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A Closer Look at the Test of Personal Intelligence Presentation

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Overview

Personal intelligence is the capacity to reason about personality and personality-related information. To understand more about the structure of the mental abilities involved in personal intelligence, we fit several factor models to an ability-based test of personal intelligence. A two-factor oblique simple structure model fit the data well. The findings inform us about the nature of abilities people use to understand personality in themselves and others.

Introduction

Personal Intelligence (PI): Quick Background

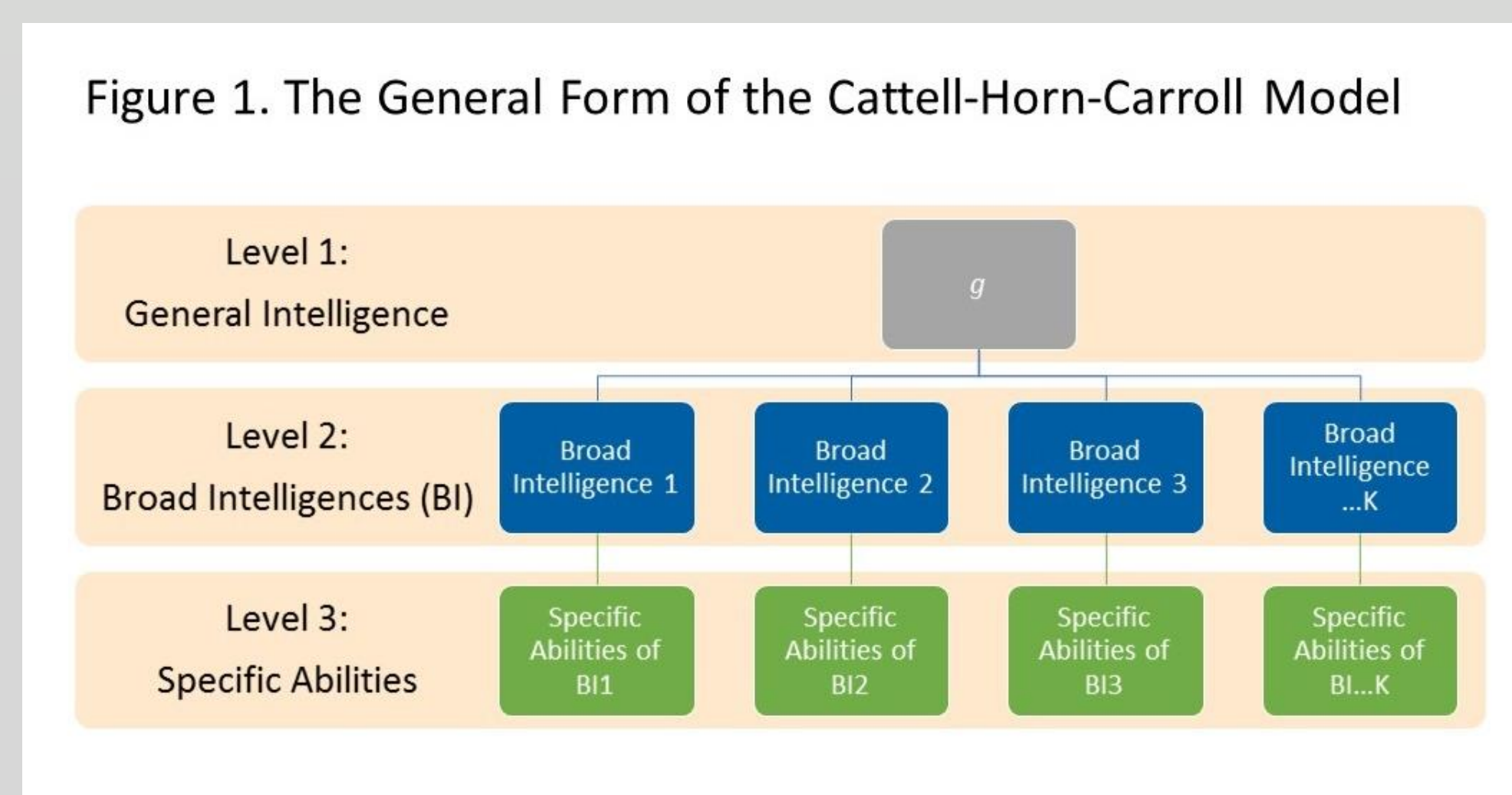
A number of theories in psychology identify key aspects of understanding personality in oneself and others.

- Psychological mindedness* is an ability exhibited by some psychotherapy patients to learn about themselves and others (Appelbaum, 1973).
- Intra- and interpersonal intelligences* include skills for building a coherent identity and understanding other people (Gardner, 1983).
- The *good judge* can perceive the personality of other people more accurately than can an average person (Funder, 2001).

Such concepts share a common focus on the capacity to reason about personality and personality-related information. Mayer (2008; 2014) developed a theory of personal intelligence (parallel to social and emotional intelligences) to synthesize these viewpoints.

General and Broad Intelligences

In the Cattell-Horn-Carroll model of intelligences, *g* (general intelligence), is at the top of a three-tiered hierarchy, with broad intelligences in the middle level and specific skills at the bottom. Figure 1. depicts a schematic illustration.



Personal Intelligence as a Broad Intelligence

We regard personal intelligence as a broad intelligence parallel in many respects to verbal, spatial, and perceptual-organizational intelligences. The theory of personal intelligence divides it into four problem-solving areas:

- to recognize personality-relevant information
- to form accurate models of personalities
- to guide oneself and others' choices using personality.
- to systematize one's plans so as to achieve one's aims

Overview of the TOPI Test

The Test of Personal Intelligence Version 1.4 (TOPI 1.4) is an ability-based test developed to measure individuals' levels of personal intelligence (Mayer, Panter & Caruso, 2012; Mayer & Skimmyhorn, 2017). The test items fall within one of four areas of problem solving just described. A sample item asks:

- If a person wants to be with one or more people, talk to them, go out with them, and have a good time, the person is likely going to:
- be in love
 - express warmth toward someone
 - meet a goal of excellence
 - socialize



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The test-taker who answers this item correctly (alternative "d") must assess the given behaviors and extract from them the most likely motive.

Overview of Studies

We tested several factor models of PI by examining item-level responses to the 93-item TOPI 1.4 from two independent samples (Studies 1 and 2), and then created factor-based scales to represent them. We also reanalyzed data from an earlier study (Mayer, Panter & Caruso, 2012) to assess the new tests correlations with criteria (Study 3).

Hypotheses

Our key hypotheses were that:

- We could fit a factor model to the test.
- The factors would be interpretable.
- The resulting factor scales would be reliable.
- The scales and their composite would correlate with important criteria.

Methods

Participants

Participants were drawn from three archival samples:

Study 1. 10,318 test-takers drawn from seven samples, mostly from the United States Military, divided into Exploratory (odd-numbered) and Cross-Check (even-numbered) participant subsamples

Study 2. An independent sample of 8,459 military personnel

Study 3. A reanalysis of a sample of 384 test-takers from Mayer, Caruso & Panter, 2012

Measures

- The 93-item *Test of Personal Intelligence* (Version 1.4) described earlier
- Assorted criterion scales in Study 3, including:
 - A measure of the Big-Five
 - Psychological mindedness
 - Psychopathological symptom checklists
 - The *Mayer-Salovey-Caruso Emotional Intelligence Test*
 - The *Reading the Mind in the Eyes Test* (a measure of interpersonal sensitivity), and
 - An estimate of *g* (a vocabulary measure)

Results

Could a Factor Model be Fit to the Test?

We began fitting models by conducting a series of exploratory factor analyses. The 2-factor model exhibited the best fit in the exploratory analysis (Table 1) and appeared interpretable.

Model Tested	Items Deleted	Items & Split	Variables/Free Parameters	Fit Indices					r _{com}
				Chi-2	df	RMSEA	CFI	TLI	
Initial Exploratory Factor Analyses, Odd Sample (N=5,144) 3- to 9-Factor Solutions: Forciprim-Rotated, Oblique									
One factor model	0	na	93/93	9813.11	4185	.016	.907	.905	na
Two factor model	0	93:43/50	93/185	7298.51	4093	.012	.947	.945	r _{com} = .46
Three factor model	0	93:34/39/20	93	6488.78	4002	.011	.959	.956	r _{com} = .35 to .32
Final Two-Factor Models, Odd Sample (N=5,144) With Poorly Performing Items Removed									
Simple structure	25	68:34/34	68/137	4074.63	2209	.013	.952	.950	r _{com} = .82
Bifactor Model	25	68:68/34/34	68/204	3408.78	2142	.011	.967	.965	r* = .00
Confirmatory Two-Factor Models, Even Sample Cross-Check (N = 5,174)									
Simple structure	25	68:34/34	68/137	4226.71	2209	.013	.947	.945	r _{com} = .81
Bifactor Model	25	68:68/34/34	68/204	3380.06	2142	.011	.967	.965	r* = .00
Confirmatory Two-Factor Models, Independent Cross Validation Sample (N = 8,459)									
Simple structure	26	67:33/34	67/135	5682.48	2143	.014	.957	.956	r _{com} = .87

*Factors in the bifactor model are constrained to a zero correlation with one another.

In order to fit the two-factor model using confirmatory factor analysis, we dropped 25 items, yielding a 68-item test. We then tested a confirmatory factor model: The 2-factor model fit well (Table 1). Subsequently, we dropped one further item based on an IRT model, for a final 67-item test. Model fits for CFI and TLI were around .95 with RMSEA < .02.

Were the Factors Interpretable?

Based on an examination of the highest-loading items on each factor, we identified them as follows:

- Consistency-Congruence Personal Intelligence (CC).** Items loading on this factor asked about consistent patterns across traits. The most common items (20 in number) concerned understanding which socio-emotional traits go together (e.g., liveliness with talkativeness) and how mental states and desires reflect motivational patterns.
- Dynamic-Analytic Personal Intelligence (DA).** Items on this factor involved reasoning about personality dynamics and integrating information. The most common two sets of items (20 altogether) concerned recognizing problematic goals and goal conflicts (e.g., "to be able to please everyone") and the ability to use personal memories to motivate oneself (e.g., "remembering a careless act that turned out badly so as to be more careful").

Were the Factor Scales and Test Composite Reliable?

Both scales yielded coefficient alpha reliabilities of .75 or higher (as did their composite), and exhibited similar, although slightly lower, marginal reliabilities using an IRT model. The latter result was probably owing to less precision of measurement at the higher end of the test scale. The two factors exhibited obtained correlations of $r = .59$ to $.64$ across studies (see Table 2 for details).

TOPI 1.4R Scales	Reliabilities		Correlations		
	Alpha	Marginal (IRT)	Consistency	Dynamic	Original TOPI 1.4
Exploratory Sample (Odd and Even Cross-Check), N = 10,318					
Consistency	.75	.66	1.00**		
Dynamic	.80	.74	.59**	1.00**	
Composite	.85***	Not est.	.89**	.90**	.97**
Independent Cross-Validation Sample, N = 8,459					
Consistency	.79	.65	1.00**		
Dynamic	.82	.74	.64**	1.00**	
Composite	.88**	Not est.	.90**	.90**	.97**

Were the New Scales Predictive of Criteria?

In a further analysis, the two factor scales and their composite exhibited significant relations with *g* (as a broad intelligences ought to) as well as other relations with criteria comparable to those of the original scale (see Table 3).

Table 3
TOPI 1.4R Criterion Correlations: Reanalysis of Mayer, Panter & Caruso, 2012

TOPI and Criterion Measures (N = 384)	TOPI 1.4R Factor Scales		Difference (absolute)	Composite Score
	Consistency	Dynamic		
TOPI Scales and Other Mental Abilities				
Vocabulary	.31**	.44**	.13**	.42**
Reading the Mind in the Eyes	.37**	.50**	.13**	.49**
MSCEIT-Strategic Area	.56**	.63**	.07	.66**
Understanding Ability	.37**	.51**	.14**	.48**
Managing Ability	.54**	.64**	.10**	.65**
Big Five				
Extraversion	-.01	-.06	.05	-.04
Neuroticism	-.06	-.03	.03	-.05
Openness	.06	.10	.04	.09
Agreeableness	.12	.15**	.03	.15**
Conscientiousness	.19**	.16**	.03	.20**
Psych Minded-Total	.29**	.39**	.10**	.38**
Symptomatology				
Maladaptive Agreeableness	-.14**	-.15**	.01	-.16**
Narcissistic Grandiosity	-.13	-.22**	.09	-.19**
Narcissistic Personality (NPI)	-.07	-.13*	.08	-.11**

Discussion and Conclusions

The present research enhances our understanding of the mental abilities underlying personal intelligence. The theory already had specified four key areas of problem solving that help to identify relevant test items to use in measurement:

- recognizing personality-relevant information
- forming accurate models of personality
- guiding choices with such information, and
- systematizing plans and goals

Using that division to develop our test-items, we then fit a factor model and concluded that there existed two mental abilities people used to solve such problems: one focused on recognizing the consistencies in personality, and the other more focused on analyzing dynamic and sometimes inconsistent information about a person and making sense of it. The two classifications are depicted together in Figure 2.

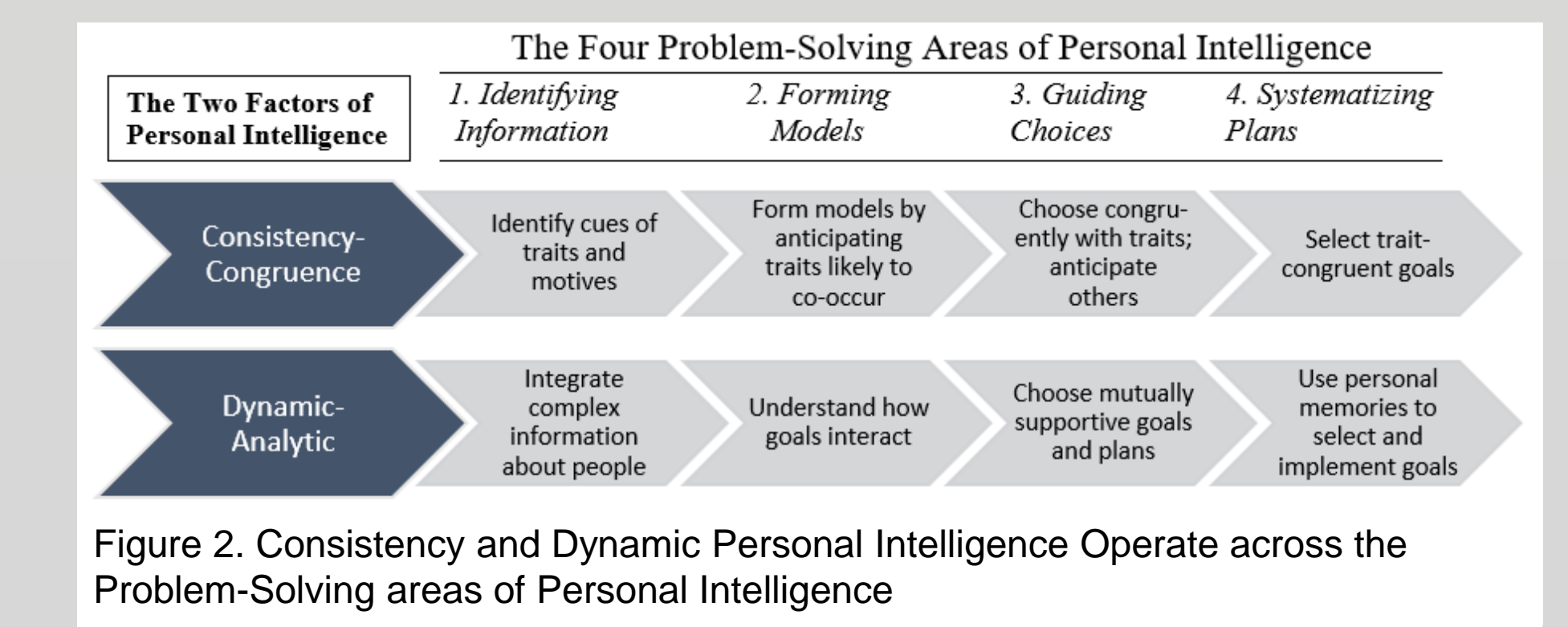


Figure 2. Consistency and Dynamic Personal Intelligence Operate across the Problem-Solving areas of Personal Intelligence

Key Sources

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