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Brief Report

A General Factor of Personality in the Millon Clinical Multiaxial Inventory-III, the Dimensional Assessment of Personality Pathology, and the Personality Assessment Inventory

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ABSTRACT

A General Factor of Personality (GFP) occupies the apex of the hierarchy in three prominent personality disorder inventories. On the Millon Clinical Multiaxial Inventory-III, a GFP accounted for 41% of the variance in two second-order factors, 31% of the variance in five first-order factors, and 26% of the variance in all 24 scales. On the Dimensional Assessment of Personality Pathology, a GFP accounted for 61% of the variance in six first-order factors and 36% of the variance in all 18 scales. In a cross-validation study of the Personality Assessment Inventory, a GFP accounted for 65% of the variance in two second-order factors, 47% of the variance in five first-order factors, and 27% of the variance in all 18 scales.

1. Introduction

In this paper we use structural equation modeling (SEM) to test the hypothesis that a General Factor of Personality (GFP) occupies the apex of the multifactorial hierarchy of personality disorders in the same way it has been found to do in the organization of non-clinical traits. In previous studies, a GFP has been extracted from the inter-scale correlations of the Big Five, the California Psychological Inventory, the Comrey Personality Scales, the EAS temperament scales, the Guilford–Zimmerman Temperament Survey, the Minnesota Multiphasic Personality Inventory-2, the Multidimensional Personality Questionnaire, and the Temperament and Character Inventory (Musek, 2007; Rushton, Bons, & Hur, 2008; Rushton & Irwing, 2008, 2009, in press-a, in press-b).

Individuals high on the GFP have been characterized as altruistic, emotionally stable, agreeable, conscientious, extraverted, and intellectually open, with high levels of well-being, satisfaction with life, self-esteem, and emotional intelligence (Rushton et al., 2008). Because the GFP defines clear positive and negative poles, it provides potential for understanding the socially "advantaged" versus the socially "challenged." Those with high scores on the GFP are predicted to have higher levels of emotional intelligence whereas those with low scores are more likely to suffer from a personality disorder. An initial study of the personality disorders from a GFP perspective yielded a general factor of maladjustment. Rushton and Irwing (2009) examined the inter-scale correlations ($N = 2600$) of the Minnesota Multiphasic Personality Inventory-2 (MMPI-2) and found a GFP that explained 49% of the variance in two second-order factors in a model that went from the 10 clinical scales to four higher-order factors to two second-order factors, and from there to the GFP.

In the current paper, we test whether a general factor of personality disorder emerges from the inter-scale correlations of validation samples in three self-report instruments. These are: the Millon Clinical Multiaxial Inventory, now in its third edition (MCMI-III), which explicitly used the American Psychiatric Association's (1994) *Diagnostic and Statistical Manual of Mental Disorders* (DSM) criteria in its construction (Millon, 2006); the Dimensional Assessment of Personality Pathology (DAPP), which was explicitly *not* based on DSM criteria (Livesley & Larstone, 2008); and the Personality Assessment Inventory (PAI), now in its second edition (Morey, 2007), also not using the DSM.

Our general strategy of analysis was to carry out exploratory analyses, using maximum likelihood estimation and Promax rotations within Mplus, in order to obtain first-order and higher-order factor structures. The preferred solution was identified by examining the Root-Mean-Square-Error of Approximation (RMSEA), and

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maximizing the number of loadings above 0.3 on each factor. These solutions were then translated into confirmatory factor models, by first freeing all loadings greater than 0.3 from the exploratory factor solution, and then allowing additional loadings if necessary. Finally, we allowed a restricted number of correlated errors in order to fit confirmatory factor models. For evaluating fit, we relied mainly on the RMSEA, the standardized root mean square residual (SRMSR), and the non-normed fit index (NNFI), as indicated by the simulations of Hu and Bentler (1998, 1999), as well as chi-square and chi-square differences following Jöreskog (1993). We adopted cut-off points of $\leqslant$0.05 for the SRMSR, about 0.06 for the RMSEA, and $\geqslant$0.95 for the NNFI. Each model was tested in stages, in order to test for the possibility of localized misfit at the second-order level, but for economy we just describe the fit of the first-order and final model which incorporated a GFP.

2. The Millon Clinical Multiaxial Inventory-III

2.1. Method

The third edition of the Millon Clinical Multiaxial Inventory (MCMI-III) is designed to aid in the assessment of both DSM-IV Axis II personality disorders and Axis I clinical syndromes (Millon, 2006). The 175 questions directly reflect the DSM's diagnostic criteria. The MCMI-III consists of 24 clinical scales: 14 personality disorder scales and 10 clinical syndrome scales.

2.2. Results and discussion

Table 1, adapted from the MCMI-III Manual, gives the inter-scale correlations among the 24 personality disorder and clinical syndrome scales for the 998 individuals of the normative sample, including males and females, with a wide variety of diagnoses. Alpha reliabilities are shown along the diagonal. The average correlation among the 24 scales is $r = .31$ ($r = .36$ corrected for reliability using the alpha coefficient).

Exploratory factor analysis suggested a five-factor solution, which was subjected to confirmatory factor analysis using LISREL 8.72, beginning with a first-order confirmatory analysis, followed by a higher-order analysis by which the inter-correlations of the first-order factors were replaced by two second-order factors, and a GFP. The first-order five-factor solution provided a close fit according to the SRMSR and NNFI, while the RMSEA indicated a moderate fit ($\chi^2 = 1621.3$; $df = 214$; $P < .001$; SRMSR = .038; RMSEA = .078; NNFI = .98). We labeled the five first-order factors defined by loadings $\geqslant$.40: *Avoidant* (negative Narcissistic, −.95; negative Histrionic, −.92; Avoidant, .77; Schizoid, .67; negative Bipolar, .44); *Depressive* (Major Depression, .96; Somatoform, .90; Dysthymia, .56; Anxiety, .42; Thought Disorder, .41); *Unstable Mood* (Borderline, .94; Bipolar, .73; Masochistic, .59; Negativistic, .58; Thought Disorder, .55; Post-Traumatic Stress Disorder, .51; Depressive, .50; Dependent, .48; Anxiety, .43); *Delusional* (Paranoid, .94; Delusional Disorder, .75; Negativistic, .39); and *Antisocial* (Antisocial, 1.00; Drug Dependence, .82; Alcohol Dependence, .73; Sadistic, .54; negative Compulsive, −.52).

Subsequently we tested a model in which two-second-order factors were added: *Internalizing* (Depressive, Avoidant, Unstable Mood, Thought Disorder) and *Externalizing* (Antisocial, Unstable Mood), together with a third-order GFP. The result, presented in Fig. 1. provides a close fit to the data according to the SRMSR and NNFI, while the RMSEA is indicative of moderate fit ($\chi^2 = 1677.3$; $df = 218$; $P < .001$; SRMSR = .047; RMSEA = .079; NNFI = .98). The rather small differences in fit between the first- and third-order models may indicate that the higher-order factors provide a good fit to the data. The GFP accounted for 41% of the variance in the two second-order factors, 30.9% of the variance in the five first-order factors, and 25.8% of the total reliable variance in all 24 scales.

3. The Dimensional Assessment of Personality Pathology

3.1. Method

The Dimensional Assessment of Personality Pathology-Basic Questionnaire (DAPP-BQ) is a 290 item self-report instrument with five response categories for each item that range from 1 (very

Table 1
Correlations between the 24 scales of the Millon Clinical Multiaxial Inventory-III.

Scale	1	2A	2B	3	4	5	6A	6B	7	8A	8B	S	C	P	A	H	N	D	B	T	R	SS	CC	PP
1	(81)																							
2A	71	(89)																						
2B	64	72	(89)																					
3	48	65	63	(85)																				
4	−75	−80	−65	−52	(81)																			
5	−43	−65	−48	−55	70	(67)																		
6A	32	28	39	28	−25	00	(77)																	
6B	32	27	42	24	−23	00	65	(79)																
7	−38	−40	−50	−39	46	36	−61	−43	(66)															
8A	57	61	69	56	−51	−29	56	64	−50	(83)														
8B	59	70	74	71	−60	−45	42	40	−48	69	(87)													
S	67	68	70	55	−61	−38	39	40	−46	68	70	(85)												
C	59	62	76	63	−55	−38	61	57	−63	79	73	70	(85)											
P	57	57	56	43	−47	−18	36	44	−29	72	54	67	55	(84)										
A	55	55	66	61	−49	−37	32	44	−39	61	60	64	67	55	(86)									
H	61	54	65	55	−48	−36	24	36	−35	55	56	57	58	46	66	(86)								
N	26	28	45	38	−17	00	45	50	−36	59	47	50	57	50	48	32	(71)							
D	68	66	79	63	−65	−48	36	37	−51	66	70	65	74	51	68	78	35	(88)						
B	35	32	40	28	−37	−15	78	54	−53	48	41	40	54	34	35	26	39	38	(82)					
T	27	23	32	20	−22	00	82	48	−47	43	35	32	51	34	22	13	39	26	62	(83)				
R	61	57	75	57	−52	−37	36	39	−43	65	64	69	74	56	81	64	48	73	38	29	(89)			
SS	64	60	76	60	−54	−36	43	46	−48	68	67	76	79	57	77	71	52	79	42	33	76	(87)		
CC	62	58	69	58	−53	−42	25	34	−41	57	60	62	68	46	68	87	31	84	27	17	72	77	(90)	
PP	41	35	38	31	−31	00	26	34	−22	53	35	52	42	71	44	39	42	38	24	21	43	46	39	(79)

Note: $N = 998$; 1, Schizoid; 2A, Avoidant; 2B, Depressive; 3, Dependent; 4, Histrionic; 5, Narcissistic; 6A, Antisocial; 6B, Sadistic; 7, Compulsive; 8A, Negativistic; 8B, Masochistic; S, Schizotypal; C, Borderline; P, Paranoid; A, Anxiety; H, Somatoform; N, Bipolar; D, Dysthymia; B, Alcohol dependence; T, Drug dependence; R, Post-traumatic stress disorder; SS, Thought disorder; CC, Major depression; PP, Delusional disorder.

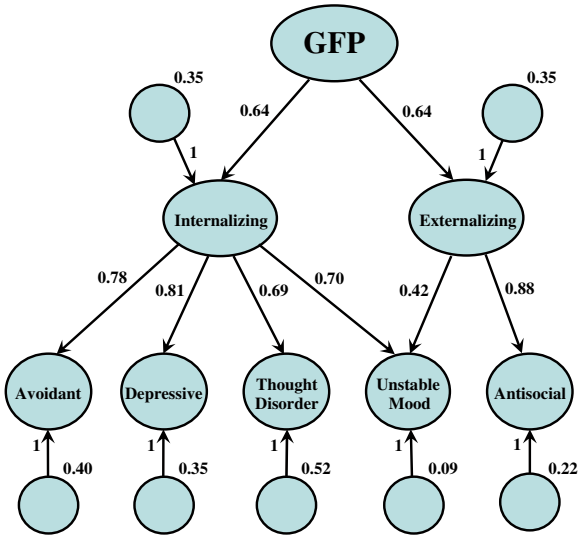

Fig. 1. Third-order common factor structure of the Millon Clinical Multiaxial Inventory-III (circles with labels = factors, empty circles = variances, arrows = regression loadings).

unlike me) to 5 (very like me) which yield 18 factor-based dimensions of personality disorder (Livesley & Larstone, 2008). The DAPP-BQ is estimated to capture between 29% and 63% of the variance of the DSM personality disorders. The manual of the DAPP-BQ remains unpublished. In this study, we took the data for analysis from the Spanish validation of the DAPP-BQ by Livesley and colleagues (Gutiérrez-Zotes et al., 2008). There were two samples: subjects with a personality disorder ($N = 155$) and subjects from the general population ($N = 300$).

3.2. Results and discussion

We weighted the correlations by sample size in order to combine the clinical and nonclinical samples ($N = 455$). Table 2 presents the correlations among the 18 primary scales. Shown in the diagonal are the mean alpha reliabilities. The average correlation among the 18 scales was $r = .34$ ($r = .39$ corrected for reliability using the coefficient alphas).

An exploratory factor analysis pointed to a six-factor solution, which was subjected to confirmatory factor analysis using LISREL 8.72. The process began with a first-order confirmatory analysis, followed by a higher-order analysis by which the inter-correlations of the first-order factors were replaced by a GFP. The first-order six-factor solution provided a close fit according to the SRMSR and NNFI, while the RMSEA indicated a moderate fit ($\chi^2 = 421.7$; $df = 106$; $P < 0.001$; SRMSR = 0.043; RMSEA = 0.077; NNFI = 0.96). We labeled the six first-order factors defined by loadings $\geqslant .40$: *Insecure* (Insecure Attachment, .72; Submissiveness, .66; Social Avoidance, .58; Narcissism, .52); *Antisocial* (Conduct Problems, .73; Rejection, .73; Callousness, .72; Stimulus Seeking, .61; Narcissism, .43); *Unstable Mood* (Affect Lability, .97; Anxiousness, .72; Identity Problems, .61; Opposition, .59; Self Harm, .52); *Introverted* (Restricted Expression, .70; Intimacy Problems, .60; Social Avoidance, .56); *Compulsive* (Compulsivity, .78; negative Opposition, −.46); and *Thought Disorder* (Cognitive Distortion, .87; Suspiciousness, .47).

In order to reveal the second-order factor structure, we subjected the correlations between the first-order factors to a second Mplus analysis. Results indicated that the sample covariance matrix could not be inverted. We, therefore directly tested the plausibility of a GFP as a single second-order factor using LISREL. The resultant model, as presented in Fig. 2. again provides adequate fit to the data according to the SRMSR and NNFI, while the RMSEA indicates mediocre fit ($\chi^2 = 553.1$; $df = 114$; $P < .001$; SRMSR = .068; RMSEA = .088; NNFI = .95). The GFP accounted for 60.9% of the variance in the six first-order factors and 36.4% of the total reliable variance in all 18 scales.

4. The Personality Assessment Inventory

4.1. Method

The Personality Assessment Inventory (PAI) is a self-administered, objective test of personality designed for the clinical assessment of adults aged 18 years and older. It contains 344 items measuring 22 scales: four validity scales, 11 clinical scales, five treatment consideration scales, and two interpersonal scales (Morey, 2007). Individuals respond to items on a four-point scale ranging from *false* to *very true*. The 11 clinical scales can be divided conceptually into three broad classes: neurotic, psychotic, and behavior disorder; the five treatment scales indicate complications such as the respondent's environmental circumstances, motivation for treatment, and potential to harm others and self; and two interpersonal dimensions were affiliative versus rejecting, and dominating versus submissive.

Table 2
Correlations between the 18 scales of the Dimensional Assessment of Personality Pathology ($N = 455$).

	Sub	AL	An	IA	CD	IP	SA	Op	Na	SS	Ca	Rej	CP	RE	IP	C	Sp	SH
Submissiveness (Sub)	(86)																	
Affect lability (AL)	48	(89)																
Anxiousness (An)	62	81	(93)															
Insecure attachment (IA)	46	59	54	(90)														
Cognitive distortion (CD)	54	73	73	49	(87)													
Identity problems (IP)	55	65	78	38	69	(90)												
Social avoidance (SA)	63	51	62	43	57	66	(89)											
Opposition (Op)	53	57	62	41	64	59	56	(87)										
Narcissism (Na)	45	63	57	57	50	45	53	47	(89)									
Stimulus seeking (SS)	17	45	32	26	40	25	19	43	46	(84)								
Callousness (Ca)	25	41	35	24	38	37	42	41	51	40	(81)							
Rejection (Rej)	11	47	30	38	32	24	20	27	55	37	53	(83)						
Conduct problems (CP)	15	43	34	25	40	31	27	46	43	51	57	49	(85)					
Restricted expression (RE)	30	19	31	06	38	42	58	30	18	12	37	08	19	(85)				
Intimacy problems (IP)	12	07	15	−15	26	34	22	14	−09	−03	22	−06	04	46	(77)			
Compulsivity (Co)	06	20	14	23	09	05	04	−23	15	−12	−01	19	−11	08	00	(87)		
Suspiciousness (Sp)	38	62	58	50	60	50	48	37	51	33	50	45	37	33	21	29	(88)	
Self harm (SH)	25	41	44	25	49	54	35	35	25	18	24	22	30	21	25	00	36	(91)

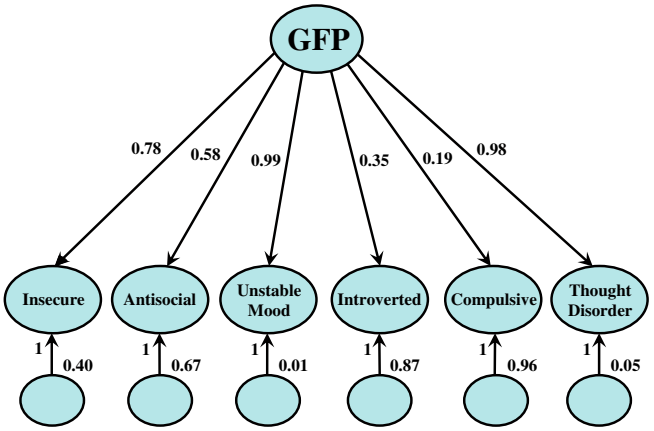

Fig. 2. Second-order common factor structure of the Dimensional Assessment of Personality Pathology (circles with labels = factors, empty circles = variances, arrows = regression loadings).

4.2. Results and discussion

Table 3, adapted from the PAI Manual, presents the correlations among the 18 scales of the PAI. Those above the diagonal are taken from a clinical sample of 1246 patients. Those below the diagonal are from a normative sample of 1000 population representative adults, matched to the US census. Shown in the diagonal are the mean alpha reliabilities. The average correlation among the 18 scales was $r = .22$ ($r = .26$ corrected for reliability using the coefficient alphas).

A criticism could be made of the previous analyses that they capitalize on chance. The existence of two large, but non-equivalent samples for the PAI provides the opportunity for a quasi-cross validation. We would not predict identical factor structures, both because the samples are different, and because there may be artifacts such as floor effects in the normative sample and ceiling effects in the clinical sample, resulting in biased estimates of some correlations. However, we can determine whether broadly similar factor structures hold in the two samples.

We first carried out analyses in the normative sample. From the exploratory factor analysis a five-factor solution was deemed the best alternative, and this was subjected to confirmatory factor analysis. Moderate fit was found according to RMSEA and close fit according to NNFI and SRMR ($\chi^2 = 794.9$; $df = 113$; $P < .001$; SRMSR = .04; RMSEA = .078; NNFI = .96). The five first-order factors were defined by loadings $\geqslant .40$: *Anxiety* (Depression, .87; Anxiety, .84; Anxiety-Related Disorders, .69; negative Dominance, −.65; Somatic Complaints, .61; Suicidal Ideation, .55; Borderline Features, .53; Stress, .44; negative Treatment Rejection, −.44; Schizophrenia, .43); *Hostility* (Aggression, .79; Borderline Features, .52); *Thought Disorder* (Nonsupport, .75; negative Warmth, −.74; Paranoia, .63; Schizophrenia, .47); *Dominance* (Mania, .79; Dominance, .73); and *Antisocial* (Alcohol Problems, .72; Drug Problems, .69; Antisocial Features, .66).

Next we carried out a higher-order confirmatory analysis by which the inter-correlations of the first-order factors were replaced by two second-order factors: *Internalizing* (Thought Disorder, Anxiety) and *Externalizing* (Hostility, Dominance, Antisocial). This model provided a close fit to the data according to the SRMSR and NNFI, while the RMSEA was indicative of moderate fit ($\chi^2 = 850.8$; $df = 118$; $P < .001$; SRMSR = .044; RMSEA = .079; NNFI = .96). However, it is well known that close fit according to overall indices does not preclude localized misfit. For this reason, we directly assessed the fit of the two second-order factors to the correlations between the first-order factors. This model did not fit. An additional loading of Antisocial on Internalizing was required in order to obtain an approximation to adequate fit ($\chi^2 = 91.9$; $df = 4$; $P < .001$; SRMSR = .040; RMSEA = .15; NNFI = .93).

This revised model (see Fig. 3.) was first tested on the normative sample ($\chi^2 = 822.6$; $df = 117$; $P < .001$; SRMSR = .043; RMSEA = .078; NNFI = .96), and subsequently validated on the clinical sample ($\chi^2 = 1652.1$; $df = 118$; $P < .001$; SRMSR = .053; RMSEA = .10; NNFI = .94). Evidently, the fit of the revised second-order model is less good in the clinical patients, but close enough to suggest that the same factor structure holds in both samples. In a final step, in the normative sample, we replaced the correlation between the two second-order factors by a GFP, identified by equating the two third-order factor loadings. The resultant model has the same fit as the second-order model shown above. The GFP accounted for 64.8% of the variance in the two second-order factors, 47.2% of the variance in the five first-order factors, and 26.6% of the total reliable variance in all 18 scales.

Table 3
Correlations between the 18 scales of the Personality Assessment Inventory—Basic Questionnaire (Clinical sample above diagonal, $N = 1246$; Census-matched normative sample below diagonal, $N = 1{,}000$; Reliabilities in diagonal; Decimal points omitted).

Scale	SOM	ANX	ARD	DEP	MAN	PAR	SCZ	BOR	ANT	ALC	DRG	AGG	SUI	STR	NON	RXR	DOM	WRM
SOM	(91)	65	58	63	23	42	57	44	10	10	12	22	41	36	35	−27	−18	−26
ANX	58	(92)	80	79	26	52	72	72	13	10	12	32	57	48	48	−45	−40	−40
ARD	45	69	(81)	71	38	57	70	72	21	14	18	34	53	48	46	−43	−28	−34
DEP	66	75	57	(90)	11	56	75	70	15	11	14	28	69	56	59	−48	−44	−53
MAN	16	23	31	08	(82)	41	35	43	47	16	23	43	15	27	22	−18	32	06
PAR	40	58	47	59	34	(87)	68	67	43	19	30	52	44	50	66	−32	−18	−43
SCZ	52	66	53	68	34	63	(85)	70	34	20	24	40	55	50	64	−42	−35	−57
BOR	44	70	61	66	44	70	68	(89)	50	28	37	59	61	61	60	−55	−27	−41
ANT	26	32	24	33	47	51	51	56	(85)	45	60	61	25	30	35	−26	13	−19
ALC	21	23	17	27	20	34	34	39	56	(89)	55	26	09	25	21	−30	00	−17
DRG	36	32	24	34	16	37	39	38	52	53	(82)	34	18	26	26	−26	00	−16
AGG	28	41	29	35	44	53	42	62	55	40	31	(88)	28	34	38	−26	16	−31
SUI	45	52	41	63	18	46	57	56	44	32	38	36	(89)	42	47	−37	−30	−37
STR	35	49	42	52	28	49	45	63	36	25	28	37	44	(78)	56	−43	−19	−24
NON	34	45	31	58	15	61	58	55	43	29	34	33	46	45	(76)	−33	−25	−53
RXR	−25	−36	−34	−34	−22	−25	−36	−42	−23	−19	−13	−26	−32	−34	−21	(78)	20	27
DOM	−16	−32	−19	−34	40	−10	−26	−12	09	−02	−12	20	−21	−10	−17	07	(80)	37
WRM	−17	−28	−19	−40	08	−40	−48	−31	−22	−25	−22	−24	−29	−13	−46	09	31	(81)

Note: SOM, Somatic complaints; ANX, Anxiety; ARD, Anxiety-related disorders; DEP, Depression; MAN, Mania; PAR, Paranoia; SCZ, Schizophrenia; BOR, Borderline features; ANT, Antisocial features; ALC, Alcohol problems; DRG, Drug problems; AGG, Aggression; SUI, Suicidal ideation; STR, Stress; NON, Nonsupport; RXR, Treatment rejection; DOM, Dominance; WRM, Warmth.

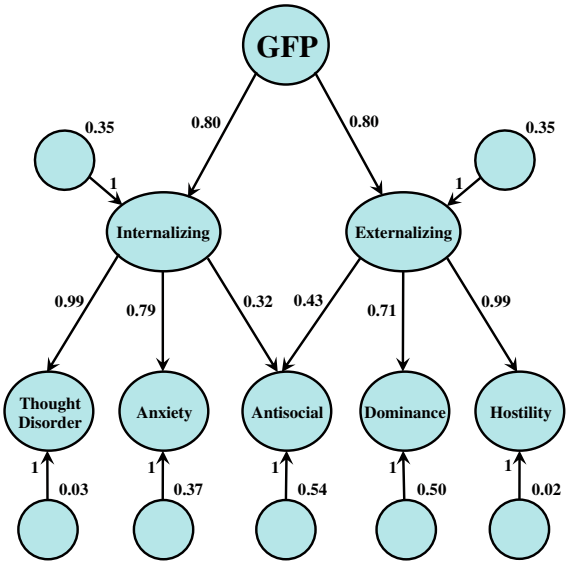

Fig. 3. Third-order common factor structure of the Personality Assessment Inventory (circles with labels = factors, empty circles = variances, arrows = regression loadings).

5. General discussion

The three studies reported here join those published on the MMPI-2 (Rushton & Irwing, 2009) to support the concept of a general factor among the personality disorders, together with a number of more minor factors. On the Millon Clinical Multiaxial Inventory-III, a GFP accounted for 41% of the variance in two second-order factors, 31% of the variance in five first-order factors, and 26% of the total reliable variance in all 24 scales. On the Dimensional Assessment of Personality Pathology, a GFP accounted for 61% of the variance in six first-order factors and 36% of the total reliable variance in all 18 scales. On the Personality Assessment Inventory, a cross-validation study found a GFP accounted for 65% of the variance in two second-order factors, 47% of the variance in five first-order factors, and 27% of the total reliable variance in all 18 scales.

The emergence of a general factor of mental disorder mirrors the highly correlated nature of the prevalence of DSM-IV disorders in the non-clinical population and co-morbidity in general. The inter-correlations suggest a general factor of maladjustment and not a more specific trait such as of demoralization. For example, on Millon's (2006) MCMI-III, both the Axis II personality disorders and the Axis I clinical scales loaded equally on the GFP, despite a theory that personality interacts with clinical syndromes. On Morey's (2007) PAI, both the treatment and interpersonal scales loaded on the GFP, despite a theory that situations and attitudes interact with diagnostic severity. Levels of social support, attitudes towards therapy, and reports of recent stress, appear to be as much a part of the latent GFP as are the clinical scales measuring Schizophrenia and Depression.

The GFP accounted for high levels of variance in the three personality disorder scales, with many similarities also found among the first-order factors as well as the second-order factors, which could be interpreted as Internalization and Externalization. Given the high levels of co-morbidity, it would be prudent not to over-interpret the meaning of any of these factors. However, in principal, there is nothing vague about the GFP. Quite the contrary; it is by definition the most internally consistent linear combination of all traits. Therefore, its location at the apex of the hierarchy should be almost completely fixed in any large data set.

The existence of the General Factor of Personality does not invalidate the utility or theoretical importance of lower-order factors. No single factor can explain all manifestations of complex behavior. For example, the tests analyzed in this paper emphasize primary traits as the major focus of assessment because this is the level seen to be most appropriate for clinical research purposes. Most clinical interventions, including medication, seek to change or modulate behaviors associated with primary traits rather then changing global personality disorder or secondary traits. Therefore it is a pragmatic question which level provides the best analysis for any particular situation.

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