Trait Invariance and Cohort Differences

of Adult Personality

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Abstract

This study examines factorial invariance and cohort differences for a set of 13 personality traits derived from the TBR Questionnaire used in the Seattle Longitudinal Study. The questionnaire, a true/false personality and attitude instrument, was derived from the California Psychological Inventory (CPI; Gough 1955). The present study has two objectives. First, recent advances in factor analytic techniques were used to replicate a model previously reported using solely exploratory methods. Second, factor scores were derived and tested for cohort and gender differences.

The 19-factor personality trait solution from Schaie and Parham (1976) was subjected to Confirmatory Factor Analysis (CFA) in an attempt to confirm the structure. With modifications, a 13-factor solution was accepted based upon a sample of 2515 subjects used in the original analyses. The model was then replicated on more recent samples (N=2811). A test of structural invariance was performed across samples with positive results.

With confirmation of structure across two samples achieved, factor scores were derived and a MANOVA was performed to test for cohort and gender differences. Results from this set of analyses revealed main effects for cohort and gender but no overall cohort by gender interaction. Older cohorts described themselves as more concerned, with a higher belief in good or right, more disorganized with a lack of motivation to complete tasks, possessing a higher interest in science and greater political concern than younger

cohorts. Younger cohorts perceived themselves as having more positive beliefs in self and standards, more law abiding and cautious, more direct (less ambiguous), less interested in academia, more honest or moral, less flexible in routine, and having a greater interest in civic duties and responsibilities than older cohorts.

Gender differences revealed that males had a higher belief in self and standards, were more law-abiding and cautious, more willing to tolerate ambiguity, more honest, and more civic minded than females. Females reported a higher dislike of academia or group dependency, higher interest in science, and being less open to disruption of routine than their male counterparts.

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Previous studies have attempted to quantify personality traits to develop meaningful explanations of adult personality. Following Cattell's (1957) 16 PF model of personality, Schaie and Parham (1976) analyzed the TBR Questionnaire (Schaie & Parham, 1975), a true/false personality and attitude measurement instrument derived from the California Psychological Inventory (CPI; Gough, 1955), and developed a 19 personality and attitude factor model to examine the longitudinal stability of the derived personality traits. They generally found overall stability within generations while differences between successive cohorts could be explained by secular trends. Three of the 13 factors based on the 16 PF scheme showed significant change over 7 years. The goals of the present study were twofold. First, contemporary techniques (LISREL VI) were used to confirm the factor structure found by Schaie & Parham (1976) on the original sample. This structure was then replicated on a new sample to test for structural invariance. Second, factor scores were estimated for the latent traits and examined for gender, cohort and gender by cohort interaction effects. This study addresses two questions:

1) What is the structure of personality factors within the TBR Questionnaire and does this structure remain invariant across samples?

2) Do gender and cohort differences exist in the resultant personality factors?

Method

Subjects

For the structural component of the study, data from all subjects of the Seattle Longitudinal Study (SLS) through the 1984 cycle (Schaie, 1983, 1989) were used (N=2515 for those tested prior to 1977 and N=2811 for those tested in 1977 and 1984). For the second component of the study, independent samples assessed in 1963, 1970, 1977 and 1984 were examined (N=2842). This sample, randomly selected from the membership of an Health Maintenance Organization, was comprised of 1328 males and 1514 females with a mean education level of 13.42 years (SD=3.2) and represented a wide variety of occupational and economic backgrounds. Participants ranged in age from 22 to 85 years at the time of testing, and were categorized into 11 birth cohorts for analysis. Birth cohorts are defined in Table 1.

Table 1 about here

Measures

As part of a larger battery of cognitive and demographic measures, subjects responded to the Test of Behavioral Rigidity (TBR) which included a 75 item questionnaire (Schaie & Parham, 1975). This questionnaire consists of 9 perseveration items, 22 rigidity and 44 social responsibility items. All items were dichotomous requiring true or false responses.

Analyses and Results

Covariance Structure Analyses

The 19 factor structural model specified by Schaie and Parham (1976) was tested on the sample of 2515 subjects originally used in their exploratory analyses. Data from these subjects were collected during the pre-1977 data collection periods. This model was rejected in favor of a 13 factor model due to item characteristics and theoretical parsimony and clarity. Factors which displayed high correlations were dropped from the original model. The fit for the new model was as follows: X^2 [df=1191] = 3548.16, p < .0001, GFI = .945, RMSR=.007 and considered acceptable. The new 13 factor model was then tested on the second sample of subjects consisting of those measured during 1977 and 1984 (N=2811), and found to have an acceptable fit (X^2 [df=1191] = 4302.98, p < .0001, GFI = .941, RMSR=.007). Structural invariance across the two samples was tested by utilizing a simultaneous two-group measurement model.

The final model specified invariant factor loadings and factor intercorrelations with a X^2 [df=2512] = 6910, p < .0001, GFI =.945, RMSR = .007 across two groups and was accepted. The final model represented 8 of the original 16 PF factors: Affectothymia, Superego, Threctia, Premsia, Untroubled Adequacy, Conservatism of Temperament, Group Dependent, and Low Self-Sentiment (Cattell, 1957, 1970). The other factors reflect attitude scales and were labelled as Honesty, Interest in Science, Flexibility, Political Concern, and Community Involvement. The 13 personality and

attitude scales are presented in Table 2 with an exemplar item from each scale. Factor intercorrelations are presented in Table 3.

Tables 2 & 3 about here

Definition of Factors

As noted by Schaie and Parham (1976), the original exploratory analysis identified several personality factors that seemed to be similar to those measured by the 16PF. To maintain consistency across studies, we retained the names of the 16PF-like factors. As was the case with the exploratory study, these factors only represent one end of the trait continuum described by Cattell, Eber, and Tatsuoka (1970). The descriptors of these factors provided by Catell, et. al., (1970) follows:

<u>Affectothymia</u> - outgoing, warmhearted, easygoing, and participating tendencies.

<u>Superego Strength</u> - conscientious, persistent, moralistic, staid.

<u>Threctia</u> - shy, timid, restrained, threat-sensitive.

<u>Premsia</u> - tender-minded, sensitive, clinging, overprotected.

<u>Untroubled Adequacy</u> - self-assured, placid, secure, complacent, serene.

<u>Conservatism of Temperament</u> - respecting traditional ideas, tolerant of traditional difficulties.

Group Dependent - a "joiner" and sound follower, group adherence.

Low self-sentiment - uncontrolled, lax, follows own urges, careless of social rules.

The five attitudinal factors as described as:

Honesty - endorsement of items that reflect personal beliefs of honesty.

Interest in science - endorsement of two items that reflect an interest in science.

Flexibility - a measure of inflexibility or lack of tolerance for disruption of routines.

Political concern - reflects attitudes toward other countries.

Community involvement - measures attitudes about citizenship and civic responsibilities.

Analysis of Cohort and Gender Differences

Factor scores were derived using weights obtained by orthonormal transformation of the scaled factor loadings from the two-group LISREL analysis. These factor scores were standardized to T-score units for ease of interpretation ($\underline{M}$=50, $\underline{SD}$=10). Factor score means are presented in Tables 4 and 5 for gender and cohort.

Tables 4 & 5 about here

A Multivariate Analysis of Variance (MANOVA) was performed on the factor scores to examine effects for gender, cohort and gender x cohort interaction.

Table 6 about here

There was a significant main effect for cohort (F=9.65, df=130,22480, $\underline{p}$<.0001) as well as gender (F=34.17, df=13,2808, $\underline{p}$<.0001), while the gender x cohort interaction effect was not significant. Significant main effects for cohort were found for all 13 factors. Older cohorts scored higher on affectothymia, premsia, untroubled adequacy, low self-sentiment, interest in science, and political concern than younger cohorts. Younger cohorts scored higher on superego, threctia, conservatism of temperament, group dependency, honesty, flexibility and community involvement. Gender differences were found for superego, threctia, untroubled adequacy, group dependent, honesty, interest in science, flexibility and community involvement. Males scored higher on superego, threctia, untroubled adequacy, honesty, and community involvement, while women scored higher on group dependent, interest in science, and flexibility. Only two gender by cohort interactions attained significance. As observed in the univariate analyses, these were for the threctia and group dependency traits.

Discussion

Application of confirmatory factor analytic techniques revealed difficulty in reproducing the original 19 factor structure defined by Schaie and Parham (1976). A 19 factor solution appears to be an overextraction of the data. The current 13 factor solution was accepted upon evaluation of problem areas resulting from the larger model. Factors that were highly correlated were dropped from the original model. The test of structural invariance across two samples was found to be acceptable. While the test for model fit appears rather large, this is due to the sample size. The goodness of fit (GFI) index was very good at .945. These findings show that the 13 factor structure fit across different samples.

Interpretation of the results showed that older cohorts described themselves as being more concerned, possessing higher belief in good, more unpredictable and willing to tolerate ambiguity, more disorganized with a lack of motivation to complete tasks, higher interest in science, and a greater concern for other people or nations. Younger cohorts perceived themselves as having more positive beliefs in self and standards, more law-abiding and cautious, more direct in actions (less ambiguous), less interested in academia, more honest or moral, less flexible to interruption of routine, and having a greater interest in civic duties and responsibilities than older cohorts.

Males reported a higher belief in self and self-standards, higher concern for abiding the law with a greater degree of

cautiousness, more willing to tolerate ambiguity, more honest, and more civic-minded concern than females. Females possessed a higher measure of group dependency, higher interest in science and less openness to disruption of normal routines or practices than males.

The present study provides an initial step to understanding personality factors within the SLS data. Evidence has been provided for the structural stability of the current model. Future work will examine the longitudinal sequences within the data to answer questions about the stability of personality traits over time (intraindividual) as well as differences between samples.

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Table 1:

Explanation of Birth Cohorts

Cohort	Birth Years
1	1886-1892
2	1893-1899
3	1900-1906
4	1907-1913
5	1914-1920
6	1921-1927
7	1928-1934
8	1935-1941
9	1942-1948
10	1949-1955
11	1956-1962

Table 2:

Personality Factors and Exemplar Items

Factor	Item
Affectothymia	There is no use doing things for people; you only find that you get it in the neck in the long run (negative)
Superego	I think I am stricter about right and wrong than most people (positive)
Threctia	I have never been in trouble with the law (positive)
Premsia	I don't like things to be uncertain and unpredictable (negative)
Untroubled Adequacy	Our thinking would be a lot better off, if we would just forget about words like "probably" "approximately", and "perhaps" (negative)
Conservatism of Temperament	I never make judgments about people until I am sure about the facts (positive)
Group Dependent	I was a slow learner at school (positive)
Low Self- Sentiment	I often start things I never finish (positive)
Honesty	If I get too much change in a store, I always give it back (positive)
Interest in Science	I like science (positive)
Flexibility	It bothers me when something unexpected interrupts my daily routine (positive)
Political Concern	We ought to worry about our own country and let the rest of the world take care of itself (negative)
Community Involvement	I would be ashamed not to use my privilege of voting (positive)

Table 3:
Factor Intercorrelation Pattern for Personality and Attitude Scales

		I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII
I	Affectot													
II	Superego	-.227												
III	Threctia	-.005	.292											
IV	Premsia	.225	-.440	-.349										
V	Un Adeq	.340	-.540	-.117	.566									
VI	Cons Tem	-.574	.560	.336	-.498	-.723								
VII	Grp Dep	-.308	-.026	-.191	-.209	-.279	.319							
VIII	Low Self	.212	-.498	-.221	.698	.403	-.431	.017						
IX	Honesty	.115	.407	.531	-.252	-.190	.337	-.044	-.175					
X	Int Sci	.081	.018	-.271	.112	.057	-.180	-.068	-.028	-.031				
XI	Flexibil	-.292	.129	-.021	-.665	-.385	.251	.423	-.250	-.038	-.119			
XII	Poli Con	.638	-.166	-.107	.177	.328	-.446	-.248	.085	.008	.122	-.180		
XIII	Comm Inv	.075	.472	.249	-.274	-.399	.390	-.124	-.258	.449	.001	.042	.033	

Table 4:
T-Score Means for Personality Factors By Gender

Factor	Males (N=1328)	Females (N=1514)	p-value
Affectothymia	50.46	49.60	n.s.
Superego	50.50	49.56	.01
Threctia	53.48	46.95	.001
Premsia	49.86	50.13	n.s.
Untroubled Adequacy	50.70	49.39	.01
Conservatism of Temperament	50.15	49.87	n.s.
Group Dependent	48.86	50.98	.01
Low Self-Sentiment	50.59	49.48	n.s.
Honesty	51.26	48.88	.001
Interest in Science	47.35	52.32	.001
Flexibility	49.33	50.59	.05
Political Concern	50.02	49.98	n.s.
Community Involvement	50.49	49.57	.01

Table 5:

T-Score Means for Personality Factors
By Cohort

Factor	I (N=119)	II (N=258)	III (N=325)	IV (N=364)	V (N=392)	VI (N=380)	VII (N=333)	VIII (N=295)	IX (N=194)	X (N=108)	XI (N=74)
Affectothymia	56.11	54.34	52.42	49.58	49.21	48.41	48.65	47.75	48.67	49.87	47.57
Superego	44.60	44.89	47.45	49.12	51.00	51.72	51.13	51.78	52.72	54.16	52.51
Threctia	45.76	44.88	48.24	48.84	51.02	51.22	51.10	51.33	52.38	54.28	53.78
Premsia	55.39	53.69	52.97	51.48	50.27	49.76	48.82	45.89	45.35	48.07	44.64
Untroubled Adequacy	55.63	55.51	53.48	51.93	50.08	48.32	48.46	47.42	44.32	44.39	45.48
Conservatism Temperament	41.00	43.07	46.14	47.02	50.89	51.95	52.42	53.95	55.52	56.54	54.93
Group Dependent	47.53	47.75	48.31	50.15	49.13	49.96	50.40	52.56	51.38	52.93	53.37
Low Self-Sentiment	53.40	53.35	52.02	51.14	48.99	49.09	49.04	47.84	49.03	47.13	48.10
Honesty	48.70	46.93	48.15	48.55	49.04	49.98	50.76	51.55	53.96	56.82	53.23
Interest in Science	52.55	52.18	51.04	50.36	49.21	49.38	50.12	49.09	49.01	47.31	48.96
Flexibility	45.61	46.88	49.00	49.40	50.16	51.32	51.27	52.12	51.75	49.05	50.29
Political Concern	54.36	53.12	52.62	50.67	49.39	47.90	48.80	47.48	50.01	48.31	49.29
Community Involvement	44.71	44.81	46.21	47.92	49.42	50.57	50.79	53.29	56.43	58.31	57.98

Table 6:

Analysis of Variance Results:
significant F Ratios (Univariates)
(N=2842)

Factor	Gender	Cohort
Affectothymia		15.97***
Superego	7.64**	20.62***
Threctia	268.11***	21.74***
Premsia		25.11***
Untroubled Adequacy	9.27**	35.37***
Conservatism of Temperament		61.94***
Group Dependent	9.46**	7.47***
Low Self-Sentiment		10.38***
Honesty	28.39***	15.88***
Interest in Science	136.00***	4.77***
Flexibility	5.06*	8.86***
Political Concern		12.19***
Community Involvement	7.08**	46.65***

The Gender X Cohort interaction was significant for Threctia (F=2.62, p <

.01); and Group Dependent (F=2.44, p < .01).

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