A statistical evaluation of the ‘Spotlight’ personality tool – A white paper.

By Dr. Chin Wei Ong

‘Spotlight’ is a psychometric tool developed by Mindflick® that has been designed to evaluate certain aspects of personality. The goal of the tool is to help individuals broaden their perception of their personality, so that they can more flexibly find solutions to thrive at work and in life (e.g., working with others, performing under pressure). Conceptually, Spotlight is operationalised as two distinct models that relate to individuals’ *behavioural style* preferences (i.e., FLEX), and their *mindset* preferences in situations where there is perceived to be something to win or lose (i.e., COPE).

The FLEX model was developed based on two of the ‘Big Five’ personality traits (Goldberg, 1990), namely ‘Extraversion’ and ‘Agreeableness’. By combining characteristics associated with each end of the scale of these two traits (ensuring that each characteristic was positively framed), four distinct behavioural style preferences were generated that make up the FLEX model: external task focused (Forceful), internal task focused (Logical), internal people focused (Empathic), and external people focused (eXpressive) (see Figure 1). Each of these four styles is associated with a set of personal characteristics that describe an individual’s behavioural preferences.

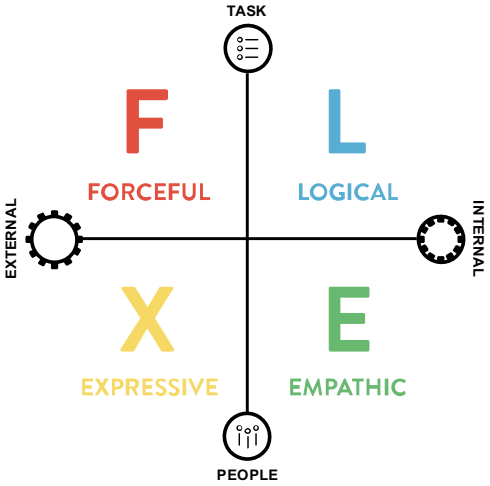

Figure 1: The FLEX model.

The COPE model was developed based on the 'Reinforcement Sensitivity Theory' (RST; Gray, 1970; 1982), which looks at individual differences in the sensitivity of basic brain systems that respond to punishing and reinforcing stimuli, thought to underlie certain personality dimensions. The personality characteristics that are associated with two central factors of this theory, which measure reward sensitivity (RS) and punishment sensitivity (PS), were used to generate four distinct mindset preferences that make up the COPE model: low PS and low RS (Contained), low PS and high PS (Optimistic), high PS and low RS (Prudent), and high PS and high RS (Engaged) (Figure 2). Once more, each of these four mindsets is associated with a set of personal characteristics (again, ensuring that these characteristics were framed positively) that describe an individual's preferences when it is perceived that something can be won or lost (i.e., reward and punishment).

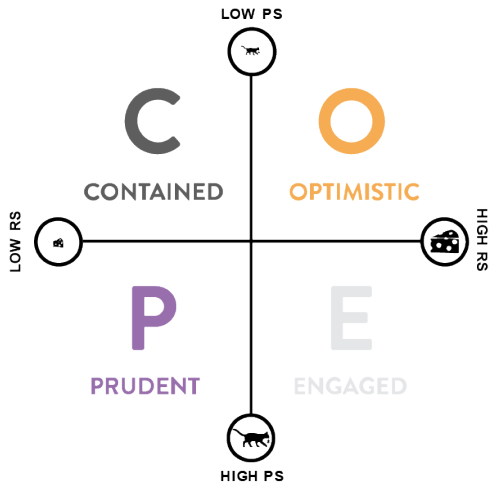

Figure 2: The COPE model.

In this White Paper, we provide statistical evidence that support the theoretical development of the aspects of personality operationalised by the FLEX and COPE models in the Spotlight personality tool. Specifically, this White Paper will demonstrate:

- How the Spotlight measurement tool was developed and refined through item analysis.

- The statistical evaluation of validity and reliability of both the FLEX and COPE measurements in Spotlight, which is in line with meeting the psychometric standards established by the British Psychological Society and the American Psychological Association.

Descriptive statistics and participant information.

Please note that all the analyses presented in this White Paper are based on a sample of 977 participants (476 men, 499 women, 2 unknown), aged 18–64 years old (M_{age} = 42.9 years, SD = 12.0), who are resident in the United Kingdom and were recruited online. All participants completed the English version of Spotlight. Descriptive statistics for the FLEX and COPE variables can be found in Table 1. We did not detect any outliers after inspecting skewness, kurtosis and Mahalanobis distance statistics across all variables, thus retaining all data for analyses.

	Mean	Standard deviation	Minimum	Maximum	Skewness	Kurtosis
Forceful	2.47	1.36	0.00	5.80	0.19	-0.75
Logical	4.05	1.21	0.20	6.00	-0.50	-0.27
Empathic	4.03	1.21	0.00	6.00	-0.80	0.27
eXpressive	3.10	1.17	0.00	5.90	-0.11	-0.69
Contained	3.65	1.04	0.20	5.80	-0.53	-0.04
Optimistic	2.29	1.46	0.00	5.90	0.23	-0.79
Prudent	3.98	0.99	0.50	6.00	-0.50	-0.12
Engaged	3.67	0.87	1.00	6.00	-0.11	-0.36

Table 1: Mean scores, Standard deviations, Minimum scores, Maximum scores, Skewness and Kurtosis statistics for FLEX and COPE.

Section 1: How was the 'Spotlight' personality tool measurement developed?

1.1 Initial development of FLEX and COPE item sets.

In accordance to the recommendations of American Psychological Association's Standards for Educational and Psychological Testing (1999, 2014), an initial pool of items was developed by a group of performance psychology experts who are highly experienced in working with high performance individuals and groups across a range of contexts (e.g., Olympic and Paralympic sports, professional sports, FTSE 100 businesses, Michelin-starred restaurants, etc.) that matched the theoretical underpinnings of the FLEX and COPE models. The performance psychology experts independently evaluated the items and then subsequently met to discuss the efficacy of each item within each designated set before pilot then testing. The item pool was reduced to fourteen sets of four items each were developed separately for the FLEX and COPE models. Further testing of the FLEX and COPE item sets was also conducted with this sample and is presented in the final section on validity.

An example of an Empathic item in a FLEX set of items is "Faithful and Trusting", while an example of an Optimistic item in a COPE set of items is "Ambitious and Goal-oriented". Responses to these sets of items are a combination of forced-choice (i.e., select one item that most/least relates to you) and Likert scale ratings for the remaining items (i.e., select a numeric rating to represent a response to a particular item). The Likert scale ranges from 0 (*Least like me*) to 6 (*Most like me*). The adoption of this hybrid item response format is meant to take advantage of the strengths of both methods, while at the same time mitigating their weaknesses. For instance, while Likert scales enable the convenient quantification of respondent scores on specific constructs, these scores can often be biased (e.g., most responses could be biased by how one influential item is scored, and individual tendencies of scoring in the extremes, or centrally). Forced-choice (ipsative) responses can reduce the biases that can potentially affect Likert scale ratings, however, the ordinal nature of the data (i.e., ranked) they produce leads to similar total scores across respondents that narrows severely the range of personalities that are observed among individuals in reality – thus highlighting the attractiveness of a Likert scale component as a response mechanism.

1.2 Item analysis.

Although the FLEX and COPE items have been carefully selected from a larger pool of items, we can further judge the quality of these items by testing them through item analysis. The first analysis tested the assumption that when a particular FLEX or COPE factor has high average scores (i.e., >= 5), a high quality item of the same factor would be rated higher on average than the other items in the same set. For example, among all the respondents who have high average Forceful scores (i.e., >= 5), the Forceful item in each set should be rated higher than the other items in the same set. Figures 3 – 10 present the comparison of the average ratings of the items in each set when the average score for each of the FLEX and COPE factors was high (i.e., >= 5).

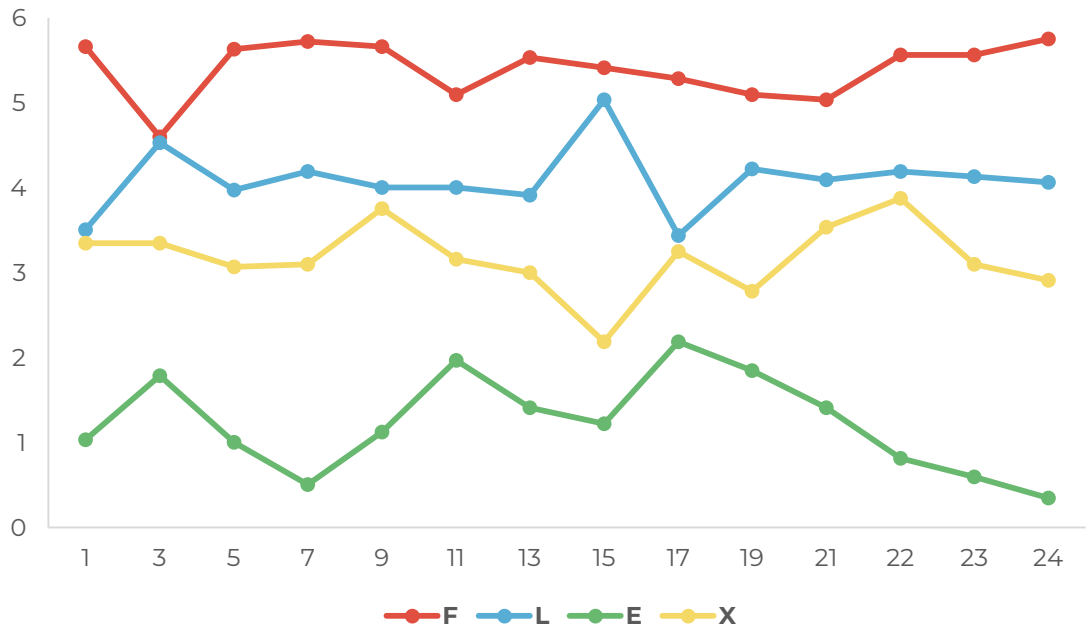

Figure 3: Item analysis of 14 sets of FLEX items when the average Forceful rating was >= 5. This analysis compared the average ratings of the items in each set when the average Forceful rating was >= 5.

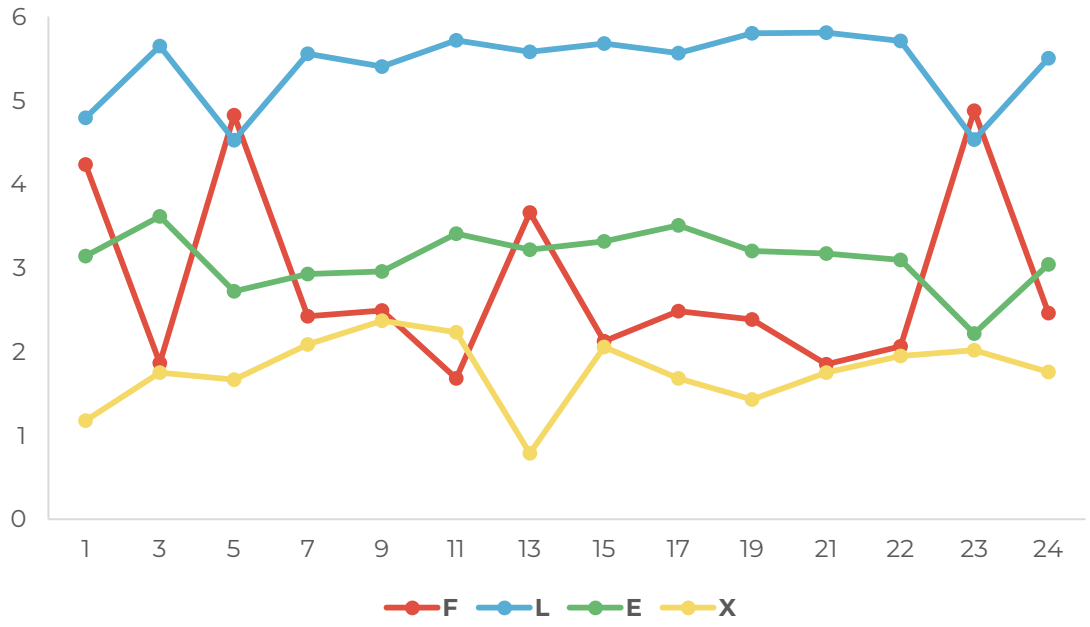

Figure 4: Item analysis of 14 sets of FLEX items when the average Logical rating was >= 5. This analysis compared the average ratings of the items in each set when the average Logical rating was >= 5.

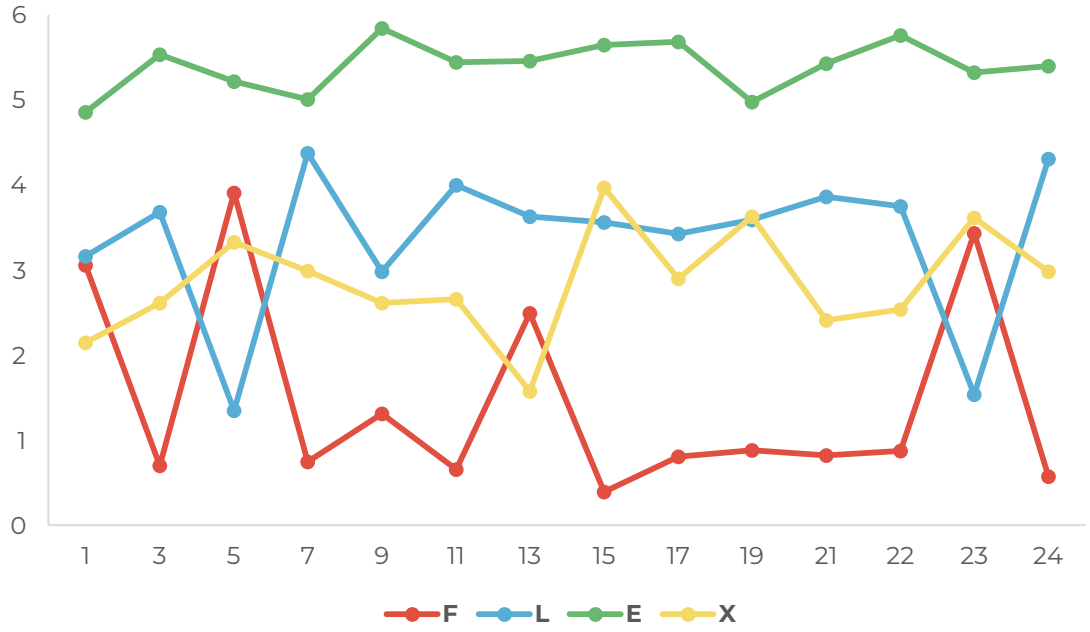

Figure 5: Item analysis of 14 sets of FLEX items when the average Empathic rating was >= 5. This analysis compared the average ratings of the items in each set when the average Empathic rating was >= 5.

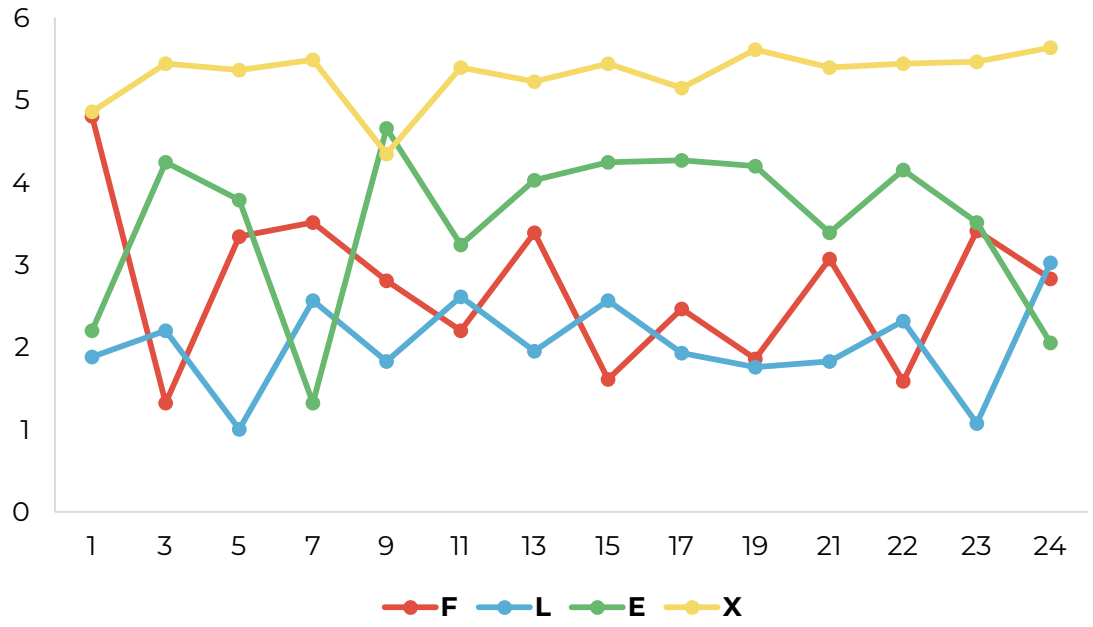

Figure 6: Item analysis of 14 sets of FLEX items when the average eXpressive rating was >= 5. This analysis compared the average ratings of the items in each set when the average eXpressive rating was >= 5.

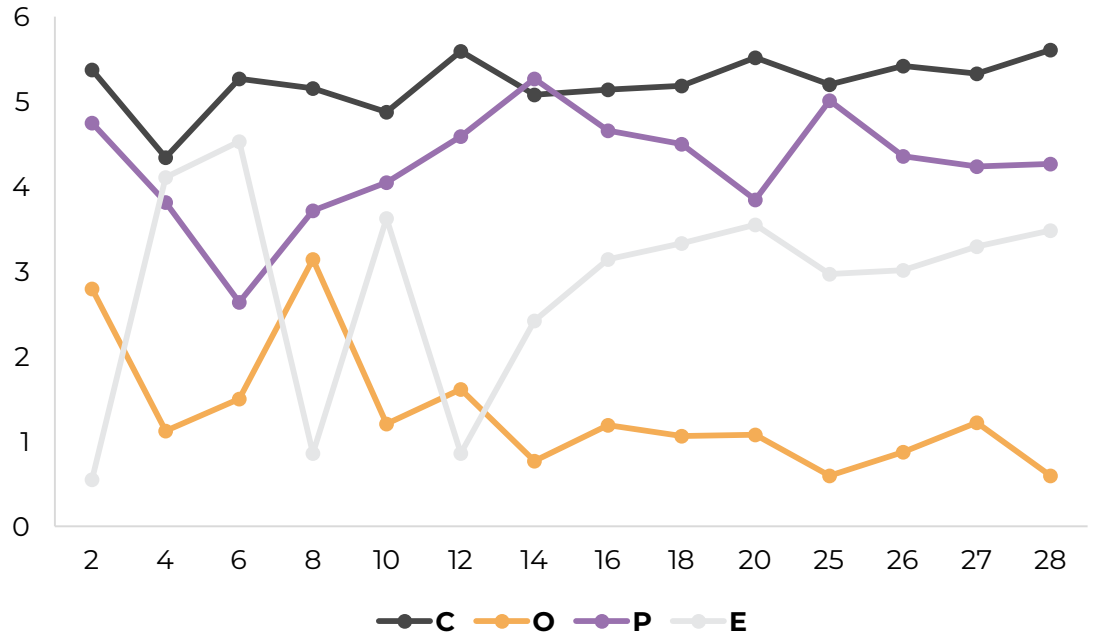

Figure 7: Item analysis of 14 sets of COPE items when the average Contained rating was >= 5. This analysis compared the average ratings of the items in each set when the average Contained rating was >= 5.

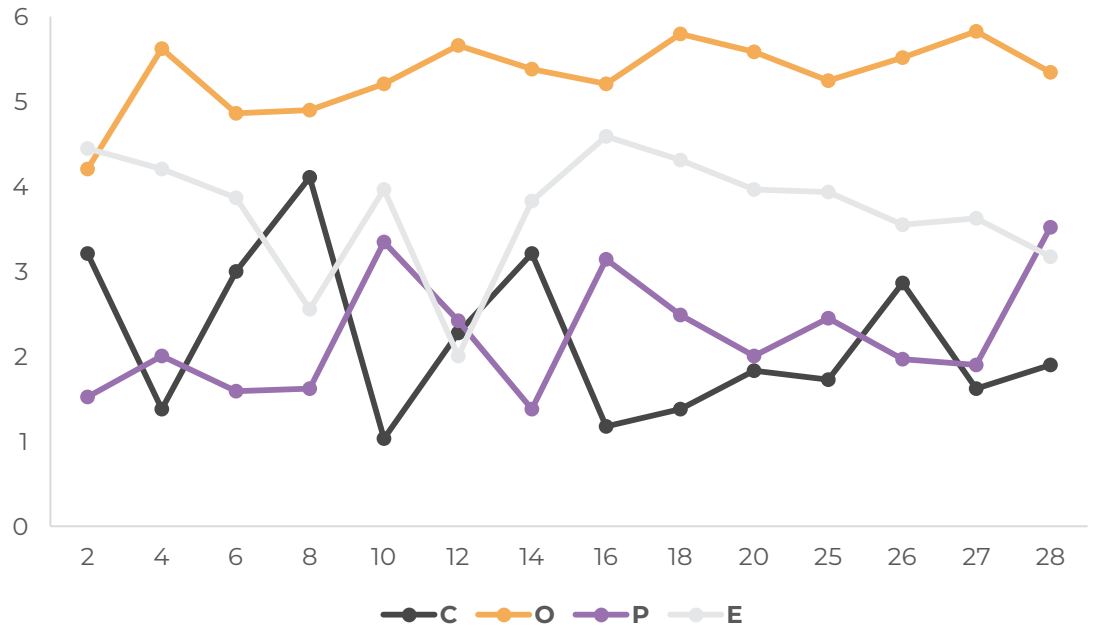

Figure 8: Item analysis of 14 sets of COPE items when the average Optimistic rating was >= 5. This analysis compared the average ratings of the items in each set when the average Optimistic rating was >= 5.

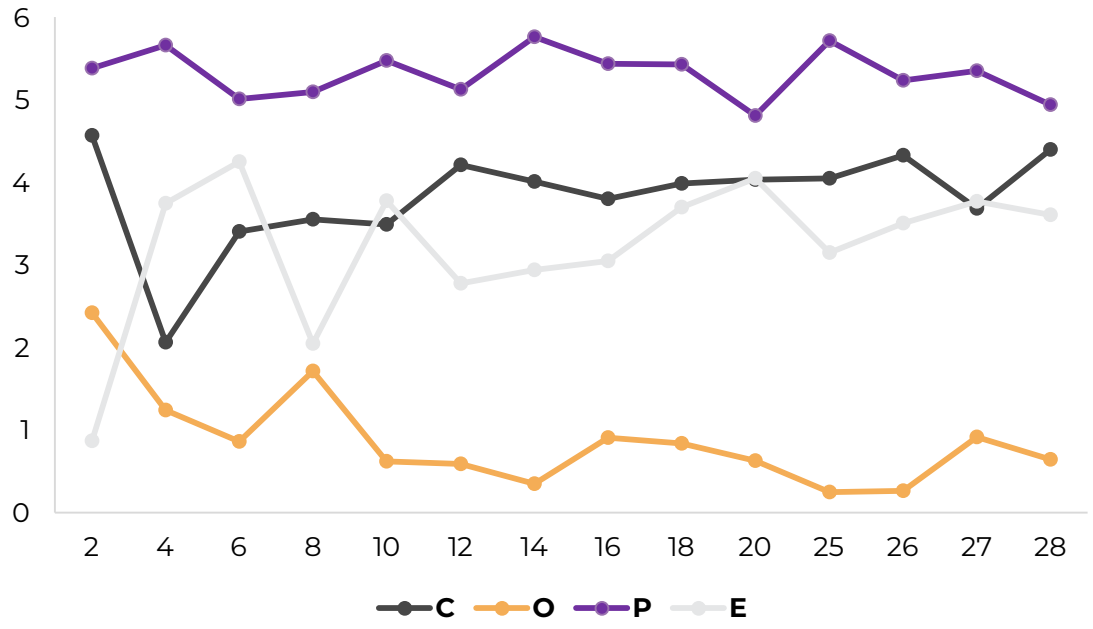

Figure 9: Item analysis of 14 sets of COPE items when the average Prudent rating was >= 5. This analysis compared the average ratings of the items in each set when the average Prudent rating was >= 5.

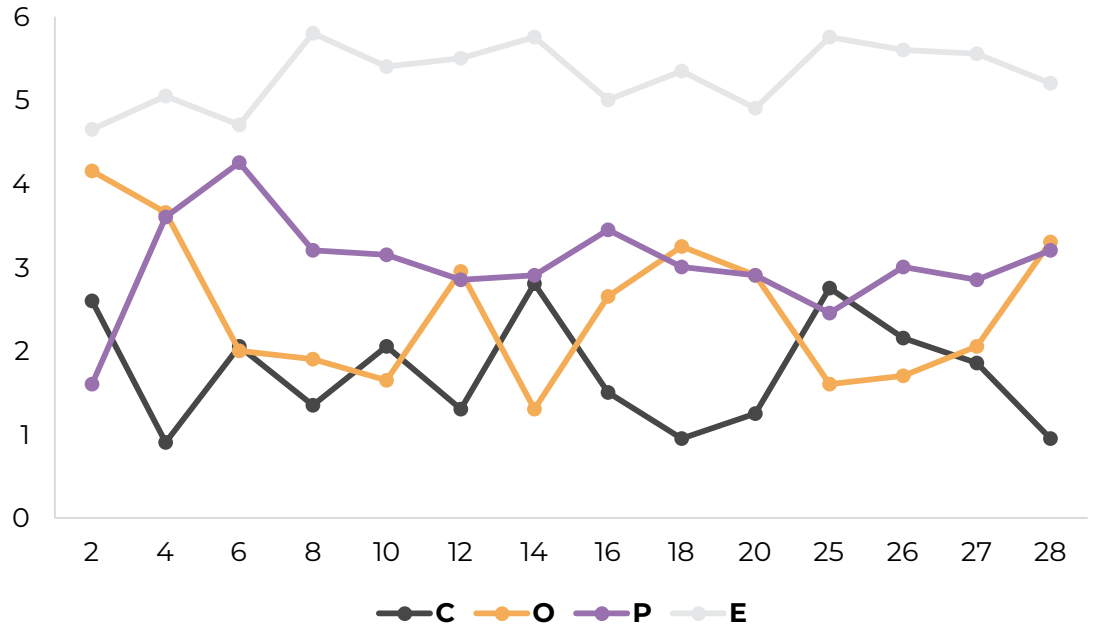

Figure 10: Item analysis of 14 sets of COPE items when the average Engaged rating was >= 5. This analysis compared the average ratings of the items in each set when the average Engaged rating was >= 5.

From the visual inspection of the items in Figures 3-10, there were a few instances where the average rating of the item for the target factor was lower than the average rating of another item in the same set. Specifically, the items identified for FLEX were Logical items 3 and 13 and eXpressive items 1 and 5; and for COPE Contained item 7 and Optimistic item 1. These observations were subsequently taken into consideration in subsequent analyses (see Section 2).

Next, we conducted a Multivariate Analysis of Variance (MANOVA) to statistically determine whether there are significant differences between the average score of each factor across groups comprising people who rated each factor highest. Post-hoc analysis identified that when a group rated a particular factor highest, they recorded significantly higher average scores for the same factor compared to the other groups (see Tables 1 and 2). These findings show that when a person is identified as having the highest average score in a particular factor of FLEX and COPE, the average score of this factor is significantly higher than the scores of other people who have not rated this factor highest. In summary, the item analysis conducted on the FLEX and COPE items suggest that there is distinction among items within each of the sets, which is not only reflective of the quality of the items, but also offers a preliminary indication of the construct validity (i.e., whether a test measures an intended construct) of the FLEX and COPE models.

		Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
F	L	2.0250*	0.12014	0.000	1.7158	2.3342
	E	2.7684*	0.11832	0.000	2.4640	3.0729
	X	1.7688*	0.13980	0.000	1.4090	2.1286
L	F	1.3697*	0.10227	0.000	1.1066	1.6329
	E	1.4116*	0.06807	0.000	1.2364	1.5868
	X	2.1888*	0.09302	0.000	1.9495	2.4282
E	F	2.0324*	0.10459	0.000	1.7632	2.3015
	L	1.3982*	0.07069	0.000	1.2163	1.5801
	X	1.1265*	0.09482	0.000	0.8825	1.3706
X	F	1.2424*	0.12568	0.000	0.9190	1.5658
	L	2.0476*	0.09824	0.000	1.7948	2.3004
	E	1.4435*	0.09643	0.000	1.1953	1.6916

Table 2: Tukey's HSD post-hoc test for FLEX.

		Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
C	O	1.6764*	0.09407	0.000	1.4343	1.9185
	P	.8493*	0.06641	0.000	0.6783	1.0202
	E	1.6845*	0.08901	0.000	1.4555	1.9136
O	C	2.3896*	0.12587	0.000	2.0657	2.7135
	P	2.9094*	0.11615	0.000	2.6105	3.2083
	E	1.9477*	0.14063	0.000	1.5858	2.3096
P	C	.7707*	0.06206	0.000	0.6110	0.9305
	O	1.6101*	0.08112	0.000	1.4014	1.8189
	E	1.1765*	0.07596	0.000	0.9810	1.3720
E	C	1.0984*	0.08247	0.000	0.8862	1.3107
	O	.9559*	0.09739	0.000	0.7053	1.2065
	P	1.0118*	0.07532	0.000	0.8179	1.2056

Table 3: Tukey's HSD post-hoc test for COPE.

Section 2: What is the factor structure of FLEX and COPE?

2.1 Examining the construct validity of FLEX and COPE models.

Following on from the previous section, we continue to examine the construct validity of FLEX and COPE by investigating in greater detail the internal structure of these models. Specifically, we examine the factor structure of both the FLEX and COPE models, to identify any items that might have deficient psychometric properties. If we refer to the proposed FLEX and COPE models in *Figures 1* and *2*, they suggest a four-factor structure for FLEX and COPE. To find out if the data suggests likewise, we conducted Exploratory Factor Analyses (EFA) for all 14 sets of items in both FLEX and COPE. An exploratory factor analysis is a data-driven statistical procedure that is used to identify the relationships among variables (in this case the relationships between individual items), and in doing so enables the categorisation of items into latent constructs (e.g., Forceful, Logical, Empathic and eXpressive factors). When interpreting the output of the EFAs, we followed the following steps:

1. The number of factors was interpreted by scrutinising the eigenvalues of each factor structure. According to Kaiser (1960), only the number of factors with eigenvalues of > 1 were considered for analysis. Further decisions on the factor structure were also be made using the cumulative variance explained by each number of factors.

2. Studying factor loadings of the individual items to help us to decide on which items load to a construct. Since unrotated EFAs usually allow items to load on to more than one factor, we applied varimax rotations to the EFAs to produce factor loadings that more strongly load to a single factor, and less so on other factors. This enhanced the interpretability of the factor loadings. In general, factor loadings that were > 0.30 or < -0.30 (Hair, Anderson, Tatham, & Black, 1998) were considered to be strong factor loadings. Items that had factor loadings smaller than 0.30 in magnitude were considered for removal.

3. Due to the integrity of the items in each set (items with the same numerical suffix hereafter), items that were in the same set as an item considered for removal, would by extension need to be removed too.

4. If further criteria were required to inform decision making on which items to retain or remove, then a comparison of the cross-loadings (i.e., factor loadings of a particular item across the various factors) would be made. The item that loaded most highly on to its theorised factor than on to other factors would be retained. Examining changes in the removal of each item to the reliability of each factor would also be considered.

2.1.1 Factor structure analysis of FLEX.

STEP 01	An EFA with varimax rotation of the FLEX model with all 14 items included was performed. From the initial analysis, the number of eigenvalues suggested a 12-factor model for FLEX. However, the cumulative variance explained suggested a 4-factor structure, accounting for 40.3% of variance explained.
STEP 02	Judging from the strength of the factor loadings of the individual items, the following 13 items had factor loading that were lower in magnitude than the criterion of +/- 0.30 (Hair et al., 1998) - F1, F3, F13, L1, E1, E3, E4, E10, E14, X5, X6, X11, X13.
STEP 03	Since the integrity of the items in the same set needs to be maintained, sets 1, 3 and 13 of FLEX were removed.
STEP 04	The removal of the final FLEX item was determined by the examination of the cross-loadings. This led to the removal of set 14 of FLEX. More detailed reporting of this final FLEX model can be found below.

2.1.2 Factor structure analysis of COPE.

STEP 01	An EFA with varimax rotation of the COPE model with all 14 items included was conducted. From the initial analysis, the number of eigenvalues suggests a 14-factor model for COPE. However, the cumulative variance explained suggests a 5-factor structure, accounting for 38.4% of variance explained. See Table 1 for the items loading on to each factor.
STEP 02	Judging from the strength of the factor loadings of the individual items, the following 21 items had factor loading that were lower in magnitude than the criterion of +/- 0.30 (Hair et al., 1998) - C2, C5, C7, C9, C11, C12, O1, P2, P3, P4, P5, P8, P12, En3, En4, En6, En7, En8, En10, En13, En14. Since there were too many items that had factor loading lower in magnitude to the prescribed criterion, the criterion was increased in a stepwise manner starting from < 0.10, with increments of 0.10. Items lower than 0.10 in magnitude included C2, En4, En10 and En13. Items lower than 0.20 in magnitude included C5, C7, C11, O1, P3, P4, En6, En8 and En14. Items lower than 0.30 in magnitude included C9, C12, P2, P5, P8, P12, En3, En7.
STEP 03	Since the integrity of the items in the same set needs to be maintained, the sets of COPE that were considered for removal included 2, 3, 4, 7, 8 and 12. Items 2 and 4 were removed, as they comprised items that had factor loadings that were lower than 0.10 in magnitude.
STEP 04	The removal of the final two COPE items were determined by the examination of the cross-loadings. This led to the removal of sets 1 and 6 in COPE. The removal of the four sets of items also resulted in a 4-factor model that demonstrated best fit, albeit comprising a few items with factor loadings that are lower than 0.30 in magnitude. More detailed reporting of this final COPE model can be found below.

2.2 Reanalysis of the 10-item sets of FLEX and COPE.

EFAs were conducted with the 10-item sets of FLEX and COPE. Although the FLEX model had nine factors and the COPE model had 12 factors with eigenvalues > 1 (see Figures 11 and 12), the cumulative variance explained suggested that a four-factor model structure was best for both FLEX and COPE. The cumulative variance explained by a four-factor FLEX and COPE models were 44.7% and 37.6% respectively. The suggested four-factor structures for FLEX and COPE indicated by the eigenvalues and variance explained was also supported by the strong factor loadings (i.e., above 0.30 in magnitude) observed across all individual FLEX and COPE items (see Table 2 and 3 for average factor loadings across each factor). Further, the four-factor solution for FLEX and COPE perhaps reflected clearer distinctions among the personality preferences relative to other personality profiling tools, which tend to favour two-factor structures, despite often theorising four-factor models. Due to the novelty of the COPE model that explains situational level behaviour (i.e., when there is perceived to be something to be won or lost), further examinations into aspects such as criterion validity (Section 4) will demonstrate further evidence of the structural make-up of COPE.

	Average factor loadings			
	Factor 1	**Factor 2**	**Factor 3**	**Factor 4**
Forceful	**0.63**	-0.01	-0.13	0.08
Logical	0.00	**0.63**	-0.07	-0.06
Empathic	-0.16	-0.04	**0.57**	0.03
eXpressive	0.09	-0.12	0.07	**0.47**

Table 5: Average factor loadings for FLEX four-factor model.

	Average factor loadings			
	Factor 1	**Factor 2**	**Factor 3**	**Factor 4**
Contained	**0.37**	-0.07	0.10	0.01
Optimistic	-0.06	**0.68**	-0.08	0.07
Prudent	0.16	-0.18	**0.39**	0.003
Engaged	-0.04	0.06	0.04	**0.34**

Table 6: Average factor loadings for COPE four-factor model.

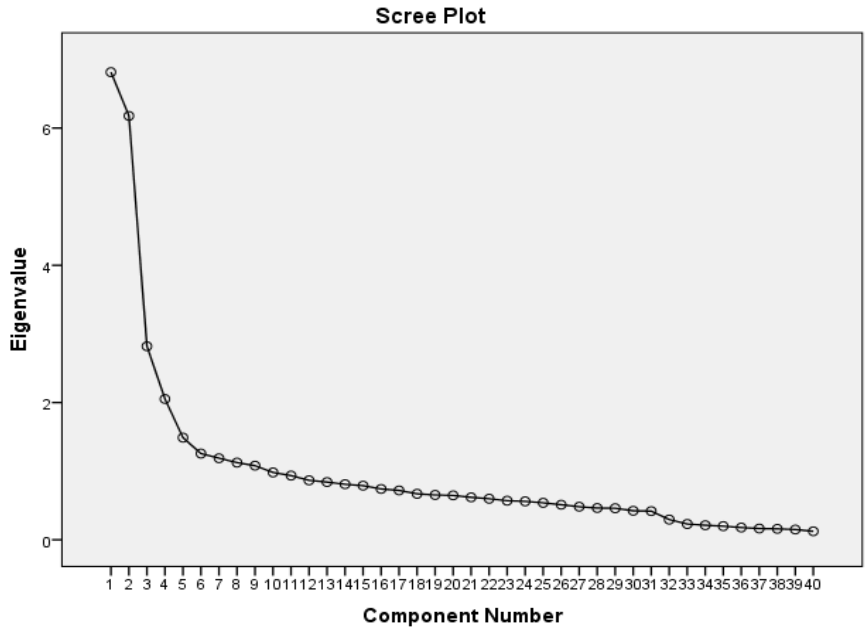

Figure 11: Scree plot for FLEX.

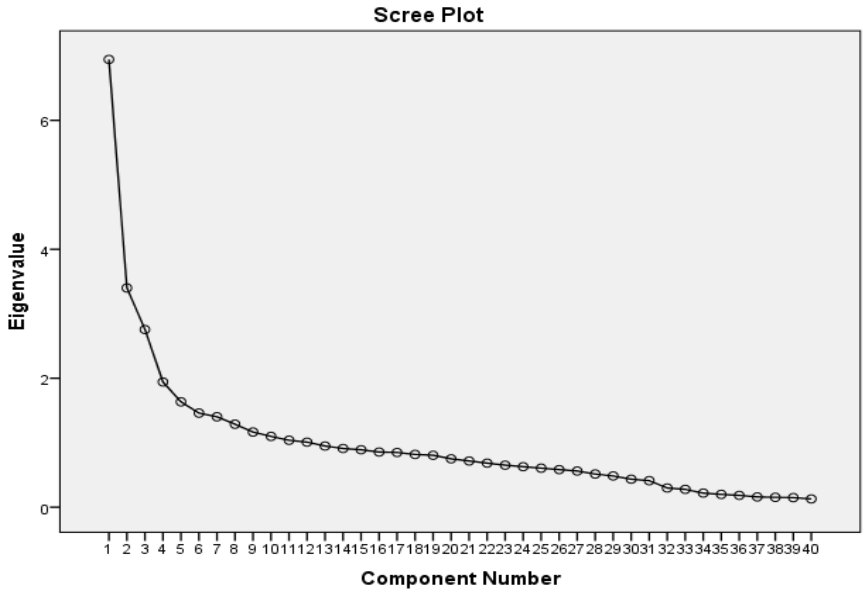

Figure 12: Scree plot for COPE.

Section 3: Reliability.

In this section, we examine the reliability of the FLEX and COPE items, or more specifically, how consistent are the various items that are associated with a particular construct/characteristic in yielding similar results (i.e., internal consistency). We examine reliability through the examination of the Cronbach's Alpha coefficients.

3.1 Cronbach's Alphas of FLEX and COPE items.

Cronbach's Alpha is a popular measure of internal consistency and is a commonly used measure of scale reliability. A Cronbach's Alpha coefficient of 0.70 or higher is typically considered acceptable in scale development. The Cronbach's Alpha coefficients for FLEX and COPE factors are either significantly higher or very close to the commonly accepted 0.70 value (see Table 7 and 8), which suggests that the items measuring FLEX and COPE are considered reliable. The integrity of the items corresponding to their specific FLEX and COPE characteristics are also considered to be highly robust, as the removal of specific items from the group did not drastically alter the overall Cronbach's Alpha coefficient.

	Forceful	Logical	Empathic	eXpressive
Overall	**0.87**	**0.85**	**0.85**	**0.82**
If item 1 deleted	0.86	0.84	0.84	0.80
If item 2 deleted	0.86	0.85	0.85	0.80
If item 3 deleted	0.85	0.84	0.82	0.81
If item 4 deleted	0.85	0.84	0.84	0.80
If item 5 deleted	0.87	0.84	0.83	0.79
If item 6 deleted	0.85	0.84	0.82	0.80
If item 7 deleted	0.85	0.85	0.83	0.80
If item 8 deleted	0.85	0.83	0.85	0.80
If item 9 deleted	0.85	0.83	0.84	0.79
If item 10 deleted	0.85	0.83	0.82	0.80

Table 7: Cronbach's Alphas of FLEX factors

	Contained	Optimistic	Prudent	Engaged
Overall	**0.75**	**0.88**	**0.72**	**0.66**
If item 1 deleted	0.73	0.88	0.74	0.65
If item 2 deleted	0.75	0.87	0.70	0.63
If item 3 deleted	0.74	0.87	0.68	0.64
If item 4 deleted	0.73	0.88	0.70	0.65
If item 5 deleted	0.73	0.88	0.69	0.61
If item 6 deleted	0.73	0.87	0.69	0.63
If item 7 deleted	0.74	0.87	0.68	0.61
If item 8 deleted	0.73	0.86	0.69	0.64
If item 9 deleted	0.72	0.87	0.66	0.63
If item 10 deleted	0.70	0.88	0.70	0.63

Table 8: Means, Cronbach's Alphas of COPE factors.

Section 4: Criterion validity of COPE.

4.1 Introduction to Reinforcement Sensitivity Theory.

Reinforcement Sensitivity Theory (RST) is considered one of the most prominent neuropsychological theories of personality in recent times (Gray & McNaughton, 2000; McNaughton & Corr, 2004, 2008; Corr & McNaughton, 2012). The most updated iteration of RST suggests that personality is governed by three neuropsychological systems: the behavioural activation system (BAS), the behavioural inhibition system (BIS), and under high threat the fight-flight-freeze system (FFFS) (Gray & McNaughton, 2000). The BAS is characterised as an appetitive system that explains why a person is striving to achieve a goal, take risks, or is interested in a new idea or project. Contrastingly, the BIS is characterised as an aversive behavioural system (i.e., avoiding danger or potential threats). As mentioned earlier in the introduction, COPE was developed based on RST, specifically modeling the positive characteristics associated with being either low or high in BAS and BIS scores – which is therefore the focus of our attention in this section.

4.2 Relationship between COPE and RST.

In order to ascertain COPE as a sound model that is theoretically grounded, we examined the criterion validity of COPE by comparing the ratings derived from the COPE items with BAS and BIS measurements. The BAS and BIS measurements we used were derived from the Reinforcement Sensitivity Theory of Personality Questionnaire (RST-PQ; Corr & Cooper, 2016). The BAS factor comprises four sub-factors of Reward Interest, Goal-Drive Persistence, Reward Reactivity and Impulsivity, accounting in total 32 items. The BIS factor comprises 23 items. The BAS and BIS measurements were completed by all 977 participants in this sample, making possible a basis of comparison with COPE. Please refer to Table 9 for descriptive statistics of BAS and BIS scores.

	Mean	Standard deviation	Minimum	Maximum	Skewness	Kurtosis
BAS	2.50	0.49	1.00	4.00	0.00	-0.47
BIS	2.45	0.70	1.15	4.00	0.09	-0.83

Table 9: Mean scores, Standard deviations, Minimum scores, Maximum scores, Skewness and Kurtosis statistics for FLEX and COPE.

An initial inspection of the correlations between BAS, BIS and the individual COPE factors (Table 10) suggested that the COPE model was in line with the theorised direction of association. Specifically, Contained is developed to be negatively associated with both the BAS and BIS, Optimistic to be positively associated with BAS but negatively associated with BIS, Prudent to be negatively associated with BAS but positively associated with BIS, and Engaged to be positively associated with both BAS and BIS. Based on these predicted associations, it seems that with the exception of the correlations between Prudent and BIS and Engaged and BIS (both of which seem to be unrelated), all the other correlations are in the predicted direction.

	Contained	Optimistic	Prudent	Engaged
BAS	-0.17*	0.56*	-0.23*	0.28*
BIS	-0.25*	-0.11*	0.01	-0.04

*Table 10: Zero-order correlations between BAS, BIS and COPE factors. Note: * $p < 0.05$.*

Next, we looked at the mean BIS and BAS scores for participants grouped by their highest COPE score. As Figure 13 demonstrates, there appeared to be the predicted association between COPE and BIS and BAS, with Contained scoring lower on both, Optimisitic with higher BAS and lower BIS, Prudent with lower BAS and higher BIS, and Engaged with higher BAS and BIS.

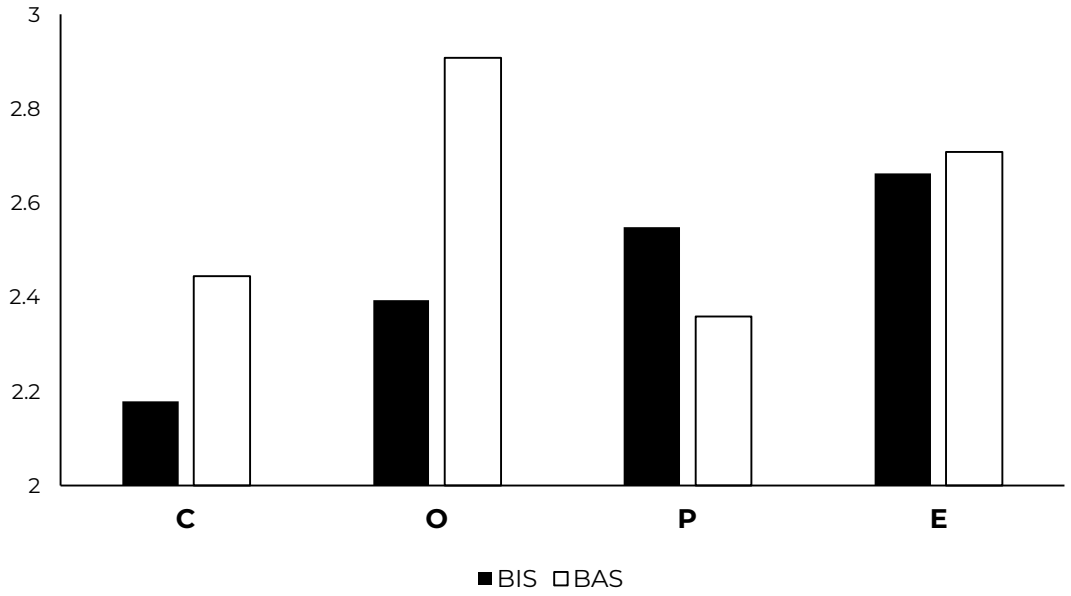

Figure 13: Mean BIS and BAS scores among the four COPE types.

We followed up the correlation analysis with a MANOVA to examine whether the BAS and BIS scores were different between the COPE factors for these participants whose first preference was each of the four COPE types. As predicted and in line with the correlation analysis, the post-hoc tests revealed that BAS scores for Optimistic and Engaged were significantly higher than Contained and Prudent, while Contained and Prudent were not significantly different from each other (Table 11). For BIS, the post-hoc analysis demonstrated that Engaged was associated with significantly higher BIS scores compared to Contained and Optimistic, as predicted. Prudent was also associated with significantly higher BIS scores compared to Contained, as predicted, but not Optimistic. Visual representations of these associations have been plotted (Figure 14). Overall, given that this is the first examination on the criterion validity of COPE, these results demonstrated significant evidence of the associations between the COPE factors and BIS and BAS.

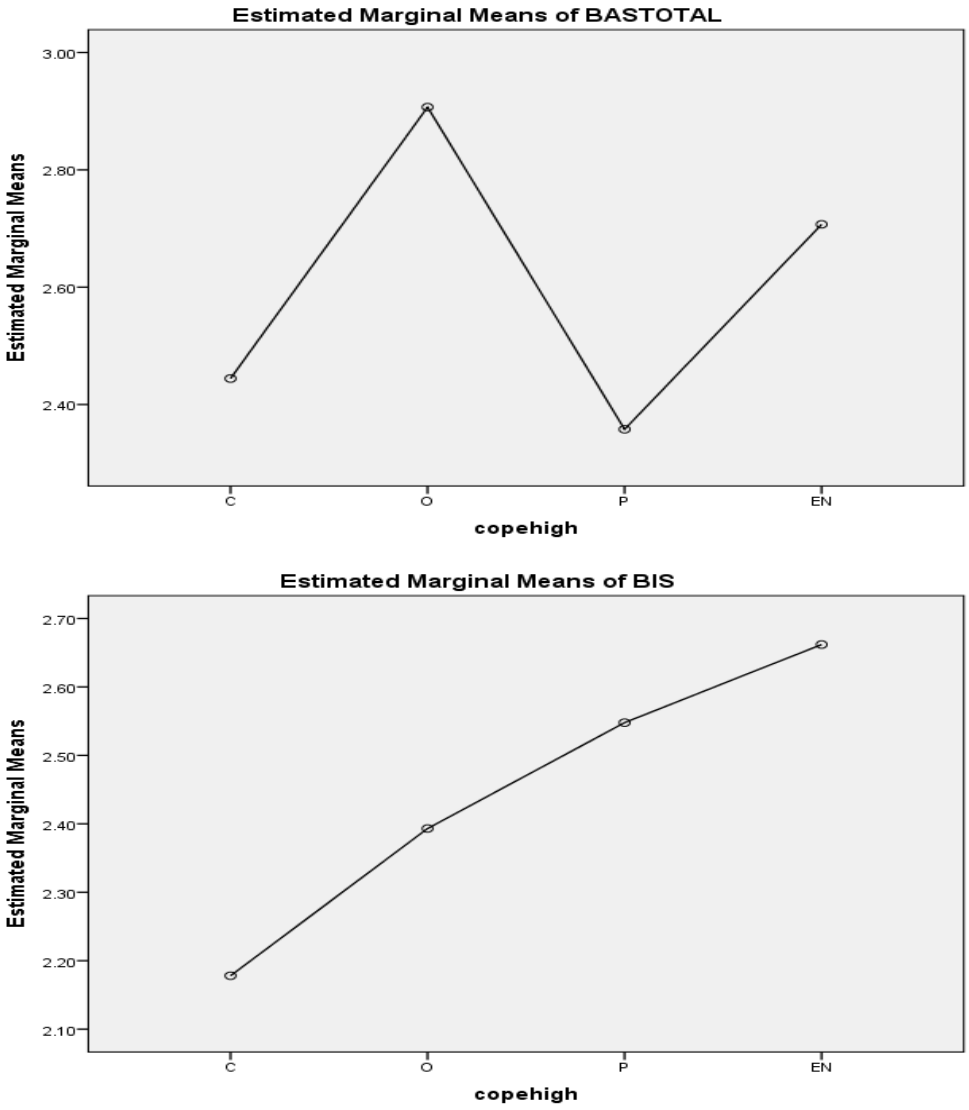

Figure 14: Plot of BAS and BIS scores against COPE factors.

			Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
BAS	C	O	-.4626*	0.05021	0.000	-0.5918	-0.3333
		P	0.0866	0.03545	0.070	-0.0047	0.1778
		E	-.2628*	0.04751	0.000	-0.3850	-0.1405
	O	C	.4626*	0.05021	0.000	0.3333	0.5918
		P	.5491*	0.04633	0.000	0.4299	0.6684
		E	.1998*	0.05610	0.002	0.0554	0.3441
	P	C	-0.0866	0.03545	0.070	-0.1778	0.0047
		O	-.5491*	0.04633	0.000	-0.6684	-0.4299
		E	-.3493*	0.04339	0.000	-0.4610	-0.2377
	E	C	.2628*	0.04751	0.000	0.1405	0.3850
		O	-.1998*	0.05610	0.002	-0.3441	-0.0554
		P	.3493*	0.04339	0.000	0.2377	0.4610
BIS	C	O	-.2150*	0.07512	0.022	-0.4084	-0.0217
		P	-.3698*	0.05303	0.000	-0.5063	-0.2333
		E	-.4839*	0.07107	0.000	-0.6668	-0.3010
	O	C	.2150*	0.07512	0.022	0.0217	0.4084
		P	-0.1548	0.06932	0.115	-0.3332	0.0236
		E	-.2689*	0.08393	0.008	-0.4848	-0.0529
	P	C	.3698*	0.05303	0.000	0.2333	0.5063
		O	0.1548	0.06932	0.115	-0.0236	0.3332
		E	-0.1141	0.06491	0.295	-0.2811	0.0530
	E	C	.4839*	0.07107	0.000	0.3010	0.6668
		O	.2689*	0.08393	0.008	0.0529	0.4848
		P	0.1141	0.06491	0.295	-0.0530	0.2811

Table 11: Tukey's *HSD post-hoc test of BAS, BIS scores and COPE factors.*

			Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
BAS	F	L	.3495*	0.05182	0.000	0.2162	0.4829
		E	.3321*	0.05103	0.000	0.2008	0.4634
		X	-0.0362	0.06029	0.932	-0.1913	0.1190
	L	F	-.3495*	0.05182	0.000	-0.4829	-0.2162
		E	-0.0174	0.03449	0.958	-0.1062	0.0714
		X	-.3857*	0.04713	0.000	-0.5070	-0.2644
	E	F	-.3321*	0.05103	0.000	-0.4634	-0.2008
		L	0.0174	0.03449	0.958	-0.0714	0.1062
		X	-.3683*	0.04626	0.000	-0.4873	-0.2492
	X	F	0.0362	0.06029	0.932	-0.1190	0.1913
		L	.3857*	0.04713	0.000	0.2644	0.5070
		E	.3683*	0.04626	0.000	0.2492	0.4873
BIS	F	L	-0.0568	0.07752	0.884	-0.2563	0.1427
		E	-0.0917	0.07634	0.626	-0.2882	0.1048
		X	0.0497	0.09021	0.946	-0.1824	0.2819
	L	F	0.0568	0.07752	0.884	-0.1427	0.2563
		E	-0.0349	0.05160	0.906	-0.1677	0.0979
		X	0.1065	0.07051	0.431	-0.0749	0.2880
	E	F	0.0917	0.07634	0.626	-0.1048	0.2882
		L	0.0349	0.05160	0.906	-0.0979	0.1677
		X	0.1415	0.06921	0.173	-0.0367	0.3196
	X	F	-0.0497	0.09021	0.946	-0.2819	0.1824
		L	-0.1065	0.07051	0.431	-0.2880	0.0749
		E	-0.1415	0.06921	0.173	-0.3196	0.0367

Table 12: Tukey's HSD post-hoc test of BAS, BIS scores and FLEX factors.

A MANOVA was also conducted for BAS, BIS and FLEX factors. The post-hoc analysis showed that Forceful and eXpressive had significantly higher BAS scores than Logical and Empathic (Table 12). The associations between FLEX and BAS is in line with previous empirical research that examined the relationships between RST and Big Five/Five-Factor Models of personality. Specifically, the research in this area has consistently found positive associations between extraversion and BAS (Keiser & Ross, 2011; Mitchell, Kimbrel, Hundt, Cobb, Nelson-Gray, & Lootens, 2007; Smits & Boeck, 2006), which is nicely aligned with FLEX, since its measurement was developed based on extraversion. Contrastingly, none of the FLEX factors were significantly different from one another in BIS scores – which is a reflection of the theoretical basis of BIS being linked with being an aversive behavioural system, and the positive empirical associations between BIS and neuroticism rather than extraversion. Put together, these results indicate that FLEX and COPE are two distinct models, and tap into distinctly different aspects of personality. The FLEX model taps into a person's behavioural style preference, while the COPE model taps into a person's situational/contextual behavioural systems with regards to reward and threat.

Conclusions.

The statistical evaluation of FLEX and COPE presented in this White Paper found the Spotlight personality tool to be both a reliable and valid tool for the evaluation of personality. FLEX and COPE items were carefully developed, which through item analysis, were found to be of high quality. There is also strong statistical support for the four-factor structures of FLEX and COPE, with both four-factor structures accounting for 44.7% and 37.6% of variance explained respectively, and average item factor loadings ranging between 0.34 and 0.68. Individually, each of the factors within FLEX and COPE also demonstrated strong reliability, with Cronbach's Alpha ranging from 0.87 to 0.66. Finally, by examining the criterion validity of FLEX and COPE, we did not only provide evidence of the sound theoretical underpinning for the link between 'Reinforcement Sensitivity Theory' and COPE, but also demonstrated evidence that FLEX and COPE are indeed distinct models of personality that tap into a person's behavioural style preferences and contextual preferences respectively. Overall, the strength of the current results promotes Spotlight as a robust personality tool with sound theoretical basis. These results provide a sound foundation for further evaluative work as Spotlight becomes increasingly accessible to larger samples that are more culturally and contextually diverse.

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