and significantly correlated. Small to moderate associations were observed among TIE composites. The strongest correlations were found between abstract thinking and intellectual pursuits as a primary focus ($r = .66$, $p < .01$).

Descriptives

Means and standard deviations were computed for all variables. *T* tests and Cohen *d* analyses were performed to test for nationality differences. As can be seen in Table 2, British participants scored significantly higher than American participants on all TIE factors, except reading and information seeking. They also rated themselves higher in SAI. In line with these results, British participants also had lower scores than American participants in SPQ-S and SPQ-A. Nevertheless, they had lower scores for all personality factors, except for agreeableness.

TIE correlates

Zero-order correlations among TIE factors, SAI, learning styles, and personality traits were then performed to examine the relationships among these variables (sex differences were also examined). As can be seen in Table 3, TIE factors showed a very similar pattern of association with key variables. Significant, albeit weak, associations were observed between all TIE factors and SAI (*r* range .17–.23).The strongest and most consistent associations were observed between TIE factors, two learning styles, and one personality trait. All TIE factors were found to be positively associated with SPQ-D and openness, and negatively related to SPQ-S. Small associations between three of the TIE factors and SPQ-A were also observed. Moreover, none of the factors were related to extraversion, but two (intellectual avoidance and direct complex problem solving) were found to be significantly associated with neuroticism, one with agreeableness (intellectual pursuits as a primary focus), and one with conscientiousness

Table 2. Descriptive statistics and nationality comparison for all variables.

	Total sample	*M* (*SD*) British *n* = 185	American *n* = 143	*t*	*d*
Reading and information seeking	44.73(10.46)	45.16(9.88)	44.18(11.17)	0.83	0.09
Intellectual avoidance	52.01 (7.70)	53.27(7.08)	50.39(8.19)	3.39**	0.37
Directed complex problem solving	36.28 (6.16)	37.43(5.99)	34.80(6.09)	3.91**	0.43
Abstract thinking	49.14 (7.86)	50.74(7.38)	47.06(8.00)	4.31**	0.47
Intellectual pursuits as a primary focus	48.93 (7.00)	50.15(6.39)	47.34(7.44)	3.66**	0.40
SAI	7.51 (4.85)	3.99(.49)	3.77(.54)	3.71**	0.41
SPQ-S	47.63 (6.99)	45.24(6.77)	50.82(5.96)	–7.70**	0.85
SPQ-D	46.95 (7.76)	46.77(7.77)	46.14(7.76)	0.72	0.08
SPQ-A	47.33 (7.26)	46.52(7.46)	48.38(6.88)	–2.30*	0.25
Neuroticism	35.27 (6.57)	34.42(5.81)	36.36(7.32)	–2.66**	0.29
Extraversion	41.56 (5.80)	40.60(5.11)	42.80(6.39)	–3.46**	0.38
Openness	37.93 (5.51)	37.29(4.47)	38.75(6.55)	–2.38*	0.26
Agreeableness	31.58 (5.58)	32.89(4.68)	29.86(6.18)	5.03**	0.55
Conscientiousness	42.59 (5.26)	41.73(4.44)	43.71(6.00)	–3.42**	0.37

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

(intellectual avoidance). Nevertheless, the correlations between TIE factors and the latter three personality traits (i.e. neuroticism, agreeableness, and conscientiousness) were all weak (*r* range .13–.18) and, therefore, do not represent a striking pattern of correlations between factors and key variables.

Given the significant mean difference between British and American participants in scores on the majority of the assessed variables, partial correlations controlling for nationality were also computed. All associations remained unaltered, except for the correlation between direct complex problem solving and extraversion, which increased to $r = .12$ ($p < .05$), and the correlation between intellectual pursuit as primary focus and agreeableness, which dropped to $r = .09$ (n.s.).

Discussion

This study attempted to test the dimensional structure of TIE and how its factors relate to the Big Five personality traits, SAI, and learning approaches (Goff & Ackerman, 1992). As regards the dimensionality of TIE, in line with Ferguson's (1999) theory a five-factor solution best explained the structure of this measure. All factors showed evidence of good reliability, except for 'intellectual pursuits as a primary focus'. It is noteworthy that this dimension has already been referred to by Ferguson (1999) as the weakest dimension of TIE. Nevertheless, it significantly and moderately correlated with all other factors, supporting its inclusion in the model as a standalone factor.

Correlations between the TIE factors and personality traits, SAI, and learning approaches were in line with predictions and, where available, previous results. Thus, all TIE factors were significantly and positively linked to deep learning, openness, and

Table 3. Bivariate correlations between TIE factors and variables of interest.

	6	7	8	9	10	11	12	13	14	15
1 Reading and information seeking	.08	.17**	−.19**	.46**	.15**	.01	−.01	.27**	.07	.08
2 Intellectual avoidance	−.01	.20**	−.42**	.41**	.14*	−.18**	.08	.27**	.02	.17**
3 Directed complex problem solving	−.06	.23**	−.21**	.48**	.13*	−.13*	.07	.27**	.10	.04
4 Abstract thinking	−.02	.18**	−.32**	.51**	−.05	−.06	.03	.45**	.04	−.07
5 Intellectual pursuits as a primary focus	−.06	.18**	−.34**	.48**	.04	−.05	−.01	.32**	.13*	.01
6 Sex (M: n = 157; F: n = 171)		.10	.08	−.04	.03	.09	.11*	.18**	−.27**	.21**
7 SAI			.08	.18**	.18**	−.15**	.13*	.14*	−.03	.20**
8 SPQ-S				−.07	.36**	.22**	.15**	−.06	−.12*	.16**
9 SPQ-D					.35**	−.06	.11	.22**	.11*	.10
10 SPQ-A						−.10	.16**	−.15**	−.03	.49**
11 Neuroticism							−.27**	.16**	.20**	−.21**
12 Extraversion								−.03	−.22**	.20**
13 Openness									−.11*	.10*
14 Agreeableness										−.28**
15 Conscientiousness										

Note: N range 296–328; *p < .05;**p < .01; TIE = Typical Intellectual Engagement scale; SAI = self-assessed intelligence; SPQ = Study Process Questionnaire; S = Surface; D = Deep; A = Achievement. Sex was coded 1 = Male, 2 = Female.

SAI, and negatively linked to surface learning. Other correlations between TIE and the examined constructs of intellectual competence were largely factor-dependent and weaker – including the previously reported link between TIE and conscientiousness. In all, the current correlations support the view of TIE as a separate construct distinct from openness, SAI, and learning approaches, although there was considerable overlap between some TIE factors and some approaches to learning factors. In particular, individuals who aim to learn the minimum amount required to pass (i.e., surface learners) are likely to have lower TIE levels than those who have intrinsic motivation and engagement with the subject matter (i.e., deep learners), which is line with previous correlations found between learning approaches and openness (Duff et al., 2004; Zhang, 2003). That said, the current correlations are indicative of the conceptual differences between openness and TIE, as openness was only modestly related to learning approaches whereas TIE factors were moderately to highly correlated with learning approaches (notably deep and surface). On the other hand, the achievement approach to learning was more weakly related to TIE, suggesting that more goal-orientated, pragmatic, and performance-driven students may be more interested in final results (i.e., academic grades) than in intellectual investment (i.e., TIE). This is also consistent with the association found between the achievement approach to learning and conscientiousness.

Although examination of intercorrelations between personality factors was not a primary focus of the present research, it is noteworthy that in the current sample agreeableness was negatively related to conscientiousness, openness, and extraversion. Although some studies have also found negative associations between agreeableness and openness (Barrick & Mount, 1993), and between agreeableness and extraversion (Digman, 1994), this is not a consistent finding in the literature (Rushton & Irwing, 2008). The negative association with conscientiousness is also not in line with most of the studies of Big Five traits (Costa et al., 1991), and additional lower-factor analyses are needed to understand these results fully.

Despite the limitations of the current study, which examined single-wave data from a small student-based sample and included no measure of maximal intelligence or academic performance, the results provide partial support for previous findings on the dimensionality of TIE as the five-factor structure was replicated (Ferguson, 1999), and two factors were collapsed onto one broader dimension. In addition, despite having assessed a heterogenic sample, comprising both British and American students, results revealed that the TIE structure, and its relationship to learning approaches and self-assessed intelligence, was consistent across nationalities. More importantly, the associations of the TIE factors with other self-report indicators of intellectual competence suggest that TIE, SAI, openness, and learning approaches are coherently related such that they may represent a nomological network of investment-related non-ability traits. TIE factors show a high degree of overlap with certain other factors, notably learning approaches, but in the case of openness and SAI there are now both conceptual and empirical reasons to expect that TIE factors make a unique contribution to the development of knowledge acquisition and intellectual competence.

Acknowledgement

The authors thank Eamonn Ferguson for kindly supplying unpublished data on the structure of the TIE scale.

Notes

1. Alternative solutions allowing intercorrelations higher than $r = .50$ were tested but revealed weaker parameters.
2. In the present study, model fitness was assessed by the following indexes: the chi-square statistic (Bollen, 1989) tests the hypothesis that an unconstrained model fits the covariance/correlation matrix as well as the given model, and ideally values should not be significant; the Tucker-Lewis coefficient (TLI;(Bentler & Bonett, 1980)) is a measure of goodness of fit, and typical values range between 0 and 1, with coefficients close to 1 indicating a very good fit; the comparative fit index (CFI; Bentler, 1990) compares the hypothesised model with a model in which all correlations among variables are zero, and values around .90 indicate very good fit; and the root mean square error of approximation (RMSEA; Browne & Cudeck, 1993), for which values of .08 or below indicate reasonable fit for the model.

References

Ackerman, P.L. (1996). A theory of adult intellectual development: Process, personality, interests, and knowledge. *Intelligence, 22,* 229–259.

Ackerman, P.L. (2000). Domain-specific knowledge as the "dark matter" of adult intelligence: Gf/gc, personality and interest correlates. *Journal of Gerontology: Psychological Sciences, 55B,* 69–84.

Ackerman, P.L., Bowen, K.R., Beier, M.B., & Kanfer, R. (2001). Determinants of individual differences and gender differences in knowledge. *Journal of Educational Psychology, 93,* 797–825.

Ackerman, P.L., & Goff, M. (1994). Typical intellectual engagement and personality: Reply to Rocklin (1994). *Journal of Educational Psychology, 86,* 171–204.

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

Ackerman, P.L., Kanfer, R., & Goff, M. (1995). Cognitive and noncognitive determinants and consequences of complex skill acquisition. *Journal of Experimental Psychology: Applied, 1,* 270–304.

Ackerman, P.L., & Rolfhus, E.L. (1999). The locus of adult intelligence: Knowledge, abilities, and non-ability traits. *Psychology and Aging, 14,* 314–330.

Ackerman, P.L., & Wolman, S.D. (2007). Determinants and validity of self-estimates of abilities and self-concept measures. *Journal of Experimental Psychology: Applied, 13,* 57–78.

Arbuckle, J., & Wothke, W. (1999). *AMOS 4 user's reference guide.* Chicago: Smallwaters Corporation.

Barrick, M.R., & Mount, M.K. (1993). Autonomy as a moderator of the relationship between the Big Five personality dimensions and job performance. *Journal of Applied Psychology, 78,* 111–118.

Beier, M.E., & Ackerman, P.L. (2001). Current events knowledge in adults: An investigation of age, intelligence and non-ability determinants. *Psychology and Aging, 16,* 615–628.

Bentler, P.M. (1990). Comparative fit indexes in structural models. *Psychological Bulletin, 107,* 238–246.

Bentler, P.M., & Bonett, D.G. (1980). Significance tests and goodness of fit in the analysis of covariance structures. *Psychological Bulletin, 88,* 588–606.

Biggs, J. (1987). *Student approaches to learning and studying.* Melbourne: Australian Council for Educational Research.

Bollen, K.A. (1989). *Structural equations with latent variables.* New York: Wiley.

Browne, M.W., & Cudeck, R. (1993). Alternative ways of assessing model fit. In K.A. Bollen & J.S. Long (Eds.), *Testing structural equation models* (pp. 136–162). Newbury Park, CA: Sage.

Carroll, J.B. (1993). *Human cognitive abilities: A survey of factor-analytic studies.* New York: Cambridge University Press.

Cattell, R.B. (1987). *Intelligence: Its structure, growth, and action.* Amsterdam, the Netherlands: North Holland.

Chamorro-Premuzic, T. (2007). *Personality and individual differences.* Oxford, UK: Blackwell.

Chamorro-Premuzic, T., & Arteche, A. (2008). Intellectual competence and academic performance: Preliminary validation of a model. *Intelligence, 36,* 564–573.

Chamorro-Premuzic, T., & Furnham, A. (2003). Personality traits and academic exam performance. *European Journal of Personality, 17,* 237–250.
Chamorro-Premuzic, T., & Furnham, A. (2005). *Personality and intellectual competence.* Mahwah, NJ: Lawrence Erlbaum Associates.
Chamorro-Premuzic, T., & Furnham, A. (2006a). Intellectual competence and the intelligent personality: A third way in differential psychology. *Review of General Psychology, 10,* 251–267.
Chamorro-Premuzic, T., & Furnham, A. (2006b). Self-assessed intelligence and academic performance. *Educational Psychology, 26,* 769–779.
Chamorro-Premuzic, T., & Furnham, A. (2008). Personality, intelligence and approaches to learning as predictors of academic performance. *Personality and Individual Differences, 44,* 1596–1603.
Chamorro-Premuzic, T., Furnham, A., & Ackerman, P.L. (2006a). Incremental validity of the Typical Intellectual Engagement Scale as predictor of different academic performance measures. *Journal of Personality Assessment, 87,* 261–268.
Chamorro-Premuzic, T., Furnham, A., & Ackerman, P.L. (2006b). Ability and personality correlates of general knowledge. *Personality and Individual Differences, 41,* 419–429.
Chamorro-Premuzic, T., Furnham, A., & Lewis, M. (2007). Personality and approaches to learning predict preference for different teaching methods. *Learning and Individual Differences, 17,* 241–250.
Costa, P.T., Jr., & McCrae, R.R. (1992). *Revised NEO Personality Inventory (NEO-PI-R) and NEO Five-Factor Inventory (NEO-FFI): Professional manual.* Odessa, FL: Psychological Assessment Resources.
Costa, P.T., Jr., McCrae, R.R., & Dye, D.A. (1991). Facet scales for agreeableness and conscientiousness: A revision of the NEO Personality Inventory. *Personality and Individual Differences, 12,* 887–898.
Digman, J.M. (1994). Child personality and temperament: Does the five factor model embrace both domains? In C.F. Halverson, G.A. Kohnstamm, & R.P. Martin (Eds.), *The developing structure of temperament and personality from infancy to adulthood* (pp. 323–338). Hillsdale, NJ: Erlbaum.
Duff, A. (2004). The role of cognitive learning styles in accounting education. *Journal of Accounting Education, 22,* 29–52.
Duff, A., Boyle, E., Dunleavy, J.F., & Ferguson, J. (2004). The relationship between personality, approach to learning and academic performance. *Personality and Individual Differences, 36,* 1907–1920.
Ferguson, E. (1999). A facet and factor analysis of typical intellectual engagement (TIE): Associations with locus of control and the five factor model of personality. *Journal of Social Behavior and Personality, 27,* 545–562.
Goff, M., & Ackerman, P.L. (1992). Personality–intelligence relations: Assessment of typical intellectual engagement. *Journal of Educational Psychology, 84,* 537–553.
O'Connor, M.C., & Paunonen, S.V. (2007). Big Five personality predictors of post-secondary academic performance. *Personality and Individual Differences, 43,* 971–990.
Reeve, C., Meyer, R., & Bonaccio, S. (2006). Intelligence–personality associations reconsidered: The importance of distinguishing between general and narrow dimensions of intelligence. *Intelligence, 34,* 387–402.
Rocklin, T. (1994). Relation between typical intellectual engagement and openness: Comment on Goff and Ackerman (1992). *Journal of Educational Psychology, 86,* 145–149.
Rushton, P., & Irwing, P. (2008). A general factor of personality (GFP) from two meta-analyses of the Big Five: Digman (1997) and Mount, Barrick, Scullen, and Rounds (2005). *Personality and Individual Differences, 45,* 679–683.
Woo, S., Harms, P., & Kuncel, N. (2007). Integrating personality and intelligence: Typical intellectual engagement and need for cognition. *Personality and Individual Differences,* 1–5.
Zhang, L. (2003). Does the Big Five predict learning approaches? *Personality and Individual Differences, 43,* 1635–1639.