



Relationships Between Biologically-Informed Reinforcement Sensitivity and Occupationally-Focused High-Potential Personality Traits

Adrian Furnham¹ , Philip J. Corr² , and David S. Semmelink^{3,4}

¹Department of Leadership and Organizational Behavior, Norwegian Business School, Oslo, Norway

²Department of Psychology, City, St George's University, London, UK

³Department of Psychology, University of Pretoria, South Africa

⁴Department of Psychology, Thomas International, Pretoria, South Africa

Abstract: We compared two measurement models of personality: the biologically-informed Reinforcement Sensitivity Theory Personality Questionnaire (RST-PQ) and the occupationally-focused High Potential Trait Inventory (HPTI). The primary aim was to determine the extent to which the RST-PQ underpins the construct validity of the HPTI. This was achieved by examining the basic motivations of approach, avoidance, and conflict, thus pointing to possible mechanisms as to how HPTI traits may be related to occupational performance. Three hundred and thirty respondents (mean age: 46.5 years), the majority (78%) of whom were employed full-time, were sampled from different countries by a major test publisher. Several statistically significant and theoretically meaningful correlations were found between RST-PQ and HPTI factors (e.g., the positive association of HPTI Conscientiousness and RST-PQ BAS-Goal-drive Persistence). Some sex and age differences were found in both sets of factors. Following zero-order correlational analysis, regression analyses helped further clarify these RST-PQ/HPTI associations. These findings throw empirical light on the relationships of two distinct personality measurement models, with very different origins – specifically, the biological inspiration of the RST-PQ contributes new knowledge as to the construct nature of the HPTI, pointing to viable hypotheses as to how HPTI factors should relate to occupationally-relevant data (e.g., sales performance). In general, the two models may be seen as complementary, each adding unique insights into personality. A study showing how these different factors relate to external criteria is now needed to speak to their respective predictive validities.

Keywords: Temperament, biology, traits

Personality psychology is characterized by a profusion of theoretical perspectives and measurement models. This fact has led to a division between those models serving the research community (usually generic structural models, often relying upon basic, sometimes biological, systems and processes) and those with a more applied purpose (instruments developed with specific external criteria in mind, especially in the commercial work of occupational selection, coaching, and training). The development of these academic-professional silos has impeded theoretical integration and statistical-structural parsimony; and, more generally, a cross-fertilization of the two fields – arguably to the detriment of both.

This research paper aims to contribute to rectifying this problem. We do this by comparing a basic, biologically-informed personality theory, as measured by the

Reinforcement Sensitivity Theory Personality Questionnaire (RST-PQ), with one informed by practical considerations of high potential personality traits in the occupational field (i.e., High Potential Trait Inventory; HPTI): two very different conceptual perspectives, but ones that have the potential to enhance understanding of the other.

Reinforcement Sensitivity Theory

Reinforcement Sensitivity Theory (RST) focuses on basic approach and avoidance systems in human motivation and behavior – it originally derives from animal learning studies, largely in the rat (Corr, 2008; see also Corr, 2013). RST has been in continuous development over the past 50 years, since the origins of its first appearance (Gray, 1970). It was greatly elaborated in the neuropsychology of

anxiety (Gray, 1982), developed further by Gray and McNaughton (2000), and more recently revised by McNaughton and Gray (2024). In its latest version, the Behavioral Inhibition System (BIS) relates to the processing of conflicting stimuli (including approach-avoidance); the Behavioral Approach System (BAS) relates to reactions to all appetitive stimuli, conditioned or otherwise; and the Fight/Flight/Freeze System (FFFS) mediates all defensive reactions (now including Freeze as a defensive posture).

Arguably (see Corr, 2016), the most theoretically faithful of the measurement instruments of revised RST is the Reinforcement Sensitivity Personality Questionnaire (RST-PQ; Corr & Cooper, 2016). This measurement instrument contains single scales for the FFFS and BIS, and four subscales for the BAS. In terms of the RST-PQ factors and the Big-5, Fear Survey Schedule (FSS), Eysenck PEN model, and trait anxiety measures of personality, recent reports reveal substantially the same associations as those reported by Corr and Cooper (2016): FFFS is moderately and positively correlated with FSS scales, somewhat less so with Neuroticism, and only weakly with trait anxiety; BIS is strongly and positively related to Neuroticism and trait anxiety, and less so with FSS scales (although to a similar extent to the FFFS) – in other words, the FFFS is differentially related to fear scales, while the BIS is differentially related to Neuroticism and trait anxiety (the fact that some of the FFS scales are more akin to goal-conflict anxiety, and not fear, accounts for the similar association with both the FFFS and BIS; see Perkins et al., 2007). In relation to the BAS subscales: Reward Interest is positively related to Extraversion, underlying its incentive-exploratory nature; Goal-Drive Persistence is positively related to Conscientiousness, supporting its theoretical nature to bridge the gap between signals of reinforcement and actual reward, as well as interest in reward in the first instance; Reward Reactivity is mostly related to Extraversion, suggesting this major trait of personality is related to processing of actual reward; and Impulsivity is characterized by low Conscientiousness and Psychoticism, as well as a relative absence of fear, which is consistent with the final stage of unrestrained (often literally) “grabbing” of the reward (e.g., sexual consummation). We can see the possible consequences of high levels of these BAS subscales, especially Impulsivity, which is related to pathological gambling and various other forms of risk-taking behavior that lack appropriate planning and restraint (Corr, 2008).

In short, the RST-PQ is related to conventional, well-established measures of personality. Importantly, it can describe underlying personality processes in terms of basic systems of motivation and emotion. Accordingly, the RST-PQ would likely be related to more occupationally relevant models of personality. One such model is the High Potential Trait Indicator (HPTI).

High Potential Trait Indicator (HPTI)

The HPTI was designed to measure personality at work (MacRae & Furnham, 2020), specifically the traits associated with high potential in occupational contexts. The idea of “high-flying” individuals, namely those with a high potential or high probability of success in their careers, has long been explored, but mainly by qualitative means (e.g., McCall, 1998). The HPTI quantifies the set of six traits associated with such exceptional work performance: *Conscientiousness*, *Adjustment*, *Curiosity*, *Ambiguity Acceptance*, *Approach to Risk* (sometimes called Courage), and *Competitiveness*.

In terms of the construct nature of these six high-flying personality traits, as should be expected, there is significant overlap with standard Big-5 factors of personality, as well as other traits known to be related to success in a variety of jobs (Teodorescu et al., 2017). The first, most well-researched trait is *Conscientiousness*, characterized by self-discipline, organisation, and the ability to moderate prepotent responses (i.e., impulsivity). The second trait is *Adjustment* (low Neuroticism), characterized by emotional resilience to stressors, positive affect, and mood stability and regulation. Adjustment has been shown to be related to various indices of higher work performance and teamwork. The third trait is *Curiosity* (or openness), characterized by an interest in new ideas, experiences, and situations – openness at work encompasses new ways of completing tasks, new ideas and ways of doing things, as well as an interest in colleagues with different opinions. The fourth trait, *Ambiguity Acceptance*, sometimes described as Ambiguity Tolerance (AT), relates to individual and/or group processes, and is the psychological reaction to unfamiliarity or incongruence – those who are tolerant of ambiguity perform well in new or uncertain situations, adapt when duties or objectives are unclear, and can learn in unpredictable times or environments. The fifth trait is *Approach to Risk*, characterized by the ability to combat and/or mitigate negative or threat-based emotions, which serves to broaden the potential range of responses – such “courageous” individuals mitigate fear of interpersonal conflict or reprisal to confront that behavior and thereby defeat it. The final, sixth trait is *Competitiveness*, related to low agreeableness on the Big-5 personality model. It is characterized by a focus on the adaptive elements of competitiveness that drive self-improvement, desire for individual and team success, and learning. The literature contains papers describing and characterising the HPTI in an occupational context (Furnham & Treglown, 2018, 2021a, b; Furnham & Impellizzeri, 2021; Treglown, MacRae, et al., 2020; Treglown, Cuppello, et al., 2020; Treglown & Furnham, 2022), and its factorial structure and psychometric properties have been established (MacRae & Furnham, 2020; Teodorescu et al., 2017).

Associations Between RST and HPTI

To date, RST measurement models (e.g., RST-PQ) and the HPTI have not been compared. This is a notable omission in the literature because each model has the potential to inform the other, especially in terms of overlapping psychological constructs. Knowledge of their associations would be especially valuable in pointing to the underlying basic motivational and emotional nature of the HPTI, thus providing theoretical support to account for any observed relationships with external occupational criteria. Specifically, such knowledge would allow us to start to think more carefully about the underlying processes underpinning occupational measures of personality.

Given the known associations between the RST-PQ and other personality measurement models, especially the Big-5, along with the similarity of the HPTI and the Big-5 factors, we can postulate several possible associations. HPTI Conscientiousness should be strongly, positively related to the BAS subscale of Goal-Drive Persistence, as this factor motivates the persistence of goal-directed behavior, especially in situations of non-reinforcement. As HPTI Adjustment is a form of low neuroticism/emotionality, it should be negatively correlated with the BIS, and probably, albeit to a lesser extent, with the FFFS. HPTI Curiosity should be strongly correlated with the BAS, especially the largely exploratory Reward Interest subscale. There is also the possibility of a negative correlation with the BIS as this RST-PQ factor has the tendency to narrow positive exploration and, in consequence, bias towards more protective routine behaviors and ways of thinking that militate against curiosity. HPTI Ambiguity Acceptance should be negatively related to the BIS, as this HPTI trait is a form of low goal-conflict, and perhaps, too, to the BAS subscales, as acceptance of ambiguity is relevant to approach behavior. HPTI Approach to Risk should be expected to be negatively correlated to FFFS and BIS, and positively related to all BAS subscales. Lastly, HPTI Competitiveness should be most positively related to the BAS subscales, as well as possibly negatively correlated with BIS/FFFS, as they are motivationally and behaviorally inhibiting factors.

Although these hypothesized associations are theoretically tenable, what is lacking in the literature are known empirical associations. The major aim of this study is to close this gap. In addition to the above hypothesized associations, in the interests of completeness, we explored possible sex differences in the scores of the RST-PQ and HPTI, as well as associations with age. There is a well-established literature on sex differences in personality which distinguishes between agentic and empathic traits (Chen et al., 2019). There is also a vast literature on sex differences in personality, which reveals numerous significant, but few big, differences between men and women (Furnham & Tre-

glown, 2021b). Essentially, women tend to score higher on Agreeableness and Neuroticism (low Adjustment) than men, which influences various aspects of their social behavior.

There is less interest in age differences in personality (Beck et al., 2022; Soto et al., 2011), though more recent interest in whether and how personality traits change over time. We will examine age effects in both questionnaires.

Method

Sample

Altogether 330 respondents completed the two personality questionnaires, of which 187 (56.7%) were female and 143 (43.3%) were male. Male respondents were coded as “0” in the data and female respondents as “1”. Respondents were drawn from various regions, including 161 (49%) from Great Britain, 52 (16%) from South Africa, 40 (12%) from the USA, 28 (8%) from Canada, 21 (6%) from Europe, 18 (5%) from Australia, and 10 (3%) from other regions. The average age of the whole sample was 46.5 ($SD = 11.3$), ranging from 20 to 70 years of age. Most respondents ($n = 199$, 60.3%) indicated having obtained a university degree. The majority were full-time employees ($n = 259$, 78%), followed by 39 (12%) not in employment, 21 (6%) self-employed, four (1%) were students, three (0.9%) were working part-time, and four (1%) did not provide a response to this question. Regarding management level, 71 (22%) were at executive or senior management level, 86 (26%) were at middle management, 40 (12%) were at first-line or supervisor level, 105 (32%) were not managers, and 28 (8%) did not provide a response to this question. Those respondents who indicated they were currently not employed provided responses to the management level question based on their previous occupational status.

It is worth noting that, although this is a convenience sample, we can assume that the respondents were sufficiently motivated to render data of high quality. Firstly, the study was administered by a major test publisher with considerable experience in excluding respondents who show aberrant responding. Rasch person-fit statistics were analyzed, an estimate that can be used to detect unusual response patterns (Wright & Stone, 1979), through Winsteps 5.8.0.0 software (Linacre, 2023), to identify potentially aberrant responding. Cases where person-fit exceeded 1.5 (underfit) or were less than 0.5 (overfit) were investigated to determine if the responses were aberrant and excluded where necessary. Secondly, respondents received personal feedback on their HPTI scores, which served to maintain their motivation to respond accurately.

Thirdly, the sample was composed of adult volunteers who had chosen to take part in various projects offered by this test publisher – importantly, those who had shown an aberrant pattern of responding in previous studies had been deleted from the sample pool.

Questionnaires

High Potential Trait Indicator (HPTI; MacRae & Furnham, 2020) is a measure of six occupationally-relevant personality traits, as detailed in the Introduction to this paper. The inventory contains 78 items, with responses to items on a seven-point Likert-type scale. The six traits (Cronbach α 's in the current study shown in parenthesis) are *Conscientiousness* ($\alpha = .74$), *Adjustment* ($\alpha = .83$), *Curiosity* ($\alpha = .79$), *Approach to Risk* ($\alpha = .75$), *Ambiguity Acceptance* ($\alpha = .77$), and *Competitiveness* ($\alpha = .82$). The original version of the questionnaire reported reliability values from .72 (*Approach to Risk*) to .80 (*Curiosity*; MacRae & Furnham, 2020), which are very similar to the findings of the present study.

Reinforcement Sensitivity Theory–Personality Questionnaire (RST-PQ) (Corr & Cooper, 2016) comprises 65 items that assess the three neuropsychological systems (Cronbach α 's in the current study shown in parenthesis): Fight-Flight-Freezing System (FFFS; $\alpha = .81$), Behavioral Inhibition System (BIS; $\alpha = .94$), and four Behavioral Approach System (BAS) subscales: Reward Interest (BAS-RI; $\alpha = .75$), Goal-drive Persistence (BAS-GDP; $\alpha = .87$), Reward Reactivity (BAS-RR; $\alpha = .79$), Impulsivity (BAS-Imp; $\alpha = .68$) and Defensive Flight ($\alpha = .75$) – see Introduction for their description. Participants were asked: “How well does the statement describe you,” on a response scale: 1 = *Not at all*, 2 = *Slightly*, 3 = *Moderately*, 4 = *Highly*. The original version of this questionnaire reported reliability values from .74 (Impulsivity) to .93 (BIS); therefore, the present alpha coefficients are in line with these earlier published data.

Procedure

Questionnaires were hosted on an online survey platform (Qualtrics) and sent to respondents who had previously indicated their willingness to participate for research purposes. Those who clicked on the link in the email were directed to a webpage where they were given the instructions and purpose of the study, and then they were provided with the opportunity to consent to participate. Once consent was obtained, respondents were navigated to the two untimed questionnaires. The ethical review deemed the study to be low risk due to its nature (i.e., anonymous, non-invasive questionnaires administered to healthy employed adults whose participation was entirely voluntary).

Analytical Plan

Our analytical plan commenced with descriptive statistics for all of our variables, including sex and age. A confirmatory factor analysis (CFA, Table 1) was then conducted to evaluate the factor structure of each trait to ensure their construct validity (Brown, 2015). Hu and Bentler's (1999) criteria for evaluating model fit were utilized, where a comparative fit index (CFI) and Tucker–Lewis index (TLI) of .90 to .95 and above is considered acceptable, and .95 and above as good, a non-significant root mean square error of approximation (RMSEA) of .08 to .06 is acceptable and .06 and below is good, and a standardized root mean square residual (SRMR) of .08 to .05 is acceptable, and .05 and below is good. Then, a zero-order Pearson product-moment correlation was conducted to provide a general overview of the relationships between the variables (Table 2). Here, we noted a number of statistically significant associations involving sex. We then presented these correlations from the perspectives of the RST-PQ and HPTI – this was mainly for descriptive purposes. Our main analysis comprised multiple regressions, regressing HPTI factors onto RST-PQ ones. An exploratory factor analysis of both measures was also conducted (see Table E1 in the Electronic Supplementary Material, ESM 1, and Table 4) but was not a main aim of this study.

Results

Cronbach's α and Rasch person reliability were utilized to assess the reliability of the scales (see Table 2). All scales showed sufficient evidence of reliability except for the Impulsivity scale of the RST-PQ, which was marginal ($\alpha = .68$, $p_{\text{rel}} = .67$). The confirmatory factor analysis indicated that all traits, except for Impulsivity, demonstrated acceptable to good model fit (see Table 1).

Sex Differences

Assumptions of normality and equality of variance were assessed prior to conducting the t -tests. The Shapiro–Wilk test was used to assess normality. Levene's test was used to assess the equality of variances between groups. All measures, except for Competitiveness ($W = .994$, $p = .21$), violated the assumption of normality. No measures of interest violated the assumption of equal variance. Welch's t -test was adopted over the Student's t -test following the recommendation of Delacre et al. (2017), who argue that it is more robust to violations of normality.

In terms of the HPTI, only Approach to Risk was statistically significant ($t = 3.78$, $df = 314.30$, $p < .001$). This is related to males having a higher mean score (65.50,

Table 1. Confirmatory factor analysis fit statistics

	χ^2	df	<i>p</i> -value	χ^2/df	CFI	TLI	RMSEA [95% CI]	<i>p</i> -value	SRMR
Conscientiousness	109.84	65	.000	1.690	.952	.942	.046 [.030, .060]	.666	.071
Adjustment	123.15	65	.000	1.895	.969	.963	.052 [.038, .066]	.383	.078
Curiosity	94.62	65	.010	1.456	.981	.977	.037 [.019, .053]	.907	.060
Risk Approach	146.84	65	.000	2.259	.924	.909	.062 [.049, .075]	.070	.079
Ambiguity Acceptance	97.74	65	.005	1.504	.978	.973	.039 [.022, .054]	.872	.061
Competitiveness	111.46	65	.000	1.715	.973	.967	.047 [.031, .061]	.632	.064
Fight-Flight-Freeze	47.03	35	.084	1.344	.991	.988	.032 [.000, .054]	.900	.054
Behavioral Inhibition System	397.34	230	.000	1.728	.988	.987	.047 [.039, .055]	.729	.066
Reward Interest	27.67	14	.016	1.977	.982	.974	.054 [.023, .084]	.365	.056
Reward Reactivity	42.35	35	.183	1.210	.994	.992	.025 [.000, .049]	.956	.050
Goal-Drive Persistence	13.35	14	.499	0.954	1.000	1.001	.000 [.000, .051]	.944	.043
Impulsivity	82.91	20	.000	4.145	.869	.817	.098 [.077, .120]	.000	.088
Defensive Fight	43.41	20	.002	2.171	.969	.957	.060 [.035, .084]	.235	.067

$SD = 8.99$) than females (61.70 , $SD = 9.68$), with a small to medium effect size ($d = .41$; Cohen, 1988).

In terms of the RST-PQ, two scales showed statistically significant sex differences: Fight-Flight-Freeze (FFFS; $t = -7.26$, $df = 314.27$, $p < .001$) and BAS-Reward Reactivity (BAS-RR; $t = -2.99$, $df = 294.86$, $p = .003$). Females had a higher mean score on FFFS (23.25 , $SD = 5.92$; males: 18.63 , $SD = 5.56$), with a large effect size ($d = -.80$). Similarly, with the BAS-RR, females had a higher mean score (28.80 , $SD = 5.07$; males: 27.04 , $SD = 5.43$), with a small effect size ($d = -.33$).

Correlations With Age

For the HPTI, there was a marginal positive association for Conscientiousness ($r = .107$, $p = .052$), and significant positive associations for Adjustment ($r = .257$, $p < .001$), Approach to Risk ($r = .145$, $p < .01$), Ambiguity Acceptance ($r = .175$, $p < .001$), as well as a significant negative association for Competitiveness ($r = -.245$, $p < .001$). Table 2 shows the product-moment correlation coefficients between the RST-PQ and HPTI scales.

RST-PQ and HPTI Associations

In the next section, the correlations of the RST-PQ and HPTI were examined. We start from the perspective of RST, examining correlations with the six factors of the HPTI. Then, for complementarity, we do the same for the HPTI perspective, examining correlations with the six RST-PQ factors.

RST-PQ Perspective

The pattern of correlations may be summarized as follows. The RST-PQ Fight-Flight-Freeze (FFFS) scale significantly negatively correlated with Adjustment ($r = -.301$,

$p < .001$), Approach to Risk ($r = -.304$, $p < .001$), and Ambiguity Tolerance ($r = -.340$, $p < .001$), indicating that those respondents higher on the RST-PQ fear-related scale are less well-adjusted and risk and ambiguity intolerant.

In terms of the RST-PQ BIS, we find significantly negative correlations with Conscientiousness ($r = -.345$, $p < .001$), Adjustment ($r = -.749$, $p < .001$), Approach to Risk ($r = -.557$, $p < .001$), and Ambiguity Acceptance ($r = -.473$, $p < .001$). As the BIS is more of a general neuroticism/emotional instability factor, compared with the FFFS, these wider and stronger associations make theoretical sense, including lower Conscientiousness, presumably due to the goal-conflicted nature of higher BIS scorers, which interferes with task-relevant activities. The highest correlation with Adjustment is as expected.

Moving on to the BAS subscales, we find the Reward Interest (BAS-RI) is moderately positively correlated with Conscientiousness ($r = .301$, $p < .001$), Adjustment ($r = .258$, $p < .001$), Curiosity ($r = .493$, $p < .001$), Approach to Risk ($r = .359$, $p < .001$), Ambiguity Acceptance ($r = .199$, $p < .001$), and Competitiveness ($r = .182$, $p < .001$). All these associations characterize the theoretical nature of BAS Reward Interest. Turning to BAS Goal-drive Persistence (BAS-GDP), we find a similar pattern of associations to BAS-RI: Conscientiousness ($r = .617$, $p < .001$), Adjustment ($r = .273$, $p < .001$), Curiosity ($r = .353$, $p < .001$), Approach to Risk ($r = .519$, $p < .001$), Ambiguity Acceptance ($r = .149$, $p < .01$), and Competitiveness ($r = .378$, $p < .001$). As the highest correlation coefficient, conscientiousness makes considerable theoretical sense, because BAS-GDP is about working persistently to reach a goal, even in the absence of immediate reward, and Approach to Risk implies that highly conscientious individuals continue pursuing their goal even in the face of potential risk. Turning to immediate reward, BAS-Reward Reactivity (BAS-RR) revealed associations with Conscientiousness ($r = .173$, $p < .01$), Curiosity

Table 2. Descriptive statistics, reliability, and correlation of scales

	Mean	SD	Alpha	p.re	p.sep	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
(1) Sex	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
(2) Age	46.5	11.34	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
(3) Conscientiousness	69.9	9.5	.74	.68	1.44	.04	.11	—	—	—	—	—	—	—	—	—	—	—	—
(4) Adjustment	62.4	12.7	.83	.81	2.04	-.04	.26***	.35***	—	—	—	—	—	—	—	—	—	—	—
(5) Curiosity	68.4	9.3	.79	.77	1.83	.02	-.05	.33***	.14**	—	—	—	—	—	—	—	—	—	—
(6) Risk Approach	63.4	9.6	.75	.69	1.50	-.20***	.15**	.49***	.48***	.35***	—	—	—	—	—	—	—	—	—
(7) Ambiguity Acceptance	49.9	10.4	.77	.71	1.56	-.08	.18**	.22***	.41***	.28***	.48***	—	—	—	—	—	—	—	—
(8) Competitiveness	48.8	12.1	.82	.81	2.05	-.09	-.25***	.31***	-.08	.13*	.30***	.14*	—	—	—	—	—	—	—
(9) Fight-Flight-Freeze scale	21.2	6.2	.81	.75	1.74	.37***	-.06	-.08	-.30***	-.02	-.30***	-.34***	.01	—	—	—	—	—	—
(10) Behavioral Inhibition System	54.5	14.7	.94	.92	3.45	.06	-.28***	-.33***	-.75***	-.09	-.56***	-.47***	-.06	.41***	—	—	—	—	—
(11) Reward Interest	19.5	4.1	.75	.71	1.57	.03	-.06	.30***	.26***	.49***	.36***	.20***	.18***	-.03	-.16**	—	—	—	—
(12) Reward Reactivity	28.0	5.3	.79	.76	1.76	.16*	-.13*	.17**	-.04	.24**	-.01	-.07	.29**	.23***	.07	.46***	—	—	—
(13) Goal-Drive Persistence	22.2	4.3	.87	.77	1.84	.02	-.06	.62***	.27***	.35***	.52***	.15**	.38***	.01	-.28***	.47***	.32	—	—
(14) Impulsivity	19.3	4.3	.68	.67	1.41	.09	-.08	-.08	-.11	.14*	.04	.07	.25***	.05	.16**	.30***	.38***	-.01	—
(15) Defensive Fight	23.4	4.0	.75	.72	1.60	-.03	.02	.01	-.18***	-.01	.14*	-.05	.27***	.06	.12*	.06	.24***	.14*	.31***

Note. * $p < .05$, ** $p < .01$, *** $p < .001$, 0 = Male, 1 = Female.

($r = .237, p < .001$), and Competitiveness ($r = .286, p < .001$) – these associations replicate some of the above, albeit the coefficients were generally lower in magnitude, suggesting that the HPTI does not differentiate between these separate BAS processes. Lastly, BAS-Impulsivity (BAS-Imp) showed a marginal negative correlation with Adjustment ($r = -.107, p = .052$), and significant positive correlations with Curiosity ($r = .141, p < .05$) and Competitiveness ($r = .249, p < .001$), although the magnitude of the correlations was generally low.

In general, whereas there is some differentiation of the FFFS and BIS scales, there is much less between the BAS sub-scales, although the pattern of associations subtly differs.

HPTI Perspective

Seen from the perspective of the HPTI, we see that Conscientiousness is composed of lower BIS, and higher BAS-RI, BAS-GDP, and BAS-RR – this makes sense in terms of the theoretical psychology of this construct. Similarly, for Adjustment, which is negatively related to the Neuroticism/emotional instability RST-PQ factors of the FFFS and especially the BIS, and its positive association with BAS-RI and BAS-GDP are expected, too. Curiosity is characterized by positive correlations with all the BAS subscales, again as should be expected. As regards the Approach to Risk, we see the negative associations with FFFS and BIS, and positive associations with BAS-RI and BAS-GDP, a pattern of associations that is repeated with Ambiguity Acceptance. Lastly, Competitiveness is characterized by positive associations with all the BAS subscales, confirming it to be an approach motivation/behavior.

Multiple Regression

To render the optimal combination of predictors, a series of hierarchical multiple regression models was run, with age and sex entered in the first step, and RST-PQ factors then entered in the second (see Table 3). The assumptions of linear regression – namely linearity, absence of multicollinearity, normality of residuals, and homoscedasticity – were evaluated and found to be satisfactorily met. Accordingly, the use of linear regression was deemed appropriate for the analysis.

Conscientiousness

The model was significant, revealing positive associations with age (modest) and BAS-GDP (moderate-to-strong). The BIS was negatively associated (modestly). These findings help to define which BAS factor is most important, namely BAS-GDP, as predicted. BIS remains significant, which was not predicted, but is consistent with the bivariate correlational analysis – as noted above, it may be that goal-conflict interferes with the task-related focus of conscientiousness.

Table 3. Multiple Linear regression of HPTI traits as outcome

	Conscientiousness		Adjustment		Curiosity		Risk Approach		Ambiguity Acceptance		Competitiveness	
	Step 1	Step 2	Step 1	Step 2	Step 1	Step 2	Step 1	Step 2	Step 1	Step 2	Step 1	Step 2
	β (t)	β (t)	β (t)	β (t)	β (t)	β (t)	β (t)	β (t)	β (t)	β (t)	β (t)	β (t)
Sex	.04 (0.78)	.11 (1.17)	-.04 (-0.73)	-.01 (-0.15)	.02 (0.40)	.01 (0.21)	-.20 (-3.81)***	-.16 (-3.71)***	-.08 (-1.49)	.00 (0.07)	-.09 (-1.59)	-.13 (-2.51)*
Age	.11 (1.94)	.10 (2.29)*	.26 (4.82)***	.08 (2.14)*	-.05 (-0.96)	.00 (-0.03)	.15 (2.77)**	.05 (1.24)	.18 (3.24)**	.07 (1.31)	-.24 (-4.58)***	-.24 (-4.85)***
FFF Scale		-.05 (-0.94)		-.02 (-0.47)		-.03 (-0.54)		-.08 (-1.62)		-.16 (-2.74)**		.04 (0.74)
BIS		-.13 (-2.37)*		-.68 (-15.35)***		.04 (0.71)		-.41 (-8.47)***		-.37 (-6.31)***		-.13 (-2.21)*
Reward In		.02 (0.29)		.13 (2.82)**		.41 (6.62)***		.13 (2.70)**		.14 (2.35)*		-.13 (-2.14)*
Reward Reac		.04 (0.68)		.07 (1.55)		.00 (-0.04)		-.06 (-1.23)		-.13 (-2.15)*		.11 (1.83)
Goal-Drive P		.58 (10.98)***		.02 (0.54)		.18 (3.11)**		.35 (7.46)***		.03 (0.51)		.34 (5.81)***
Impulsivity		-.05 (-1.06)		-.02 (-0.45)		.04 (0.66)		.07 (1.58)		.15 (2.69)**		.21 (3.79)***
Defen/Fight		-.05 (-1.05)		-.13 (-3.24)**		-.07 (-1.36)		.12 (2.94)**		-.03 (-0.50)		.16 (3.13)**
F change	2.20 (2, 327)	26.80 (9, 320)	11.83 (2, 327)	53.73 (9, 320)	0.54 (2, 327)	13.00 (9, 320)	10.96 (2, 327)	40.6 (9, 320)	6.28 (2, 327)	14.75 (9, 320)	11.83 (2, 327)	15.88 (9, 320)
(df)												
R ²	.007	.414 (.407)	.062	.591 (.529)	-.003	.247 (.250)	.057	.520 (.463)	.031	.293 (.262)	.062	.289 (.227)
(change)												
p-value	.112	< .001	< .001	< .001	.584	< .001	< .001	< .001	.002	< .001	< .001	< .001

Note. *p < .05, **p < .01, ***p < .001.

Table 4. Exploratory factor analysis factor correlations

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8	Factor 9	Factor 10	Factor 11
Factor 1											
Factor 2	-.17										
Factor 3	-.10	.36									
Factor 4	.32	-.03	-.13								
Factor 5	.35	.00	-.09	.32							
Factor 6	.01	.21	.10	-.06	-.01						
Factor 7	-.05	.13	.01	-.08	-.12	.14					
Factor 8	.28	-.09	-.06	.09	.12	.12	.08				
Factor 9	-.15	.17	.18	-.04	-.01	.08	.10	-.11			
Factor 10	.33	-.16	-.04	.06	.13	.08	-.01	.11	-.07		
Factor 11	.13	.01	.16	.05	.08	.10	.08	.04	.17	.09	
Factor 12	-.21	.19	.12	-.08	-.09	.09	.04	-.12	.02	-.08	-.02

Adjustment

The model was significant, revealing a strong negative association with the BIS, as expected, but also a positive association with BAS-RI. These findings confirm the major role played by the BIS, indicating that this HPTI trait is largely composed of general neuroticism, albeit with some modest contribution from the BAS subscale.

Curiosity

The model was significant, revealing a moderate positive association with BAS-GDP, but also a modest positive association with BAS-RI. This finding helps to define BAS-GDP as the strongest predictor of this HPTI trait, with some contribution from the BAS subscale.

Approach to Risk

The model was significant, revealing a negative association with sex and BIS, and positive associations with BAS-RI and BAS-GDP. Males scored higher on this HPTI trait – this was found with *t*-tests: those respondents with higher scores on the two BAS subscales were higher on this HPTI trait, and higher BIS scores were related to lower trait scores. The main difference with the bivariate correlations is the dropping off of FFFS – BIS, which seems the most important defensive factor, serving to inhibit the approach to risk (as the BIS is involved in goal-conflict related risk assessment processing, this is entirely theoretically consistent with RST).

Ambiguity Acceptance

The model was significant, revealing positive associations with BAS-RI and BAS-Imp (modest), and a negative association with BAS-RR. These results largely replicate the bivariate correlations; however, BAS-RR emerged as a significant negative predictor (it was negative, too, in the bivariate correlation but not formally statistically significant): this is an intriguing finding that might suggest that a higher level of

reactivity to reward reduce acceptance of ambiguity perhaps because at that point ambiguity is perceived to be much reduced or absent. In addition, FFFS and BIS were both negatively correlated with ambiguity acceptance, which is certainly understandable in the case of BIS, which showed the highest correlation magnitude: being especially prone to goal-conflict processing is bound to reduce the acceptance of ambiguity (which, itself, is a form of goal-conflict). Together with the FFFS, defensive behavior seems to antagonize ambiguity acceptance.

Competitiveness

The model was significant, revealing negative associations with sex, revealing males are higher on this HPTI trait – this significant finding emerged only in the regression analysis, and was not revealed in the *t*-test, reported above (at one-tailed probability, $p = .086$). In contrast to the negative association with and BAS-RI, positive associations were found for the other BAS subscales: GDP, RR, and Imp. These results largely replicate the bivariate correlations; however, BAS-RI emerged as a significant negative predictor, although the magnitude of the coefficient was small. The BAS-RR findings might suggest that the psychological qualities of competitiveness are inconsistent with a more emotionally stable curiosity (i.e., a well-adjusted open-mindedness).

Discussion

In interpreting the results, we focus on the regression results, which offer the most parsimonious account. It is clear from Table 3 that many of the RST-PQ factors, like the BIS system, are related to a number of the HPTI personality factors, while others, like the FFFS, do not. Further, the demographic and RST-PQ accounted for over half the

variance in two of the HPTI factors (Adjustment and Curiosity), but less than a third of the variance in two (Ambiguity Acceptance and Competitiveness). Importantly, the three BAS scales relate very differently to the HPTI scales, with Reward Sensitivity being particularly related to Curiosity, and Goal Driven Persistence related to Conscientiousness, Risk Taking, and Competitiveness, but Reward Reactivity is associated with only one trait. More importantly, studies using the HPTI have consistently shown the unique power of Ambiguity Acceptance to predict important work-related behavior (Cuppello et al., 2023a, b; 2024).

The hypothesized associations between RST-PQ and HPTI factors were largely confirmed. Conscientiousness was, indeed, strongly positively related to the BAS subscale of Goal-Drive Persistence, as this factor motivates the persistence of goal-directed behavior, especially in situations of non-reinforcement. It was also negatively and weakly associated with the BIS, suggesting this HPTI trait may have some emotional stability variance associated with it.

As regards Adjustment – a form of low neuroticism/emotionality – as expected, it was negatively and strongly correlated with the BIS. However, the present findings suggest that it is a little more than pure negative emotionality, as it was positively, albeit weakly, correlated with BAS-RI, suggesting it is not the mere absence of negative emotionality but includes some positive emotionality associated with approach motivation. In terms of Curiosity, BAS-GDP was the strongest positive association, and we also observed BAS-RI as predicted, although the magnitude of this correlation was modest. Both associations suggest that this HPTI factor measures more than simply reward interest (hypothetically related to open-mindedness), but it has a goal-driven persistence component. As the total amount of variance explained in this HPTI factor from RST-PQ was rather low, we must conclude that there is more in the *Curiosity* construct that can be accounted for by RST-PQ factors – much the same may be said also for Approach to Risk and Competitiveness. It should be noted that the hypothesized possibility of a negative correlation with the BIS was not found, suggesting that negative emotionality and behavioral escape/avoidance do not have a bearing on this measure of Curiosity. Moving to the Approach to Risk, this HPTI factor was found to be higher in males, and lower in those higher in the BIS, suggesting goal-conflict related BIS processing lowers the propensity to approach risk, which makes sense when we see that approach to risk is, itself, a form of goal-conflict. This form of “courage” was, as expected, positively related to BAS subscales, specifically BAS-RI, but also BAS-GDP, which was contrary to expectation; however, in hindsight, it may not be so surprising as “approach” to anything is likely to be related to this BAS-related subscale, especially as it

entails some element of conscientiousness. However, Approach to Risk was not significantly related to BAS-RR, which might suggest that it is related to pre-reward approach; however, we must acknowledge that it is problematic to draw inferences about dynamic stages of reward/approach processes based solely on cross-sectional trait assessment processes. As predicted, Ambiguity Acceptance was negatively correlated with the BIS and (not predicted) the FFFS, as well as positively correlated with two BAS subscales (BAS-RI and BAS-GDP), as expected. However, BAS-RR was negatively associated, indicating that those prone to higher levels of reward reactivity have lower levels of acceptance of ambiguity, which might suggest that there is less perceived ambiguity when reward is deemed to be close.

Finally, as predicted, Competitiveness (low Agreeableness) was positively correlated with all BAS subscales, but contrary to expectation, was not related to either FFFS or BIS, suggesting fear/anxiety does not inhibit the form of competitiveness contained in the HPTI. This finding suggests that this HPTI factor is predominantly a BAS factor, without any contribution, which otherwise might be thought to inhibit it, from defensive/emotionality factors. In this sense, Competitiveness may be related more to psychopathy and narcissism. Indeed, Furnham and Cuppello (2024) found trait Competitiveness related to all Dark Tetrad factors, particularly Narcissism. Competitiveness was also found to be higher in males.

The results also show strong, consistent, and explicable sex and age effects. As has been shown in many studies, females tended to be lower on Risk Approach, though it was surprising that they were not lower on Adjustment. There was a large sex difference on the FFFS variable, which has been shown to be related to Neuroticism and is often explained in evolutionary psychology theory (Furnham & Kanazawa, 2020). Interestingly, the results showed that older people were more Adjusted (less Neurotic) and less Competitive (more Agreeable), which has been demonstrated in a range of studies on change in personality (Soto et al., 2011). The results for the RST-PQ suggest the strongest correlate of age was *Goal-drive Persistence*, which suggests that as people get older, they learn the value of being focused without easily giving up on their goals. They were also lower on the BIS score, suggesting that learning over time reduces the need for careful processing of environmental threats.

What do our findings add to how associations between the HPTI and occupational performance might be interpreted? The relationships between the RST-PQ and the HPTI traits inform the construct validity of the HPTI. This knowledge can, then, assist researchers in understanding why HPTI traits are empirically correlated with occupationally relevant measures (e.g., managerial performance), and

what drives “success” at work, as seen from an RST perspective. As such, we contend that our findings add to the knowledge of the construct validity of the HPTI – something we guess from their trait names alone at our peril. We consider this an important aspect of our study. Therefore, although our interpretations of the results are based only on correlations/regressions, given our theoretical knowledge of both sets of personality measures, it is feasible to start to hypothesize as to which mechanisms and processes produce the occupationally-relevant associations observed with the HPTI. Of course, it would have been ideal to have included such occupational measures to get at this issue more directly – this should form an important aim of future research.

Limitations

We should note that our data were collected from a convenience sample. As there was an element of self-selection, this may mean that the sample was not fully representative of the general population, limiting the generalizability of the findings – it is even possible that there was a potential skewing towards those more interested in personality research or those with certain personality traits (e.g., agreeableness and open-mindedness). However, we might add here that our sample comprised a diverse demographic profile, which might be seen as a strength. We explored how sex and age were considered and were entered into the regression models, which is important as they were significantly related to some of the RST-PQ and HPTI traits. What we did not attempt was any form of moderation analysis of sex and age, and this, too, would be a valuable focus of future research. It needs to be noted, too, that the RST-PQ BAS Impulsivity internal consistency coefficient was rather low (0.68), which should caution firm conclusions about its association with HPTI personality factors.

As noted above, if we had explored how these two very different personality measurement models differentially related to external criteria (e.g., managerial performance), we would be in a better position to account for their respective predictive validity. Specifically, such data would allow us to conclude whether occupationally-focused personality models offer greater predictive validity than more basic, biological-informed models, such as the RST-PQ. In this regard, it is relevant to note that most of the variance in the HPTI was not explained by the RST-PQ – what we cannot know is how this residual variance is differentially related to variance in occupational performance. Given the many statistically significant and theoretically meaningful associations between the RST-PQ and HPTI, this would be an intriguing question to answer. On the related question of the status of our hypotheses, we argue that they are confirmatory in nature by virtue of the fact that they were

formulated before data analysis and were informed by the relevant literature, especially the theoretical basis of RST. Nevertheless, replication of our findings is needed, and such a study could be more explicitly confirmatory in purpose, given the pattern of findings reported in this paper. Due to the theoretically coherent nature of our findings, we would be surprised if the substantive findings were different.

It is also important to note that, given our reliance on multiple regression, there is a possibility that two or more predictors in the regression model were so highly correlated to lead to the problem of multicollinearity, which inflates standard errors, making it more difficult to detect significant effects – in addition, it may reduce interpretability as it become less clear which predictor is driving the observed effects. However, the largest variance inflation factor (VIF) was 1.63, suggesting that there was no evidence of multicollinearity.

Despite these limitations, we argue that our results make a valuable contribution to the personality assessment field, for several reasons. First, the general approach we adopted was novel and led to the finding of meaningful relations between two personality measurement models founded on very different conceptual perspectives. Secondly, the sample is large enough to provide robust estimates of the associations between the two measurement models. Thirdly, the associations we observed make theoretical sense and were largely as predicted. The throwing of biologically-informed personality light (RST-PQ) onto a specifically applied personality model (HPTI) is not without merit and, after the further work suggested in this paper, may lead to new insights into the personality dynamics of occupational behavior.

Conclusion

We examined the statistical relationships between two very different measurement models of personality, one based on biological processes (i.e., the RST-PQ), and one specifically developed for occupational purposes (i.e., the HPTI), informed more by the well-established Big-5 model of personality. As predicted and empirically confirmed, theoretically meaningful associations were found, pointing to considerable shared variance between the personality measurement models, but also unique variance. Although these findings make considerable theoretical sense, in future research, there is a need to examine how these shared and unique sources of variance play out in predictive validity studies. Such a study would help to determine differential validity relevant to occupational performance, and would answer the crucial question: is there incremental validity of occupationally-focused personality models when compared to biologically-informed ones? Is it perhaps surprising that this question is still in need of an answer.

Electronic Supplementary Materials

The following electronic supplementary material is available with this article at <https://doi.org/10.1027/1614-0001/a000446>.

ESM 1. Exploratory factor analysis factor loading pattern of the RST-PQ and HPTI with principal axis factoring and oblimin rotation.

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History

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Publication Ethics

This was sought and obtained (SLA/2022/02). The study involved secondary analysis of anonymized data, collected from a non-vulnerable population in a panel with informed consent that

allowed the use of the data by third party researchers. Participants gave consent for their anonymized data to be analyzed and published.

Conflict of Interest

The authors declare that, at the time of submission, D.S. Semmelink was employed by the intellectual property rights holders of the HPTI, Thomas International Ltd.

Authorship

Philip J. Corr, Writing, Data analysis, Proofing; Adrian Furnham, Visualisation, Writing – review & editing; David S. Semmelink, Data analysis, Proofing.

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ORCID

Adrian F. Furnham
 <https://orcid.org/0000-0001-7545-8532>
 Philip J. Corr
 <https://orcid.org/0000-0002-7618-0058>
 David S. Semmelink
 <https://orcid.org/0000-0003-0761-6185>

Adrian F. Furnham

BI Norwegian Business School
 Nydalsveien 37
 0484 Oslo
 Norway
adrian@adrianfurnham.com