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**Personality differentiation by cognitive ability; An application of the moderated factor  
model**

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RUNNING HEAD: Personality differentiation

### **Abstract**

The personality differentiation hypothesis holds that at higher levels of intellectual ability, personality structure is more differentiated. We tested differentiation at both the primary and global factor level in the US standardisation sample of the 16PF5 (n=10,261; 5124 male; mean age=32.69 years (SD=12.83 years). We used a novel combined item response theory and moderated factor model approach that overcomes many of the limitations of previous tests. We found moderation of latent factor variances in five of the fifteen primary personality traits of the 16PF. At the domain level, we found no evidence of personality differentiation in Extraversion, Self-Control, or Independence. We found evidence of moderated factor loadings consistent with the personality differentiation for Anxiety, and moderated factor loadings consistent with anti-differentiation for Tough-Mindedness. As differentiation was restricted to a few personality factors with small effect sizes, we conclude that there is only very limited support for the personality differentiation hypothesis.

**Keywords:** personality differentiation, personality structure, intelligence, cognitive ability

### **Highlights:**

- First application of moderated factor models to personality differentiation.
- No evidence of differentiation found for the global domains of Independence, Self-control or Extraversion.
- Moderation of factor loadings consistent with differentiation found for Anxiety.
- Moderation of factor loadings consistent with anti-differentiation found for Tough-Mindedness.
- Collectively minimal support for personality differentiation by cognitive ability

## 1.0 Introduction

While very many studies have investigated the relation between intellectual ability and personality trait levels (e.g. Bartels et al., 2006; Chamorro-Premuzic et al., 2005; Murray et al. 2014), much less attention has been paid to the relation between intellectual ability and personality trait structure. An exception has been the work in the personality differentiation framework. The personality differentiation hypothesis originated with Brand, Egan and Deary (1994) who proposed that at higher levels of intellectual ability, personality structure is more differentiated. The authors proposed the hypothesis by way of analogy with the ‘intelligence differentiation’ hypothesis in cognitive ability (Spearman, 1927) and was based on the idea that more intelligent individuals have more specialised skills and interests which in turn become reflected in more differentiated personality structures.

Empirical studies have largely operationalised differentiation statistically as personality constructs having smaller variances and larger inter-correlations in individuals of lower cognitive ability. Several studies have reported a tendency for larger facet (Austin, Hofer, Deary & Eber, 2000; Harris, Vernon & Jang, 2005) or dimension variance (Austin, Deary & Gibson, 1997; De Fruyt, Aluja, García, Rolland, & Jung, 2006; Harris et al., 2005; Harris, Steinmayr, & Amelang, 2006; Myers & McCaulley, 1985; Shure & Rogers, 1963) in higher ability groups. With the exception of only a few samples (e.g. Austin et al., 1997) or traits within studies, dimension inter-correlations have indeed tended to decrease with ability level (Austin et al., 2002; De Fruyt et al., 2006; Blas & Carraro, 2011; Harris et al., 2006; Möttus et al., 2007) though the effects are not large nor always statistically significant. This past work has led to a general perception that there is at least some support for the personality differentiation hypothesis.

In interpreting the above-mentioned evidence, it is important to consider the possibility that cognitive ability may not produce true differences in latent personality structure, but differences in the manner in which individuals interpret, understand and respond to personality items which could, in turn, impact on observed structure (Allik & McCrae, 2004; Watson, Deary & Austin, 2007). If, for example, personality items show differential reliability across the range of cognitive ability due to these or other measurement issues, then this could mask or mimic differentiation effects. That is,

28 observed personality differentiation could be a measurement phenomenon rather than a latent  
29 structure phenomenon (e.g. see Murray, Dixon & Johnson, 2013).

30         The majority of previous personality studies have utilised observed scores which conflate trait  
31 and error variance making it difficult to differentiate between effects (or the absence of effects) due to  
32 differential measurement properties and differential latent structure across the range of cognitive  
33 ability. Although Brand et al., (1994) did not explicitly lay out any predictions regarding how  
34 personality differentiation should manifest in the latent variable models now commonly used to model  
35 and test hypotheses regarding personality structure, it would be reasonable to assume some parallels  
36 between personality differentiation and the intelligence differentiation hypothesis which served as its  
37 inspiration. The intelligence differentiation hypothesis proposes that *g* is less influential at higher  
38 levels of intellectual ability. This has been operationalized in factor models of intelligence as smaller  
39 factor loadings of specific intellectual skills (usually measured by subtest scores) for higher levels of *g*  
40 (Tucker-Drob, 2009; Molenaar, Dolan, & Verhelst, 2010). In personality, considering the relations  
41 between items and facets and between facets and global factors, this translates into the prediction that  
42 personality factor loadings will be reduced at higher levels of intellectual ability. That is, the  
43 personality factors interact with intellectual ability.

44         To ensure that any differences in factor loadings do not merely reflect differential reliability,  
45 one solution is to utilise a moderated factor model which allows moderation of item residuals to be  
46 modelled and thus explicitly models the differential reliability that might otherwise be mistaken for  
47 personality differentiation (Molenaar, Dolan, Wicherts, & van der Maas, 2010). The moderated factor  
48 model proposed by Molenaar et al. (2010) can be used to test for personality differentiation by  
49 evaluating whether the loadings in a factor model of personality are moderated by intelligence.- The  
50 approach is conceptually similar to the multi-group CFA (MG-CFA) approaches to testing personality  
51 differentiation (see DeFruyt et al. 2006; McLarnon & Carswell, 2013) but it has the advantage that it  
52 allows intellectual ability to be modelled continuously rather than across discrete groups created  
53 using artificial dichotomisation. Further, the moderated factor model provides more easily  
54 interpretable indices of moderation because it directly estimates 'moderation parameters'. These

55 parameters represent the linear change in loadings with cognitive ability level. In spite of these  
56 advantages, the moderated factor model approach is yet to be applied to the personality  
57 differentiation. It was, therefore, the aim of the present study to apply the moderated factor model to  
58 evaluate personality differentiation in a large population representative sample of individuals who  
59 had completed an omnibus personality inventory, the Sixteen Personality Factor Questionnaire,  
60 Version 5 (16PF5) (Conn & Reike, 1994).

## 61 **2.0 Methods**

### 62 **2.1 Sample & Measure**

63 We use the American standardisation sample of the 16PF5 (N= 10,261)<sup>1</sup>. The standardisation sample  
64 was reviewed in 2002 based on the US census in 2000 to ensure it remained representative of the  
65 general population of the USA with respect to a number of demographic variables including sex (5124  
66 males, 49.9%), ethnicity (77.9% white, 10.8% black, 3.6% Asian), age (mean age = 32.69 years, SD =  
67 12.83 years, range = 16 to 82) and geographic region. Conn and Rieke (1994) note that the  
68 educational level and years in education of the sample is greater than that of the US population.

#### 69 **2.1.1 Personality measures**

70 In its current form, the 16PF5 comprises 15 personality scales, structured into five second order global  
71 factors, namely Extraversion (Self-Reliance (Q2), Warmth(A), Liveliness(F), Privatness(N), Social  
72 Boldness(H)); Anxiety (Tension(Q4), Apprehension(O), Emotional Stability(C), Vigilance(L));  
73 Tough-Mindedness (Sensitivity(I), Openness to Change(Q1), Warmth(A), Abstractness(M));  
74 Independence (Dominance(E), Social Boldness(H), Vigilance(L), Openness to Change(Q1)); and  
75 finally Self-Control (Abstractness(M), Rule Consciousness(G), Perfectionism(Q3), Liveliness(F)).  
76 Each of the primary personality scales consists of between 10 and 14 items with a three point response  
77 format, “No”, “?” and “Yes”, scored as 0, 1 and 2 respectively.

#### 78 **2.1.2 Intelligence measure (moderator)**

79 In addition, the 16PF5 contains a 15 item Reasoning scale: a short cognitive ability measure assumed  
80 to tap verbal, numerical and logical abilities. It is designed to provide a quick measure of intelligence  
81 and correlates at  $r=.61$  the Information Inventory (Altus, 1948) and at  $r=.51$  with the Form A, Scale

82 2 Culture Fair Intelligence Test (CFIT; IPAT 1973a, 1973b). The test manual reports a Cronbach's  
83 alpha of .80 for the scale with 2 week and 2 month test-retest reliabilities of .71 and .70 respectively.  
84 Based on a sample of 2500 respondents, the Reasoning scale has been shown to have correlations with  
85 the primary factors of the 16PF ranging from  $r = -.27$  (L: Vigilance) to  $r = .20$  (Q1: Openness to  
86 Change) (Conn & Rieke, 1994, Appendix 5B). Investigations of differential item functioning by  
87 gender and ethnicity found no biasing by race or gender the exception of one item that functioned  
88 differently in a Hispanic sample (Conn & Rieke, 1994).

## 89 **2.2 Analysis Strategy**

### 90 **2.2.1 Overview**

91 Given the 3-level hierarchical structure of the 16PF5 (items, primary factors, global factors) the  
92 statistically most sound analysis would have been to fit a second-order moderated factor model to the  
93 item level personality data (i.e., a second-order item response theory model or discrete factor model  
94 subject to moderation). However, such a model has not yet been developed. In addition, for the  
95 present undertaking fitting such a model will be numerically challenging due to the large number of  
96 items (40 to 51 across global models), the large sample size, and the high dimensionality of the  
97 16PF5. We therefore test for moderation at the primary and global factor level separately.

### 98 **2.2.2 Primary factor level**

99 As the primary factor level consists of item level categorical data, we adopted an item response theory  
100 approach. Our choice for a specific IRT model was guided by the recurrent finding that the middle '?'  
101 option of the 16PF response scale does not consistently perform as a middle response option (Murray,  
102 Booth & Molenaar, 2015; Stark, Chernyshenko, Drasgow & Williams, 2006). As tests on interaction  
103 effects in general (Loftus, 1978) and differentiation effects in particular (Murray et al., 2013) are  
104 sensitive to scaling of the measurement, we wanted to explicitly take the ordering of the response  
105 options (including '?') into account. Therefore, we adopted the Bock's Nominal Response Model  
106 (NRM, 1972). In this model, each item category is associated with a loading parameter, unlike the  
107 discrete factor model where each *item* has a loading. This complicates the operationalisation of the  
108 differentiation effect in terms of moderated factor loadings. We therefore introduced the

109 differentiation effect on the variance of the primary factor. That is, by making the primary factor  
110 variance an exponential function of the intelligence moderator, we could investigate whether the  
111 variance decreased for increasing levels of intelligence. Note that moderation of the factor variance  
112 has been proposed as an alternative but comparable method to test for differentiation (Molenaar et al.,  
113 2010).

### 114 ***2.2.3 Global factor level***

115 To assess differentiation at the global factor level, we used a two-step approach. First, we estimated  
116 factor scores for the primary factors using the NRM discussed above. Next, we fit a moderated first-  
117 order factor model to each of the global factors. Within this model, personality differentiation was  
118 operationalised as decreasing primary factor loadings at increasing levels of intellectual ability. Note  
119 that if the primary factors are differentiated (as tested using the methods discussed above), the  
120 primary factor scores will incorporate this effect. This is desirable, as the presence of differentiation at  
121 the primary level may be the effect of differentiation at the global factor level.

### 122 ***2.2.4 Primary Factor Moderation Analyses***

123 In order to test moderation, two models were estimated per primary factor, a baseline model and a  
124 differentiation model. In the initial baseline model we estimated all item parameters. In addition, we  
125 included a main effect of the moderator on the latent factor in order to account for the simple linear  
126 association between the moderator and the primary factor under consideration (see Purcell, 2002;  
127 Molenaar et al., 2010). Next, in the differentiation model, we included an exponential function  
128 between the latent factor variance and the moderator. Subsequently, inferences about the presence of  
129 moderation were based on the Akaike Information Criterion (AIC: Akaike, 1987), Bayesian  
130 Information Criterion (BIC: Raftery, 1995) and sample size adjusted BIC (saBIC: Sclove, 1987)  
131 between the baseline and the differentiation model.<sup>2</sup> For all fit indices, smaller values indicate a better  
132 fitting model. We considered a difference to be practically significant if the difference in BIC between  
133 two models was  $> 10$  (Raftery, 1995). All models were estimated in Mplus 7.4 (Muthen & Muthen)  
134 using marginal maximum likelihood estimation. Latent variable scaling and identification was  
135 achieved by fixing the first item loading to 1.



136 **2.2.3 Global Factor Moderation Analyses**

137 For each global factor, we fit an NRM including all items proposed to measure the primary factors  
138 subsumed by that global factor. So, for example, for the global factor of Anxiety, we fit a MD-NRM  
139 with four correlated primary factors (Tension(Q4), Apprehension(O), Emotional Stability(C),  
140 Vigilance(L)), measured by 40 items.

141 Models were estimated using marginal maximum likelihood estimation as implemented in the  
142 ‘mirt’ package (Chalmers, 2012) within the R statistical software (R Core Team, 2013). The  
143 maximum a posteriori (MAP) factor scores were obtained for each primary factor. Model fit was  
144 evaluated based on root-mean square error of approximation (RMSEA), Tucker-Lewis index (TLI)  
145 and comparative fit index (CFI) using the generally recognised guidelines for fit of  $< 0.05$ ,  $>0.90$  and  
146  $>0.90$  respectively (Schermelleh-Engel, Moosbrugger, & Müller, 2003).

147 Next, we fit a series of moderated factor models to the factor scores of the primary factors.  
148 For these first-order models, moderation of the factor loadings represents the primary test of  
149 differentiation, and provides evidence of variation in the relationship between the global factors and  
150 their indicators at different levels of cognitive ability. Linear functions were used to model the  
151 relationship between the factor loadings and the moderator. In addition to the factor loadings, we also  
152 moderated the residual variances by specifying an exponential functions between the residual  
153 variances and the moderator. Inclusion of moderated residuals in the model accounts for differential  
154 reliability that could be mis-attributed to personality differentiation if left un-modelled (Murray,  
155 Dixon & Johnson, 2013). Finally, to account for the main effect of the moderator (as discussed  
156 above), we also used a linear function between the intercepts and the moderator (See Molenaar et al.,  
157 2010).

158 Similarly as above, we first estimated a baseline model with moderation parameters on the  
159 factor loadings fixed to zero, and moderation parameters for the intercepts and residuals freely  
160 estimated (M1). We compared this model to a model (M2) in which the moderation parameters of the  
161 indicator intercepts, residuals and factor loadings were freely estimated. As above, the best fitting  
162 model was selected based a number of model fit indices: AIC, BIC, saBIC and deviance information

163 criterion (DIC: Spiegelhalter, Best, Carlin & van der Linde, 2002). We estimated the models in Mx  
164 (Neale, Boker, Xie & Maes, 2002). Latent variable scaling and identification was achieved as follows:  
165 For each global factor, the factor loading of the first indicator was constrained to be equal to 1 for  
166 moderator values of 0. In addition, the mean of the global factors were fixed to equal 0.

## 167 **3.0 Results**

### 168 **3.1 Primary Factor Moderation**

169 Model fit indices (see Table 1) suggested moderation of factor variances was present for only  
170 five of the 15 primary scales. In the case of L, M, N, and Q1 the moderation parameter was positive,  
171 suggesting greater factor variance at higher levels of cognitive ability. In the case of Q4, the  
172 moderation parameter was negative, suggesting the opposite. The former is consistent with anti-  
173 differentiation and the latter with differentiation. Apprehension (O) shows an improvement in fit, but  
174 BIC change is only 7.95, and so does not meet our threshold for practical improvement of 10.

175 (Insert-Table-1-about-here)

### 176 **3.2 Primary Factor Scores**

177 Table 2 contains the model fit indices for the NRM models for each of the five global factors. All  
178 models showed good levels of model fit by all indices, with the exception of the model for Tough-  
179 Mindedness that fell slightly below the desired cut-off for acceptable fit according to the CFI and TLI.  
180 Nevertheless, we conclude that the model fit is sufficient to justify the use of the primary factor scores  
181 obtained from these NRM models.

182 (Insert-Table-2-about-here)

### 183 **3.3 Moderation by Reasoning Ability**

184 For Anxiety and Tough-mindedness, the model including moderation of factor loadings (M2)  
185 displayed best fit. For Independence, Self-control and Extraversion, the inclusion of moderated factor  
186 loadings did not improve model fit uniformly according to all indices, and as a result, it was  
187 concluded that the baseline model provided the most parsimonious description of the data.

188 (Insert-Table-3-about-here)

#### 189 **3.3.1 Anxiety**

190 Figure 1 plots the indicator factor loadings across different levels of cognitive ability. For all  
191 indicators with positive factor loadings (Emotional Stability(C)), the moderation effect was negative,  
192 and for those indicators with negative factor loadings (Tension (Q4), Apprehension (O), Vigilance  
193 (L)), the moderation effect was positive. Thus, for all indicators, as the level of cognitive ability  
194 increases, the relation between Anxiety and its indicators becomes weaker. This finding is consistent  
195 with the personality differentiation hypothesis. However, as is clear when one considers the scales of  
196 the two panels in Figure 1, the moderation effects were generally small, and in the case of O,  
197 practically zero.

(Insert-Figure-1-about-here)

### 199 **3.3.2 Tough-Mindedness**

200 In the case of Tough-Mindedness, one indicator (Warmth A) shows a similar pattern to the indicators  
201 of Anxiety, specifically, that the factor loading becomes weaker as ability level increases. However,  
202 the opposite effect is seen for the remaining three indicators (Sensitivity (I), Openness to Change  
203 (Q1), Abstractness (M); note lines for I and Q1 are almost entirely overlapping). Here, as ability level  
204 increases, factor loadings become stronger. This is the opposite effect to what would have been  
205 predicted by the personality differentiation hypothesis

(Insert-Figure-2-about-here)

## 207 **4.0 Discussion**

208 We used a combined IRT and moderated factor model approach in a large standardization sample of  
209 an omnibus personality inventory, the 16PF5, in order to test the personality differentiation  
210 hypothesis. We found very limited support for the differentiation hypothesis. There was no evidence  
211 for moderation of factor loadings for the domains of Extraversion, Independence and Self-Control.  
212 Moderation of factor loadings was found for Anxiety and Tough-Mindedness, but only in the case of  
213 Anxiety was this moderation consistent with the personality differentiation hypothesis.

214 Thus, our results do not support the personality differentiation by cognitive ability  
215 hypothesis.. Previous results, primarily framed in terms of Brand et al.'s (1994) personality  
216 differentiation hypothesis have been somewhat mixed with regards to the strength of the evidence for

217 the moderation of personality structure by cognitive ability, however, this may be at least partly  
218 attributable to the fact that the majority of previous studies have used observed scores which do not  
219 separate out changes in variance and inter-correlations with ability level that are due to measurement  
220 issues versus the latent constructs. Further, studies which have taken these issues into account using  
221 latent variable models have done so within the traditional multi-group CFA measurement invariance  
222 framework which has required the discretisation of the cognitive ability continuum into low and high  
223 ability groups (e.g. Mclarnon & Carswell, 2013). The current analysis is the first to utilise a method  
224 specifically tailored to testing differentiation hypotheses and which allows continuous moderation of  
225 personality structure by cognitive ability. Therefore, the models reported in the current study arguably  
226 provide the clearest tests of moderation of personality structure by cognitive ability to date.

227 We would also question the strength of the theoretical basis for the personality differentiation  
228 hypothesis. Originally developed by analogy with the intelligence differentiation hypothesis, there has  
229 been little attempt to develop it in its own right. For example, no mechanism by which personality  
230 differentiation should occur has been articulated nor any predictions as to how to test any  
231 hypothesised mechanisms delineated. Thus, although it is now possible to conduct more sophisticated  
232 tests of the hypothesis, if the personality differentiation is to be taken seriously as a description of the  
233 interplay between cognitive ability and personality development there will be also be a need to  
234 develop a more convincing theoretical basis alongside the application of these tests.

235 Whilst the findings in the current study are not favourable for the personality differentiation  
236 hypothesis, three developments on the current study may prove useful contributions to work in this  
237 area. First, although the models applied here represent an advantage over previous studies, as we  
238 noted earlier, a more ideal test of differentiation would make use of the full hierarchical structure of  
239 personality inventories and fit second-order moderated models based on item level data. As this is  
240 currently not possible yet, we relied on an analysis in separate steps to test for differentiation;  
241 however, such second-order models would be welcomed to provide a more specific tests of  
242 differentiation.



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### Figure Legends

**Figure 1:** Estimated factor loadings for Anxiety indicators as a function of Reasoning ability. C= Emotional Stability; L = Vigilance; O = Apprehension; Q4 = Tension. Moderation parameters for factor loadings were: C= -0.0082, L= 0.0030, O= 0.0009, Q4= 0.0164.

**Figure 2:** Estimated factor loadings for Tough-mindedness indicators as a function of Reasoning Ability. A= Warmth; I=Sensitivity; M=Abstractness ;Q1= Openness to Change. Moderation parameters for factor loadings are: A= -0.0119, I= 0.0242, M= 0.0538, Q1= 0.0277. Lines representing Q1 and I are overlapping.

**Table 1:**

Model fit statistics and parameter estimates for the first order NRM models assessing moderated latent factor variances

	AIC	BIC	saBIC	Parameter Estimates from moderation models					
				Main Effect	p-value	Intercept Variance	p-value	Moderation Variance	p-value
<b>A baseline</b>	<b>167663.23</b>	<b>167988.85</b>	<b>167845.85</b>						
A moderation	167660.85	167993.71	167847.53	0.029	<.001	0.771	<.001	0.016	.107
<b>C baseline</b>	<b>140969.76</b>	<b>141266.44</b>	<b>141136.15</b>						
C moderation	140971.30	141275.22	141141.75	-0.019	.001	0.687	<.001	0.005	.513
<b>E baseline</b>	<b>153436.92</b>	<b>153733.60</b>	<b>153603.30</b>						
E moderation	153438.96	153742.88	153609.41	-0.004	.476	0.475	<.001	0.001	.917
<b>F baseline</b>	<b>165475.71</b>	<b>165772.39</b>	<b>165642.09</b>						
F moderation	165473.82	165777.74	165644.27	0.017	<.001	-0.339	.003	0.014	.074
<b>G baseline</b>	<b>170039.14</b>	<b>170364.76</b>	<b>170221.76</b>						
G moderation	170038.30	170371.16	170224.98	0.053	<.001	0.342	<.001	0.012	.110
<b>H baseline</b>	<b>150075.98</b>	<b>150372.66</b>	<b>150242.37</b>						
H moderation	150074.50	150378.41	150244.94	0.028	<.001	1.379	<.001	0.013	.105
<b>I baseline</b>	<b>186189.90</b>	<b>186515.53</b>	<b>186372.52</b>						
I moderation	186184.85	186517.71	186371.53	-0.021	<.001	0.346	<.001	0.018	.017
L baseline	161133.51	161430.19	161299.90						
<b>L moderation</b>	<b>161115.88</b>	<b>161419.80</b>	<b>161286.33</b>	0.172	<.001	0.850	<.001	0.031	<.001
M baseline	170741.06	171066.69	170923.68						
<b>M moderation</b>	<b>170715.52</b>	<b>171048.38</b>	<b>170902.20</b>	-0.045	<.001	0.689	<.001	0.037	<.001

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N baseline	158223.58	158520.26	158389.97						
<b>N moderation</b>	<b>158162.44</b>	<b>158466.36</b>	<b>158332.89</b>	0.045	<.001	0.784	<.001	0.055	<.001
<b>O baseline</b>	<b>163933.76</b>	<b>164230.44</b>	<b>164100.14</b>						
O moderation	163918.58	164222.49	164089.02	-0.071	<.001	1.683	<.001	0.029	<.001
Q1 baseline	236207.04	236619.50	236438.36						
<b>Q1 moderation</b>	<b>236133.51</b>	<b>236553.20</b>	<b>236368.89</b>	-0.045	<.001	-1.786	<.001	0.063	<.001
<b>Q2 baseline</b>	<b>155771.68</b>	<b>156068.36</b>	<b>155938.07</b>						
Q2 moderation	155767.61	156071.52	155938.05	-0.066	<.001	1.329	<.001	0.017	0.022
<b>Q3 baseline</b>	<b>155469.66</b>	<b>155766.34</b>	<b>155636.05</b>						
Q3 moderation	155471.55	155775.47	155642.00	0.064	<.001	0.158	.145	0.002	.774
Q4 baseline	157838.30	158134.98	158004.69						
<b>Q4 moderation</b>	<b>157817.79</b>	<b>158121.71</b>	<b>157988.24</b>	-0.053	<.001	0.828	<.001	-0.031	<.001

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**Table 2:**

Model fit for the multi-dimensional NRM models

	<b>RMSEA (95% CI)</b>	<b>CFI</b>	<b>TLI</b>
Anxiety	.045 (.044 to .045)	.95	.95
Tough-Minded	.046 (.046 to .047)	.87	.86
Independence	.035 (.035 to .036)	.94	.93
Self-Control	.043 (.042 to .043)	.93	.92
Extraversion	.045 (.044 to .045)	.94	.93

**Table 3:**

Model fit indices for the moderated factor models for the global scales of the 16PF5

	AIC	DIC	BIC	saBIC
<i>Anxiety</i>				
M1: Baseline Model	-22893.85	-122175.39	-159873.92	-94689.68
<b>M2: Free Loadings</b>	<b>-22997.45</b>	<b>-122216.39</b>	<b>-159911.25</b>	<b>-94733.36</b>
<i>Tough-Mindedness</i>				
M1: Baseline Model	4648.90	-108404.02	-146102.55	-80918.31
<b>M2: Free Loadings</b>	<b>2443.54</b>	<b>-109495.90</b>	<b>-147190.76</b>	<b>-82012.87</b>
<i>Independence</i>				
<b>M1: Baseline Model</b>	<b>1422.62</b>	<b>-110017.15</b>	<b>-147715.69</b>	<b>-82531.44</b>
M2: Free Loadings	1428.79	-110003.27	-147698.13	-82520.25
<i>Self-Control</i>				
<b>M1: Baseline Model</b>	<b>-6010.64</b>	<b>-113733.78</b>	<b>-151432.32</b>	<b>-86248.07</b>
M2: Free Loadings	-6009.30	-113722.32	-151417.17	-86239.29
<i>Extraversion</i>				
<b>M1: Baseline Model</b>	<b>-16777.74</b>	<b>-146799.45</b>	<b>-193922.62</b>	<b>-112442.31</b>
M2: Free Loadings	-16793.89	-146794.03	-193912.60	-112440.24

*Note:* Values in bold font represent the best fitting models.

Figure 1:

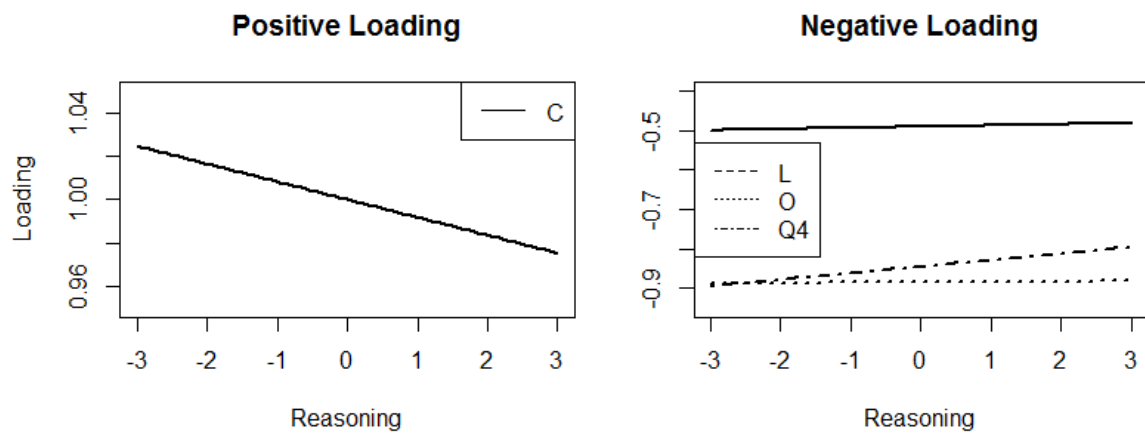
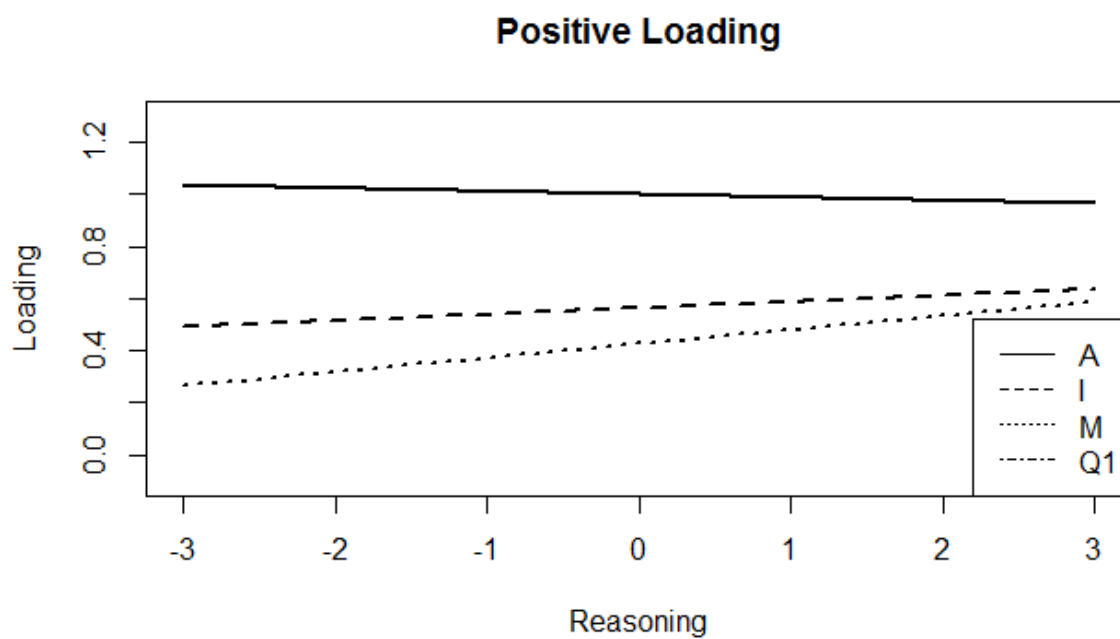


Figure 2:





**Footnote**

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<sup>2</sup>The standard errors of the moderation parameters are likely wrong as they are based on the assumption of a symmetrical sampling distribution of the parameters, which is unlikely for interaction effects.