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Comparing the Eysenck and HEXACO Models of Personality in the Prediction of Adult Delinquency†

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Abstract: Drawing from self and peer reports of personality, the present study compares the structures of the HEXACO and Eysenck models of personality and the models' capacity to predict self reported acts of delinquency. Correlations amongst scales revealed that Psychoticism captures elements of both HEXACO Emotionality and Conscientiousness. The Eysenck Lie scale correlated positively with both self and peer reported HEXACO Honesty–Humility and Conscientiousness, suggesting that this validity scale includes substantive variance relating to the latter factors. Regression analyses of personality data from both rater sources revealed that Honesty–Humility and Psychoticism were strong predictors of delinquency that independently offered substantial incremental validity. For self reports, the Extraversion and Lie scales were also strong unique predictors of delinquency. Copyright © 2011 John Wiley & Sons, Ltd.

Key words: big five; delinquency; Eysenck; HEXACO; peer report

An adequate description of personality structure is arguably a useful foundation from which to develop theories explaining the underlying causal mechanisms of personality. Much personality research has focused on the goal of developing a parsimonious but comprehensive system of personality but given the ambiguity of the criteria for an adequate model, not to mention the complexity of human personality, this has proven to be a difficult task. Models and taxonomies that have emerged in the personality literature tend to vary in the number and the content of the dimensions they use to describe personality, and often distinct traits identified in one model merge into single dimensions within another (e.g. Wilson & Herrnstein, 1986). In the present paper, we seek to improve our knowledge of personality structure by comparing H. J. Eysenck and Eysenck's (1976) very well-established PEN personality taxonomy to Ashton and Lee's (2001, 2007, 2008) emerging six-factor HEXACO model. In doing so, we first undertake correlational analyses of self and peer reports of personality to ascertain the relative positioning of the PEN factors within the HEXACO space and then follow this up by comparing the capacity of both models to predict self reported adult delinquent behaviours (e.g. driving offenses, vandalism, assault and drug use).

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THE HEXACO MODEL OF PERSONALITY

Recently, Ashton, Lee, Perugini et al. (2004) have argued that factor analyses of descriptive traits in a variety of different languages and cultures in fact reveal a six-factor structure that is more robust than the traditional Big Five (B5) structure (see also Ashton, Lee, & Goldberg, 2004). On the basis of these and other findings, Lee and Ashton (2004) developed what is now termed the HEXACO model of personality. The HEXACO describes personality using the six dimensions of Honesty–Humility, Emotionality, eXtraversion, Agreeableness, Conscientiousness and Openness. Three of the HEXACO and B5 factors, Extraversion, Conscientiousness and Openness are essentially analogous to one another. HEXACO Emotionality and Agreeableness, however, represent rotational variants of B5 Neuroticism and Agreeableness. Specifically, HEXACO Agreeableness includes elements of irritability and temper which are generally included within the B5 Neuroticism factor and hence it is often now referred to as 'Agreeableness (versus Anger)' (Ashton & Lee, 2007; Ashton & Lee, 2008). By contrast, HEXACO Emotionality includes elements of sentimentality and sensitivity, which are generally included within B5 Agreeableness (Lee & Ashton, 2004). As such, individually, HEXACO and B5 Agreeableness describe different variance in personality, as do HEXACO Emotionality and B5 Neuroticism. Collectively, however, the two respective factors within each model account for much of the same variance in personality.

In contrast to the remaining five factors, the Honesty–Humility factor has no direct analog within the B5 factor space. This factor measures the extent to which an individual is willing to engage in insincere and 'unfair' behaviours, and the extent to which an individual seeks wealth and high

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apparent status (Lee & Ashton, 2004). The Honesty–Humility factor is therefore hypothesized to capture new variance in personality that is not adequately accounted for by the B5.

EYSENCK THREE-FACTOR MODEL

The Eysenck three-factor model of personality is somewhat more parsimonious than the HEXACO in that it utilizes only three dimensions of Psychoticism, Extraversion and Neuroticism (PEN). Rather than evolving from studies of descriptive traits, these dimensions are thought to reflect underlying biological processes that are associated with individual differences in ability to learn and condition (Eysenck & Eysenck, 1976).

The Extraversion and Neuroticism factors are essentially analogous to their B5 counterparts, though this has not always been the case for Extraversion, which at one point included elements of impulsivity (Costa & McCrae, 1995). The Psychoticism factor has been somewhat more contentious, however, particularly in relation to where it sits within the B5 personality space. The Psychoticism scale was originally designed to measure vulnerability to psychotic mental illness and a tendency to engage in sociopathic behaviour (Eysenck & Eysenck, 1968). Empirical studies reveal, however, that Psychoticism scales are strongly correlated with both Agreeableness and Conscientiousness (Aluja, Garcia, & Garcia, 2002; Aziz & Jackson, 2001; Costa & McCrae, 1995; McCrae & Costa, 1985). While proponents of both models tend not to dispute this observation, it is the underlying mechanisms underpinning these correlations that are contested. Eysenck (1992), for example, has argued that Agreeableness and Conscientiousness represent sub-factors of Psychoticism whereas Costa and McCrae (1992, 1995) regard Psychoticism as a conflation of the two, and maintain that a more informative picture of personality is obtained from the separation of the two factors.

THE EYSENCK LIE SCALE

Though not part of the Eysenck personality model as such, most inventories designed to measure the PEN factors also include a fourth component, termed the 'Lie' scale. This scale was initially intended to detect socially desirable responding, however, it appears to also capture some substantive variation in personality (McCrae & Costa, 1983). For example, in several studies across nations, Francis and colleagues (Francis, 1991; Francis, Brown, & Pearson, 1991; Francis, Philipchalk, & Pearson, 1991; Katz & Francis, 1991) found the Lie scale of the Eysenck personality questionnaire (Eysenck & Eysenck, 1975) to be two-dimensional, with one dimension reflecting social conformity and the other being more similar to that which would detect faking behaviour. McCrae & Costa (1985) also observed negative correlations between *self* report Lie scores and *peer* report Neuroticism and Openness, as well as a positive correlation with peer report Conscientiousness. Further, Riemann & Kandler (2010) cite a study by Angleitner, Riemann, and Strelau (1997), where self and peer reports on the Lie scale were collected and found to converge quite strongly ($r = .47$). Collectively, these observations reinforce the hypothesis that the Lie scale captures substantive personality variance.

PEN IN THE HEXACO SPACE

To summarize the above, it appears from the literature that Psychoticism captures variance within the B5 Agreeableness and Conscientiousness factors whereas the Lie scale captures variance attributable to Neuroticism, Conscientiousness and Openness. Little is known, however, about where the Lie and Psychoticism scales of the PEN model will fit within the HEXACO space, and no research known to the present authors has evaluated both models within a single sample. In the present study, we therefore explore the structure of the PEN factors and the Lie scale in the context of the HEXACO space, with some predicted outcomes articulated below.

Psychoticism

Recall that the HEXACO includes rotational variants of B5 Neuroticism and Agreeableness. The orientation of these two factors may hold important implications for the positioning of Psychoticism within the HEXACO space. Indeed, the Emotionality factor includes content around sentimentality and dependence on others whereas the Psychoticism factor comprises content around tough-mindedness and independence from societal norms. It therefore seems likely that the elements of the Psychoticism domain that correlate with B5 Agreeableness will instead emerge as negative correlates of HEXACO Emotionality. In contrast, the negative relationship observed by others between B5 Conscientiousness and Psychoticism is expected to persist in the HEXACO space.

Lie scale

Visual inspection of items in the Lie scale of the Eysenck personality questionnaire—revised short scale (EPQ-R), which was used in this study, reveals many which include content around taking advantage of, blaming, and taking property from, others, cheating, and taking more than one's fair share. In the Lie scale, it is assumed that individuals who do not endorse these reverse-keyed items are responding in a false and socially desirable manner (i.e. that they are 'lying'). The content of these items appears, however, to overlap considerably with content within the Honesty–Humility factor around fairness, specifically the lower pole. As such, a failure to endorse these reverse-keyed items would instead be indicative of *higher* levels of Honesty–Humility. We therefore predicted that the Lie scale would correlate positively with the Honesty–Humility factor, despite the apparent contradiction in the two scale labels.

Many of the remaining items of the Lie scale refer to concepts such as 'good habits', not putting things off, keeping promises and practicing what one preaches, where

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endorsement is assumed to reflect socially desirable responding, or 'lying'. This content appears, however, to be closely and positively related to that represented by the Conscientiousness factor, thus the Lie scale was also predicted to correlate positively with the Conscientiousness factor scale. Inspection of the remaining Lie scale items did not reveal any obvious content around Openness nor Neuroticism, thus, despite previous research finding links between the Lie scale and these two factors (McCrae & Costa, 1983), in this study we did not expect to find any.

PERSONALITY CORRELATES OF DELINQUENCY

Another useful method for comparing the utility of two personality models is through the evaluation of their respective capacities to predict individual differences in a target behaviour; which, in the present study, is self reported adult delinquency. In contrast to research which has sought to explain delinquency through social-economic factors (e.g. Heaven, 1994; Wilson & Herrnstein, 1986), considerably more success has been met in identifying links between personality traits and delinquent proclivities.

Within the B5 space, studies have typically identified Agreeableness and Conscientiousness as the factors most robustly associated with delinquency and, more broadly, antisocial behaviours. These two factors seem to emerge as strong predictors irrespective of whether correlational (e.g. Heaven, 1996; Mak, Heaven, & Rummery, 2003; see meta-analysis by Miller & Lynam, 2001) or between-group comparison methods are used (e.g. Le Corff & Toupin, 2009; van Dam, Janssens, & De Bruyn, 2005). Further, recent studies which have specifically employed the HEXACO model have also provided evidence that the Honesty–Humility factor exhibits strong incremental validity over and above the remaining five factors in the prediction of delinquent-type behaviours (see Ashton, Lee, & Son, 2000; Lee, Ashton, & de Vries, 2005; Lee, Ashton, & Shin, 2005; Lee, Gizzarone, & Ashton, 2003).

In the context of the PEN model, Eysenck and Eysenck's (1976) theory of antisocial behaviour states that delinquency should emerge as a product of inadequate socialization (i.e. the process of acquiring a conscience and learning the rules of socially acceptable behaviour). According to the theory, Extraverts are posited to be more susceptible to poor socialization as the associated lower levels of cortical arousal will lead to lower levels of learning and conditioning and consequent shaping of behaviour. This learning deficit is also expected to be exacerbated to the extent that an individual is also high on Neuroticism, due to the associated anxiety (Eysenck & Eysenck, 1977). In practice, however, consistent empirical support for the links of Extraversion and Neuroticism with delinquency has not been forthcoming (Aleixo & Norris, 2000; Daderman, 1999; Heaven & Virgen, 2001; van Dam, De Bruyn, & Janssens, 2007). Indeed, Cale's (2006) recent meta-analysis revealed only a negligible relationship between the broader construct of antisocial behaviour and Extraversion ($\rho = .09$), and a weak relationship involving Neuroticism ($\rho = .19$).

In contrast, the Psychoticism dimension, which curiously does not fit easily into the Eysencks' *theory* of antisocial behaviour, is that which seems to demonstrate the most robust relationship with delinquency. This relationship has been replicated in numerous studies using varied samples and measures (e.g. Aleixo & Norris, 2000; Daderman, 1999; Eysenck & Eysenck, 1970; Eysenck & Eysenck, 1971; Eysenck & Eysenck, 1977; Heaven, 1993; Heaven, 1994; Heaven, 1996). Both Miller & Lynam (2001) and Cale's (2006) meta-analyses reinforced these findings, where the correlation between Psychoticism (and other similar factors) and antisocial behaviour was estimated at $\rho = .39$.

SUMMARY AND HYPOTHESES

Summarizing the above, it appears from the extant literature that the personality factors that are likely to each *correlate* with self reported delinquency are Conscientiousness, Honesty–Humility, B5 Agreeableness and Psychoticism. It is somewhat less clear, however, exactly which of these correlations will persist in the context of a regression model containing the full HEXACO and PEN factors. To the extent that Psychoticism indeed represents merely a conflation of Conscientiousness and Agreeableness (or in the case of HEXACO, Emotionality), one would expect that its presence in a model containing the other two factors will be redundant (and vice versa). In such a case, we would expect that the three factors, whilst being collectively predictive of delinquency, would each fail to uniquely contribute to its prediction.

Though Honesty–Humility's theoretical orthogonality to the remaining five HEXACO factors should see it remain a significant predictor in the presence of the remaining five, it is not clear if such a relationship will persist in a model which includes Psychoticism. Nonetheless, we hypothesize here, on the basis of past studies showing Honesty–Humility to offer incremental validity over the B5 (e.g. Lee et al., 2003), that it will in this case uniquely contribute to the prediction of self reported delinquency.

METHOD

Participants

Initial contact was made with participants using three different methods and each participant who volunteered after initial contact was asked to recruit another person whom they felt they knew well enough to describe accurately to another person. First year psychology students were contacted via a course website and received course credit points in exchange for participation. Thirty-seven responses, including those from nominated peers, were obtained through this method. Second, third and fourth year psychology students were contacted via email (resulting in 87 responses) and other participants were recruited through visits to student residences (resulting in 26 responses). The total sample size was therefore 150 participants (52 male and 98 female),

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however, peer reports were not received for four participants, leaving a sample size of 146 for any associated analyses. Participants' ages ranged from 15 to 75 years, with a mean age of 23.55 years ($SD = 10.14$) and median age of 21 years. The majority (85%) of the participants were aged between 17–26 years. Most participants (67%) were friends with their nominated peers, whereas many (26%) were in a romantic relationship with their nominated peer. Eighteen per cent were genetically related to their nominated peers (either siblings or parents/children).

Measures

Adapted self reported delinquency

The self report delinquency scale (SRDS) in the present study was an adapted version of the juvenile delinquency measure developed by Mak (1993), which presents participants with a list of delinquent behaviours and asks them if they had engaged in the listed behaviours in the previous 12 months (e.g. 'In the past twelve months have you stolen money of $10 or more in one go?'). Items are summed to provide an overall score. Several items were removed from the original scale due to being specific to minors and others were added pertaining to traffic offenses and armed robbery. The adapted scale comprised a total of 32 items. Cronbach's α coefficient for the adapted SRDS was .84.

Short HEXACO personality inventory

The six factors of the HEXACO model were measured using a shorter version of the HEXACO personality inventory (HEXACO-PI), which consists of ten items per scale. Research indicates that the convergent correlations of factor scales across the longer and shorter versions of the HEXACO-PI are high, exceeding .90 (Lee, Ashton & de Vries, 2005). Cronbach's α coefficients for the HEXACO-PI are presented in Table 1 and they ranged from .72 (Honesty–Humility) to .85 (Extraversion) for self reports and .83 (Openness) to .89 (Agreeableness) for peer reports. Participants were instructed to report the accuracy of each statement as descriptions of their personality using a five-point response scale (1 = 'strongly disagree' to 5 = 'strongly agree'). Across all self reports, only six missing responses were observed. To obtain scale scores for these individuals, the missing responses were replaced by the mean of the participant's responses to the remaining items of the scale.

For the peer reporting, the statements were altered slightly to reflect the peer reporting nature of the task (e.g. 'In conversations, *he/she* usually does more talking than other people do'), and participants were asked to indicate the accuracy of each statement as descriptions of their peer's personality using the same response scale as above. In the adaptation of the HEXACO-PI from self report to peer report, two items from the Honesty–Humility scale were incorrectly worded due to a clerical error and were not included in any analyses. Despite this, the Cronbach's α coefficient for this reduced scale remained sound (.75). Across the peer reports, there were 34 missing responses but 26 of these were attributable to a single individual so this individual's HEXACO peer reports were removed altogether from further analyses, leaving a sample size of 145 peer reports. Otherwise, to obtain scale scores, missing responses were replaced by the mean of the individual's responses to the remaining items of the associated scale.

Eysenck personality questionnaire—revised short scale

The Eysenck personality questionnaire—revised short scale (EPQ-R) contains 48 items, divided into three 12-item scales that measure the PEN dimensions and a fourth 12-item Lie scale (Eysenck & Eysenck, 1991). This measure contains both positively and negatively keyed items to which agreement is indicated with a 'Yes' or 'No' response. Visual inspection of the items from the Psychoticism scale revealed one item ('Would you take drugs which may have a strange or dangerous effect?') that was very similar to two in the delinquency scale pertaining to the actual use of illegal hard drugs and marijuana. This item correlated very strongly with the self reported delinquency measure ($r = .59$, and $r = .55$ for self and peer report data, respectively), and so it was removed when computing scale scores for the regression analyses, due to concerns around tautology. Items were summed to give final scores on each subscale.

Each participant completed the original self report version of the EPQ-R, as well as an adapted peer report version, though the Lie scale was excluded from the peer version. There were a total of six missing responses in the self reports and 11 in the peer reports. No individual had more than one associated missing response and all were scored as zero. Cronbach's α internal consistency coefficients for the EPQ scales are presented in Table 1 and ranged from .72 (Psychoticism) to .88 (Extraversion) for self reports and .78 (Psychoticism) to .89 (Extraversion) for peer reports.

Procedure

Testing of first year psychology students was conducted in pairs on campus. One participant from each pair was then taken to a separate room so participants could not see each other's responses. Participants took between 15 and 40 minutes to complete the questionnaires. Upon completion of the questionnaires participants were thanked and debriefed. The remaining participants were given a package containing information sheets, consent forms, questionnaires and reply paid envelopes. Consent forms and questionnaires were returned via mail to the experimenter.

RESULTS

Descriptive statistics and intercorrelations

Descriptive statistics, coefficient alphas and intercorrelations for all self and peer report scales are presented in Table 1. Where there is ambiguity in the source of reports in the

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Table 1. Means, standard deviations, intercorrelations and alpha coefficients for all self and peer report variables

	Mean	*SD*	Sex	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1. Delinquency Self—HEXACO	3.28	3.57	−.36	(.82)																			
2. Self H-H	3.29	.61	.30	−.54	(.72)																		
3. Self Emo	3.16	.72	.52	−.39	.30	(.83)																	
4. Self Ext	3.35	.75	.17	.21	−.11	.06	(.88)																
5. Self Agree	2.93	.72	−.03	−.23	.31	.02	−.07	(.85)															
6. Self Consc	3.08	.74	.14	−.29	.22	.16	−.08	−.02	(.82)														
7. Self Open	3.53	.68	.12	−.14	.14	−.01	.04	.11	.22	(.81)													
Self-PEN																							
8. Self PEN—Psy*	3.01	2.26	−.38	.58	−.31	−.54	.14	−.16	−.41	−.06	(.72)												
9. Self PEN—Ext	8.55	3.46	.10	.25	−.16	−.01	.77	.00	−.17	−.03	.10	(.88)											
10. Self PEN—Neu	5.25	3.25	.27	−.18	.09	.59	−.19	−.17	.04	−.05	−.39	−.20	(.81)										
11. Self PEN—Lie	3.99	2.50	.17	−.44	.33	.13	.04	.18	.26	.03	−.32	.03	−.07	(.70)									
Peer—HEXACO																							
12. Peer H-H	3.29	.71	.17	−.60	.51	.14	−.19	.28	.14	.13	−.28	−.20	.06	.19	(.85)								
13. Peer Emo	3.10	.71	.49	−.28	.17	.66	.01	.03	.04	.03	−.39	−.01	.47	.15	.03	(.84)							
14. Peer Ext	3.48	.73	.21	.15	−.04	.00	.66	−.12	−.13	.00	.10	.60	−.14	−.07	−.13	.01	(.87)						
15. Peer Agree	2.95	.85	−.02	−.28	.17	.16	−.14	.60	−.11	−.04	−.18	−.11	.05	−.03	.54	−.06	−.18	(.89)					
16. Peer Consc	3.16	.79	.33	−.47	.33	.25	−.17	.11	.69	.19	−.47	−.21	.20	.28	.44	.13	−.09	.18	(.86)				
17. Peer Open	3.32	.71	.08	−.18	.16	−.06	−.06	.16	.22	.68	−.04	−.15	−.06	−.06	.28	−.04	−.05	.10	.28	(.83)			
Peer—PEN																							
18. Peer PEN—Psy*	3.52	2.62	−.33	.56	−.32	−.54	.15	−.30	−.33	−.02	.70	.17	−.36	−.33	−.46	−.43	.20	−.41	−.53	−.08	(.78)		
19. Peer PEN—Ext	9.18	3.36	.16	.17	−.05	−.03	.60	−.01	−.25	−.05	.10	.68	−.14	.02	−.07	−.02	.77	−.05	−.14	−.05	.16	(.89)	
20. Peer PEN—Neu	3.64	3.12	.19	−.03	.02	.35	−.14	−.18	.12	.00	−.18	−.13	.43	.02	−.17	.54	−.25	−.31	.00	−.08	−.15	−.21	(.82)

Notes: $n = 150$ for all self reported variables, 146 for all peer reported PEN variables, and 145 for all peer reported HEXACO variables; $p < .05$ for $|r|$ greater than .16; $p < .01$ for $|r|$ greater than .21; figures along the diagonal in parentheses are coefficient alphas; males were coded as 1 and females as 2; H-H = Honesty–Humility, Emo = Emotionality, Ext = Extraversion, Agree = Agreeableness, Consc = Conscientiousness, Open = Openness, Psy = Psychoticism, Neu = Neuroticism.

*One item pertaining to drug use is omitted from the Psychoticism scale.

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correlations reported here, the subscripts *s* and *p* are provided to reflect self and peer reports, respectively.

Within-inventory correlations

Correlations amongst scales from the same personality inventory tended to be small in both self and peer report measures. There were two exceptions to this, however, with peer reported Agreeableness and Conscientiousness both correlating strongly with peer reported Honesty–Humility ($r_p = .54, .44$, respectively, both $p < .01$). The observation of large inter scale correlations in peer reports is fairly consistent with previous research into peer personality reports, particularly in relation to scales capturing B5 Agreeableness, Neuroticism and Conscientiousness (Beer & Watson, 2008).

Self-peer report correlations

The correlations between self and peer reports on the same HEXACO traits were very strong on all scales barring a relatively moderate correlation for Honesty–Humility ($r = .51$, $p < .01$). Nonetheless, all were comparable to those observed in other studies comparing self to 'other' reports (e.g. Watson, Hubbard, & Wiese, 2000). For the PEN, Psychoticism and Extraversion provided strong self-peer report convergence ($r = .70, .68$ respectively, both $p < .01$) whereas the correlations between peer and self reports on the Neuroticism scale was somewhat more modest ($r = .43$, $p < .01$).

Cross-inventory correlations

As expected, strong correlations were observed between HEXACO Extraversion and PEN Extraversion for both self and peer reports ($r_s = .77$, $r_p = .77$, both $p < .01$). Additionally, and also as expected, Neuroticism correlated strongly with Emotionality for self and peer reports ($r_s = .59$, $r_p = .54$, both $p < .01$) but somewhat more modestly with Agreeableness ($r_s = -.17$, $p < .05$, $r_p = -.31$, $p < .01$). Self and peer reported Psychoticism correlated strongly and negatively with Emotionality ($r_s = -.54$, $r_p = -.43$, both $p < .01$), Conscientiousness ($r_s = -.41$, $r_p = -.53$, both $p < .01$) and Honesty–Humility ($r_s = -.31$, $r_p = -.46$, both $p < .01$). Interestingly, a large difference was observed between the self and peer correlations between Psychoticism and Agreeableness ($r_s = -.16$, *ns*, vs. $r_p = -.41$, $p < .01$). As hypothesized, the Lie scale correlated positively and moderately with self and peer reported Conscientiousness ($r_s = .26$, $r_p = .28$, both $p < .01$) as well as self reported Honesty–Humility ($r_s = .33$, $p < .01$).

Correlations with self reported delinquency

Self reported delinquency correlated significantly and negatively with self and peer reported Honesty–Humility ($r_s = -.54$, $r_p = -.60$, both $p < .01$), Agreeableness ($r_s = -.23$, $r_p = -.28$, both $p < .01$), Conscientiousness ($r_s = -.29$, $r_p = -.47$, both $p < .01$) and Emotionality ($r_s = -.39$, $r_p = -.28$, both $p < .01$). Delinquency also correlated strongly and positively with self and peer reported Psychoticism ($r_s = .58$, $r_p = .56$, both $p < .01$) and sex ($r = -.36$, $p < .01$), with males providing higher delinquency scores than females.

Regression of self reported delinquency

To explore the predictive utility of the HEXACO and PEN models in the prediction of self reported delinquency, two sets of two-step hierarchical regression analyses were conducted, one for the self reports, the other for peer reports. In the first step, Sex was entered as a control variable. In the second step, the six HEXACO scales were entered along with the Psychoticism scale and, for self reports, the Lie scale. The PEN Neuroticism and Extraversion scales were not included in these analyses because, as noted above, they correlated very strongly with HEXACO Emotionality and Extraversion, respectively.

Table 2 shows the results of the hierarchical regression analyses, with squared part correlations (semi-partial correlations) included so as to determine the unique

Table 2. Hierarchical multiple regression of self reported delinquency on the self and peer reported HEXACO psychoticism scaled and self reported lie scale

	Self report ($n = 150$)			Peer report ($n = 145$)		
Criterion: Self reported delinquency	Step 1: Control (β)	Step 2: Full (β)	Squared part correlation	Step 1: Control (β)	Step 2: Full (β)	Squared part correlation
Sex	$-.360^{**}$	$-.110$	.008	$-.367^{**}$	$-.159$	.016
Honesty–humility		$-.280^{**}$	.055		$-.460^{**}$	.116
Emotionality		$-.052$	.002		$-.073$	.003
eXtraversion		$.161^{*}$	.023		.085	.006
Agreeableness		$-.040$	.001		.088	.005
Conscientiousness		.005	.000		$-.085$	.004
Openness		$-.065$	.004		$-.001$	.000
Psychoticism		$.321^{**}$	.053		$.237^{*}$	.025
Lie		$-.222^{*}$	.039	—	—	—
Multiple R^2	$.129^{**}$	$.544^{**}$	—	$.135^{**}$	$.514^{**}$	—
ΔR^2		$.415^{**}$	—		$.379^{**}$	—

Notes: $^{*}p < .01$, $^{**}p < .001$. Males were coded as 1 and females as 2.

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contribution of each predictor. For self reports, Honesty–Humility, Psychoticism, Extraversion and the Lie scale remained significant predictors of self reported delinquency. The significant zero-order correlations of HEXACO Agreeableness, Emotionality and Conscientiousness with self-report delinquency did not hold up in the presence of the other personality scales. Collectively, the eight scales accounted for an additional 41.5 per cent of the variance in self reported delinquency beyond sex ($\Delta F(8, 140) = 15.92$, $p < .001$). Honesty–Humility and Psychoticism each uniquely accounted for over 5 per cent of the variance, and the Lie scale uniquely accounted for a little under 4 per cent of the variance. Extraversion, which was not expected to emerge as a significant predictor uniquely accounted for approximately 2 per cent of the variance.

For the peer reports, only Psychoticism and Honesty–Humility remained significant predictors of self reported delinquency. The zero-order correlations between Emotionality, Agreeableness and self reported delinquency therefore failed to hold up in the presence of the remaining scales. Collectively, the seven peer report scales accounted for an additional 37.9 per cent of the variance in self reported delinquency beyond sex ($\Delta F(7, 136) = 15.14$, $p < .001$). Peer report Honesty–Humility emerged as a very strong predictor, uniquely accounting for almost 12 per cent of the variance in self reported delinquency. Psychoticism, in contrast, accounted for only 2.5 per cent of the variance.

DISCUSSION

This study presents the first known attempt at exploring the recently developed HEXACO and well-established PEN frameworks concurrently, whilst employing a combination of self and peer reports. Correlational analyses suggested that the Psychoticism scale at least partly comprises elements of Conscientiousness, Emotionality, and to a lesser extent, HEXACO Agreeableness. Nonetheless, it remained a strong predictor of self reported delinquency even in the presence of these three HEXACO factors, whether self or peer reports were used. The present study also provided empirical support for the uniqueness of Honesty–Humility, which for self reports clearly emerged as an independent factor, and for both self and peer reports, remained a strong unique predictor of self reported delinquency. There appears, however, to be some overlap in content between the Honesty–Humility factor and the Lie scale of the EPQ-R. The nuances of these results are discussed in more depth below.

PEN in the HEXACO space

Previous studies of the B5 and PEN have identified associations between Psychoticism and B5 Agreeableness (e.g. Costa & McCrae, 1995). The observation in the present study that this association was stronger for Emotionality than for Agreeableness (especially in self-reports), however, would suggest that the Psychoticism—B5 Agreeableness relationship is largely attributable to overlapping content on warmth, empathy and relating to others as opposed to content on quickness to anger and irritability. Indeed, such an interpretation is consistent with the essence of the Eysencks' preferred substitute term 'tough-mindedness', which they had recommended for use when discussing Psychoticism with non-psychologists (Eysenck & Eysenck, 1975). Even though the Psychoticism—Agreeableness relationship was present in the peer report data, the relationship between Psychoticism and Emotionality remained strong. We suggest here that to build a more complete picture of what Psychoticism is capturing within the HEXACO space, future research should be undertaken at a narrower facet level.

It was also interesting to observe very high correlations in the self reports between HEXACO Emotionality and PEN Neuroticism. If Emotionality and HEXACO Agreeableness are indeed rotational variants of B5 Agreeableness and Neuroticism, *and* if PEN Neuroticism is essentially equivalent to B5 Neuroticism, then it should have correlated roughly equally with HEXACO Emotionality and Agreeableness. The observed relationship between Psychoticism and Emotionality discussed immediately above would seem to support the former condition, indicating that PEN Neuroticism, as it is captured by the EPQ-R short scale, is instead capturing mostly Emotionality. Indeed, inspection of the items revealed only two items which refer to moodiness and irritability, whereas the remaining items referred to feelings of anxiety, guilt, helplessness and tension.

The lie scale

McCrae & Costa (1983) remarked that the Lie scale seemed to be capturing more 'substance than style' and we believe that at least some of this 'substance' is Honesty–Humility. One arguable interpretation for the correlation between the Lie and Honesty–Humility scales is that both scales simply measure a tendency to respond in a socially desirable manner. However, this interpretation is not consistent with the large observed *cross*-rater correlations involving the Lie scale (which correlated with peer reported Conscientiousness and Psychoticism) and Honesty–Humility (which exhibited reasonable self-peer convergence, as well as roughly equal correlations with delinquency across rater source). We suspect that the Eysencks, in their attempts to develop a scale designed to measure lying, may have, ironically, constructed a measure of something that resembles Honesty–Humility.

HEXACO, PEN and delinquency

For both self and peer reports, much of the HEXACO model's ability to predict self reported delinquency was due to the inclusion of the Honesty–Humility factor, suggesting that Honesty–Humility is not merely a redundant manifestation of Agreeableness or Conscientiousness. Indeed, the current findings add to a growing body of research suggesting that the six-factor HEXACO model of personality is a useful framework for drawing links between personality and delinquent and deviant behaviour. Furthermore, the finding that Honesty–Humility remained a strong predictor when the predictor and criterion variables were collected

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from different sources also refutes the possibility that Honesty–Humility is merely an indirect measure of social desirability, reinforcing Ashton and Lee's (2002) argument for a six factor structure to personality.

McCrae and Costa (1992) suggested that the value in separating Psychoticism into Conscientiousness and Agreeableness lies in latter combination's ability to detect differential relationships with various criteria. The results of this study indicate, however, that in the prediction of self reported delinquency, there is merit in retaining the supposedly broader Psychoticism factor. Why might this be the case? One possibility is that Psychoticism represents a unipolar dimension, or at least that the Psychoticism *scale* is mainly sensitive to variation at the higher pole of the Psychoticism dimension. McCrae & Costa (1985) noted, for example, that typically only very few of the items on various Psychoticism scales are endorsed by participants and, indeed, the scale mean observed in this study was fairly low ($M = 3.01$ out of a maximum of 11 for self reports). They speculated that the Psychoticism scale 'measures extreme and deviant manifestations of [Agreeableness and Conscientiousness]' (p. 596). If this is true, perhaps this scale's potential for incremental validity will be limited to the prediction of truly rare deviant behaviours, such as delinquency. Future research could investigate this further with the use of a criterion variable that is of a similar 'negative' nature but occurs more frequently[1].

Interestingly, the Lie scale provided incremental validity over and above the P + HEXACO scales, implying that it is capturing some unique variance that is related to self reported delinquency. One possibility is that this scale may indeed be capturing *some* variance due to a socially desirable response bias (e.g. Francis, Brown et al., 1991), and that this bias is also present within the delinquency scores. Alternatively, it may be the case that the substantive personality variance captured by the Lie scale is predictive of delinquency. Had peer-ratings on an adapted Lie scale been obtained in this study, it would have been possible to determine whether the Lie scale—Delinquency relationship persists without a social desirability bias[2].

Limitations

As with most studies that use correlational methods and self reported measures of behaviour, there are some limitations to the conclusions that might be drawn. In the present case, the measure of delinquency used was only sensitive to whether or not a delinquent act had been committed *and self reported*, but not to the frequency with which it was committed. The consequent lack of discrimination between once-off and habitual offenders may serve to reduce the amount of variance captured by the scale. In spite of the measurement-induced reduction in variance of delinquency scores, sizeable correlations, in keeping with those generally reported in personality/criterion related literature, were observed. Nonetheless, we contend that future studies should aim to adopt other means through which links between personality and actual acts of delinquency might be evaluated. For example, the frequency of offending or other objective measures such as arrests or incarceration (e.g. Samuels, Bienvenu, Cullen, Costa, Eaton, & Nestadt, 2004) may be helpful and, at the same time, reduce the problems associated with common methods. Nonetheless, the shared variance resulting from common methods was countered in the present case by the use of peer reports of personality. The fact that the results from self and peer reports are broadly similar lends support to the conclusions we have drawn here.

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[2]Authors thank an anonymous reviewer for this suggestion.

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