

Predicting health outcomes: Traditional personality measures and novel empirically-derived scales.

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Personality & Health

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- More recent research (using Big Five models) has demonstrated that personality predicts health outcomes *across the lifespan*.
 - Childhood personality predicts adult outcomes (Hampson, Goldberg, Vogt, & Dubanoski, 2007)
 - Personality in young adulthood predicts mortality (Jackson, Connolly, Garrison, Leveille, & Connolly, 2015)
 - Personality in old age predicts disease onset (Weston, Hill, & Jackson, 2015)

Personality & Health

- Personality traits also predict *proximal* health behaviors
 - Conscientiousness predicts healthy behaviors
(Bogg & Roberts, 2004; Booth Kewley & Vickers, 1994)
 - Neuroticism predicts unhealthy behaviors
(Booth Kewley & Vickers, 1994; Turiano, Hill, Roberts, & Spiro, 2012)
 - Personality predicts use of emergency services and probably other health services
(Chapman et al., 2009)

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 - Personality predicts use of emergency services and probably other health services
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- Researchers and clinicians are now calling for inclusion of personality assessment in clinical settings
 - “Translating personality psychology to help personalize preventive medicine for young adult patients” (Israel et al., 2014)
 - NIH Director of OBSSR (Riley) calling for “personality-based precision medicine” research to inform the development and tailoring of individualized interventions.

Personality-Based Precision Medicine

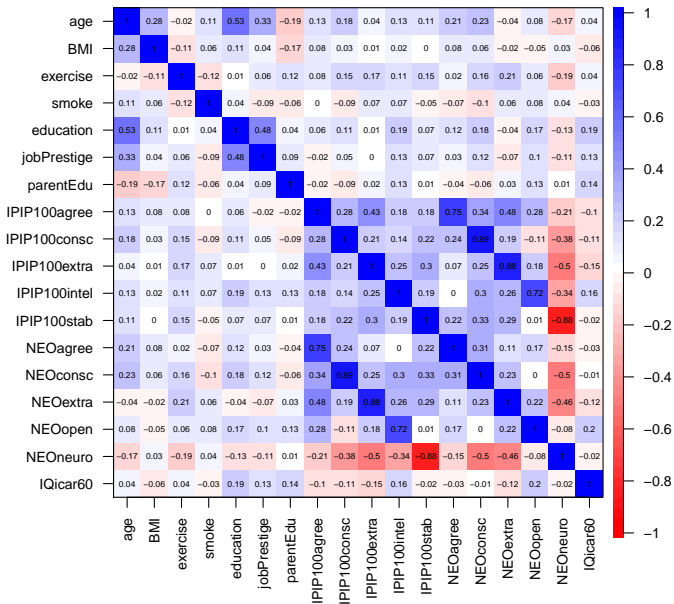
- A wide range of personality based interventions have demonstrated utility including:
 - (1) top down, (2) bottom up, (3) social context, (4) partner, (5) developmental

(Reiss, Eccles & Nielsen, 2014; Chapman, Roberts, & Duberstein, 2011)
- Personality interventions are not new!
(e.g., psychotherapy and intensive military training)
- More is not always better...
(e.g., we don't want *everyone* to be more conscientious)
- Improved measurement precision is necessary for individualized treatment.

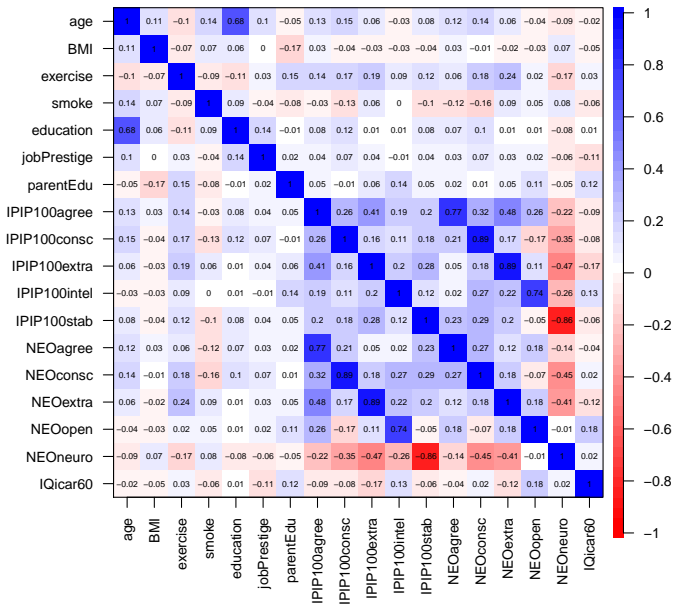
Body Mass Index as an Example

- Obesity is a major public health concern worldwide.
 - High BMI associated with subsequent onset of diabetes, cardiovascular disease, orthopedic complications, sleep disorders, and several types of cancer (Wills, 2004)
- Among teenagers, the prevalence of obesity increased from 5% to 21% between 1980 and 2012 (Ogden et al., 2014)
- Previously reported associations with obesity include:
 - higher SES (-) and small associations with conscientiousness (-) (Bogg & Roberts, 2004)
 - neuroticism (-) and extraversion (+) (Kakizaki, 2008)
- Strong interest in developing behaviorally based interventions that target unhealthy BMIs, particularly important for children and young adults.

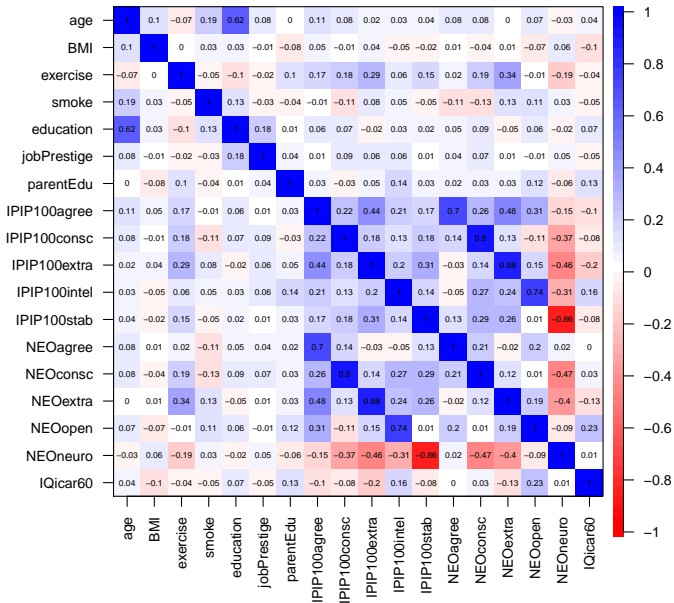
BMI and Big Five Correlations – Full Sample



BMI and Big Five Correlations – Female Teens



BMI and Big Five Correlations – Male Teens

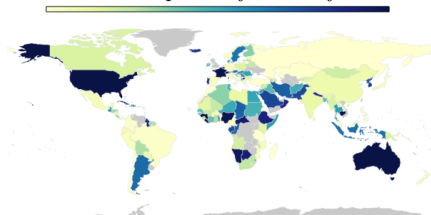


What do we do now?

- Bad news: traditional Big Five (and Big Six) measures don't relate much to BMI.
- Good news: the SAPA method allows us to evaluate a much larger pool of items.

SAPA Sample: $N = 188,435$

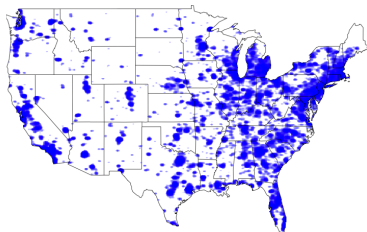
Participants by Country



Top Countries by Participants

Country	Participants
United States	131,440
Canada	8,196
United Kingdom	4,875
Australia	3,592
India	2,035
Malaysia	1,844
Germany	1,736
Philippines	1,672
Sweden	1,206
Mexico	791

Participants by US ZIP Code



Gender & Age	Participants
Male Teens	22,580
Female Teens	39,622
Male Non-Teens	47,510
Female Non-Teens	78,722

SAPA Measures

- **“Personality”:** 696 items

- IPIP Big Five Factor Markers (100 items; Goldberg, 1999)
- Big Five Aspect Scales (100 items; DeYoung et al., 2007)
- six factor HEXACO scales (240 items; Ashton et al., 2007)
- Questionnaire Big Six scales (48 items; Thalmayer et al., 2011)
- IPIP NEO scales (300 items; Goldberg, 1999)
- IPIP MPQ scales (127 items; Goldberg, 2014; Tellegen & Waller, 2008)
- Plasticity/Stability scales (40 items; DeYoung, 2010)
- EPQ-R scales (Lie scale omitted)(79 items; Eysenck et al., 1985)

- **Cognitive Ability:** 60 items

- International Cognitive Ability Resource (60 items; Condon & Revelle, 2014)

- **Interests:** 351 items

- six factor O*NET Interest Profiler scales (60 items; Rounds et al. 2010)
- eight factor Oregon Vocational Interest scales (92 items; Pozzebon et al., 2010)
- Oregon Avocational Interest scales (199 items; Goldberg, 2010)

- **300+ “criterion” variables**

Two Ways to Improve on the Big Five

1. Hierarchical models
 - identify generalizable models at multiple levels
 - resist the temptation for symmetry and nesting
2. Empirical scales
 - predict the outcome directly using all available items

Development of a Hierarchical Model

- Thorough evaluation of structure at all levels of factor extraction
 - Limited evidence for a “superior” fit at any level from the fit statistics
 - SRMR: more than 2 factors
 - RMSEA and eBIC: 27 factors (!)
 - MAP: 9 factors
 - item complexities suggests 5, 15, and maybe 26
- Organization of item content was examined for all factor solutions from 1 to 20

Item content for 1 to 15 factors

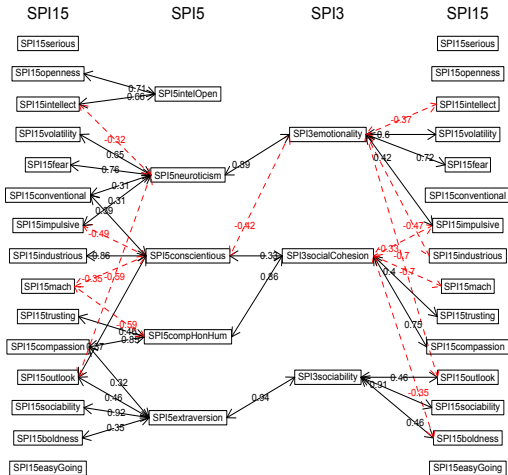
Extracted	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13	F14	F15
1	outlook/ sociability														
2	sociability	impulsivity													
3	emotionality	sociability	social cohesion												
4	extraversion	emotionality	consc	psychopathy											
5	extraversion	emotionality	consc	agreeable /honesty /humility	intellect										
6	sociability	emotionality	consc	agreeable	intellect	boldness									
7	sociability	emotionality	industrious	humility/ agreeable /honesty	intellect	boldness	assertive								
8	extraversion	consc	humility	outlook	intellect	emotionality	boldness	assertive							
9	sociability	industrious	humility/ compassion	outlook	intellect	emotionality	boldness	self-esteem	conventional						
10	sociability	industrious	compassion /humility	outlook	emotionality	intellect	boldness	self-esteem	unidentified	apathy /lie					
11	sociability	compassion	industrious	outlook	emotionality	boldness	openness	intellect	self-esteem	trusting	unidentified				
12	sociability	outlook	industrious	emotionality	openness	machiavel	boldness	compassion	conventional /orderliness	intellect	trusting	odddity /lie			
13	sociability	outlook	industrious	emotionality	compassion /empathy	machiavel	openness	boldness	confidence /intellect	conventional	trusting	odddity /lie	accepting		
14	sociability	outlook	industrious	stability	compassion	machiavel	openness	boldness	intellect	conventional	trusting	laugh /worry	accepting	out-spoken	
15	sociability	outlook	industrious	compassion	stability	machiavel	openness	boldness	intellect	conventional	trusting	laugh /worry	self-esteem /humility	accepting	unidentified

Development of a Hierarchical Model

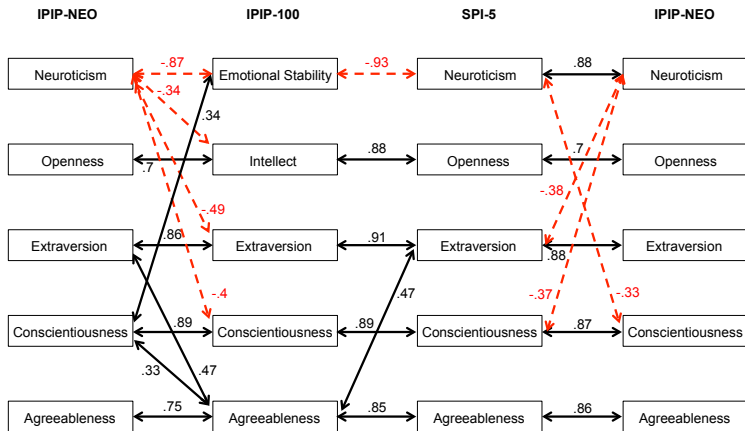
- 3, 5 and 15 factors were ultimately supported by orientation of item content.
- Scale development followed from:
 - empirical identification of top items at each level
 - preferential use of items that overlap across more than one level
- 150 items set can be used to derive scores at 3 levels of specificity
- Factors are organized heterarchically across levels; no evidence for dendritic nesting

Correlations among the SPI 3, 5, and 15 scales

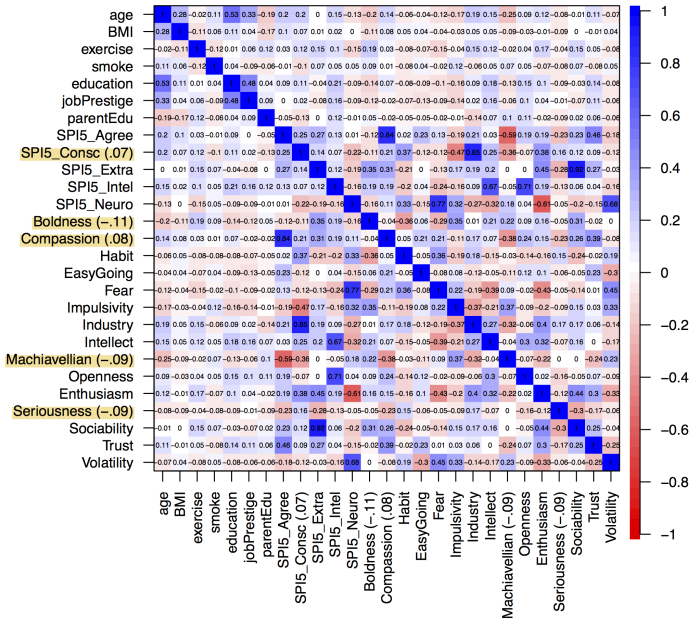
150 items scored at 3 empirical levels of personality
(cut = 0.3)



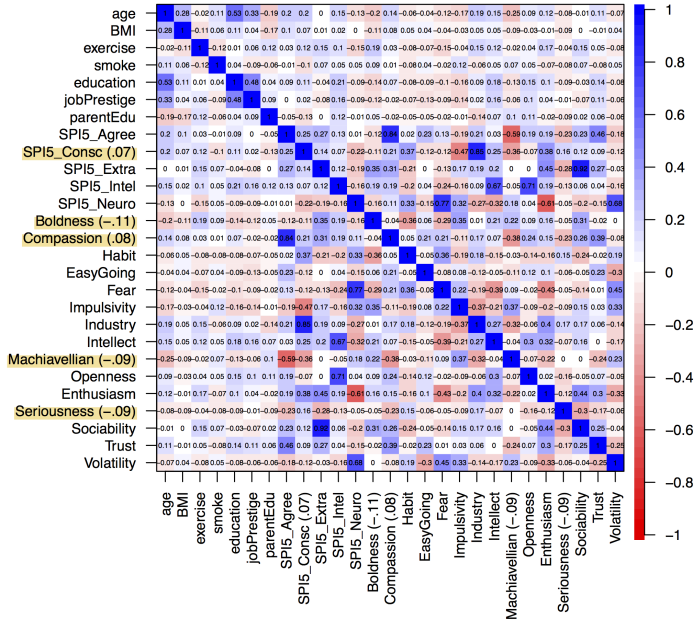
Correlations between the SPI5 and extant 5 factor scales



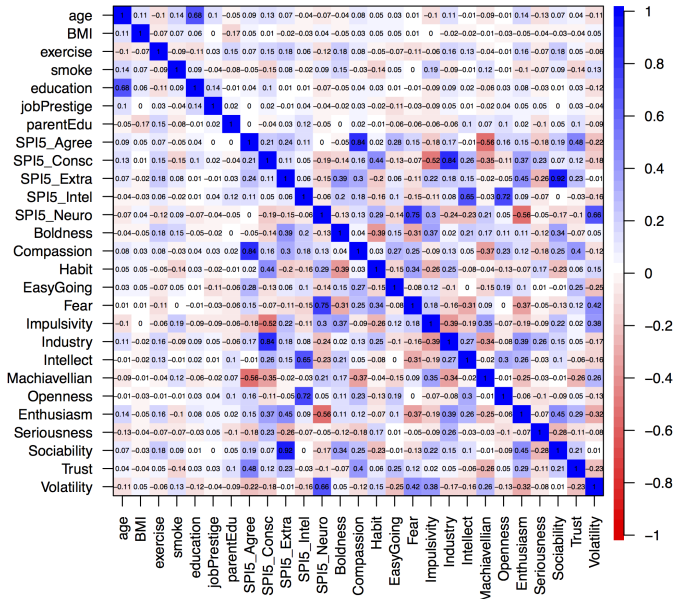
SPI-15 and BMI – Full Sample



SPI-15 and BMI – Male Teens



SPI-15 and BMI – Female Teens



What if structure differs in sub-samples of the population?

Table 1: All except Teen – Extraversion

Item	MR2
q4267	Like mixing with people. 0.76
q1899	Usually enjoy being with people. 0.73
q4262	Can easily get some life into a dull party. 0.72
q1671	Seem to derive less enjoyment from interacting with people than others do. -0.72
q1803	Talk to a lot of different people at parties. 0.72
q4295	Other people think of me as being very lively. 0.71
q4237	Enjoy meeting new people. 0.71
q262	Am the life of the party. 0.70
q4226	Am a talkative person. 0.70
q1370	Love large parties. 0.70

Table 2: All except Teen – Neuroticism

Item	MR1
q986	Get stressed out easily. 0.74
q995	Get upset easily. 0.73
q52	Am a person whose moods go up and down easily. 0.72
q979	Get overwhelmed by emotions. 0.72
q4224	My mood often goes up and down. 0.70
q1989	Worry about things. 0.70
q1099	Have frequent mood swings. 0.69
q4252	Am a worrier. 0.69
q965	Get easily agitated. 0.68
q413	Can be stirred up easily. 0.68

Table 3: All except Teen – Conscientiousness

Item	MR4
q519	Complete my duties as soon as possible. 0.65
q930	Finish what I start. 0.64
q619	Do things according to a plan. 0.64
q1422	Make plans and stick to them. 0.62
q1374	Love order and regularity. 0.61
q76	Am always prepared. 0.61
q1452	Neglect my duties. -0.61
q626	Do things in a half-way manner. -0.60
q665	Dont finish the things that I start. -0.60
q931	Follow a schedule. 0.60

Table 4: All except Teen – Agreeableness

Item	MR3
q90	Am concerned about others. -0.63
q1763	Sympathize with others feelings. -0.62
q146	Am indifferent to the feelings of others. 0.62
q253	Am sensitive to the needs of others. -0.61
q1818	Tend to dislike soft-hearted people. 0.59
q851	Feel sympathy for those who are worse off than myself. -0.58
q630	Do things out of revenge. 0.58
q4293	Would like for other people to be afraid of me. 0.57
q460	Can't be bothered with others needs. 0.57
q1896	Use others for my own ends. 0.57

Table 5: All except Teen – Intellect

Item	MR5
q2745	Am able to come up with new and different ideas. 0.64
q128	Am full of ideas. 0.61
q516	Come up with something new. 0.59
q2754	Am an original thinker. 0.58
q1050	Have a rich vocabulary. 0.58
q1388	Love to read challenging material. 0.57
q1090	Have excellent ideas. 0.57
q492	Carry the conversation to a higher level. 0.56
q1088	Have difficulty understanding abstract ideas. -0.55
q194	Am not interested in abstract ideas. -0.55

What if structure differs in sub-samples of the population?

Table 6: Female Teen – Extraversion

Item	MR1
q4240 Tend to keep in the background on social occasions.	-0.80
q4283 Can get a party going.	0.77
q4226 Am a talkative person.	0.77
q4234 Can usually let myself go and enjoy a lively party.	0.77
q4267 Like mixing with people.	0.75
q4257 Usually take the initiative in making new friends.	0.74
q1899 Usually enjoy being with people.	0.74
q1370 Love large parties.	0.73
q262 Am the life of the party.	0.73
q1379 Love to chat.	0.73

Table 7: Female Teen – Neuroticism

Item	MR3
q4239 My feelings are easily hurt.	0.74
q979 Get overwhelmed by emotions.	0.70
q986 Get stressed out easily.	0.69
q995 Get upset easily.	0.68
q4252 Am a worrier.	0.67
q1505 Panic easily.	0.66
q52 Am a person whose moods go up and down easily.	0.65
q1989 Worry about things.	0.65
q4224 My mood often goes up and down.	0.65
q4256 Worry about awful things that might happen.	0.64

Table 8: Female Teen – Conscientiousness

Item	MR4
q1979 Work hard.	0.67
q1550 Push myself very hard to succeed.	0.66
q619 Do things according to a plan.	0.66
q76 Am always prepared.	0.65
q604 Do more than whats expected of me.	0.64
q930 Finish what I start.	0.63
q2737 Am a goal-oriented person.	0.63
q931 Follow a schedule.	0.62
q1374 Love order and regularity.	0.62
q1321 Like to plan ahead.	0.62

Table 9: Female Teen – Agreeableness

Item	MR2
q90 Am concerned about others.	-0.68
q1818 Tend to dislike soft-hearted people.	0.65
q1354 Look down on others.	0.64
q487 Cant stand weak people.	0.61
q253 Am sensitive to the needs of others.	-0.61
q630 Do things out of revenge.	0.59
q146 Am indifferent to the feelings of others.	0.56
q145 Am inclined to forgive others.	-0.56
q1832 Think of others first.	-0.55
q1763 Sympathize with others feelings.	-0.55

Table 10: Female Teen – Intellect

Item	MR5
q2745 Am able to come up with new and different ideas.	0.68
q128 Am full of ideas.	0.62
q1050 Have a rich vocabulary.	0.58
q1388 Love to read challenging material.	0.57
q1090 Have excellent ideas.	0.56
q1058 Have a vivid imagination.	0.56
q2754 Am an original thinker.	0.56
q516 Come up with something new.	0.55
q1392 Love to think up new ways of doing things.	0.54
q1761 Swim against the current.	0.53

What if structure differs in sub-samples of the population?

Table 11: Male Teen – Extraversion

Item	MR1
q4226 Am a talkative person.	0.80
q712 Dont talk a lot.	-0.76
q745 Enjoy being part of a loud crowd.	0.75
q4247 Prefer reading to meeting people.	-0.74
q4283 Can get a party going.	0.74
q4234 Can usually let myself go and enjoy a lively party.	0.74
q1899 Usually enjoy being with people.	0.73
q4292 Like having plenty of bustle and excitement around.	0.72
q4267 Like mixing with people.	0.72
q4243 Like going out a lot.	0.72

Table 12: Male Teen – Neuroticism

Item	MR2
q986 Get stressed out easily.	0.72
q4239 My feelings are easily hurt.	0.70
q960 Get caught up in my problems.	0.69
q1505 Panic easily.	0.69
q995 Get upset easily.	0.69
q4252 Am a worrier.	0.68
q1099 Have frequent mood swings.	0.66
q1989 Worry about things.	0.66
q4256 Worry about awful things that might happen.	0.65
q824 Feel desperate.	0.64

Table 13: Male Teen – Psychopathy?

Item	MR3
q1765 Take advantage of others.	0.70
q4293 Would like for other people to be afraid of me.	0.69
q1896 Use others for my own ends.	0.66
q1854 Trust others.	-0.66
q90 Am concerned about others.	-0.64
q957 Get back at others.	0.63
q1354 Look down on others.	0.62
q145 Am inclined to forgive others.	-0.62
q1764 Sympathize with the homeless.	-0.60
q487 Cant stand weak people.	0.60

Table 14: Male Teen – Conscientiousness

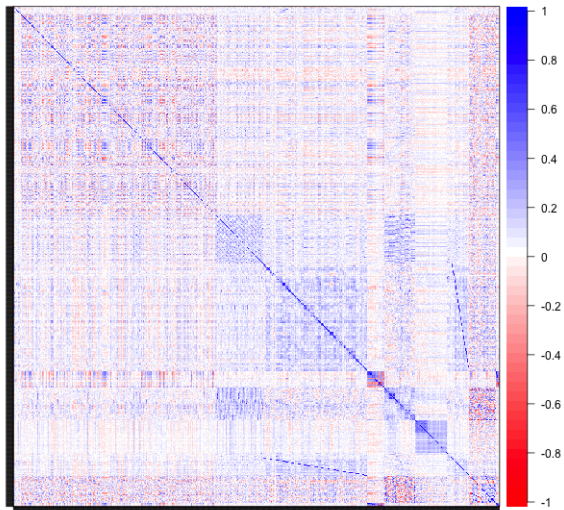
Item	MR4
q619 Do things according to a plan.	0.67
q604 Do more than whats expected of me.	0.65
q992 Get to work at once.	0.65
q491 Carry out my plans.	0.64
q1550 Push myself very hard to succeed.	0.64
q76 Am always prepared.	0.63
q930 Finish what I start.	0.63
q1979 Work hard.	0.63
q1452 Neglect my duties.	-0.63
q1422 Make plans and stick to them.	0.62

Table 15: Male Teen – Intellect

Item	MR5
q2754 Am an original thinker.	0.71
q2745 Am able to come up with new and different ideas.	0.66
q128 Am full of ideas.	0.64
q778 Enjoy thinking about things.	0.60
q1388 Love to read challenging material.	0.59
q1392 Love to think up new ways of doing things.	0.59
q761 Enjoy intellectual games.	0.57
q1232 Know that my ideas sometimes surprise people.	0.56
q1327 Like to solve complex problems.	0.56
q1648 See beauty in things that others might not notice.	0.55

Empirical Scale Development Makes Use of All Available Items

Allows for Tailoring of Scales to Sub-Populations



Empirical Scales of BMI – Full Sample

	BMI	Item
q1474	0.31	Often eat too much.
age	0.28	Age
PEdu	-0.17	Parent's educational attainment level.
q56	-0.16	Am able to control my cravings.
q1462	-0.14	Never splurge.
q1461	-0.13	Never spend more than I can afford.
q1384	0.13	Love to eat.
q1590	-0.12	Rarely overindulge.
q832	-0.12	Feel healthy and vibrant most of the time.
q40	-0.12	Admire a really clever scam.
q711	0.12	Dont strive for elegance in my appearance.
q1662	-0.11	Seek adventure.
q4236	0.11	People should always respect the law.
q152	0.11	Am just an ordinary person.
q1104	-0.11	Have great stamina.
q2821	-0.11	Behave in unusual and strange ways.

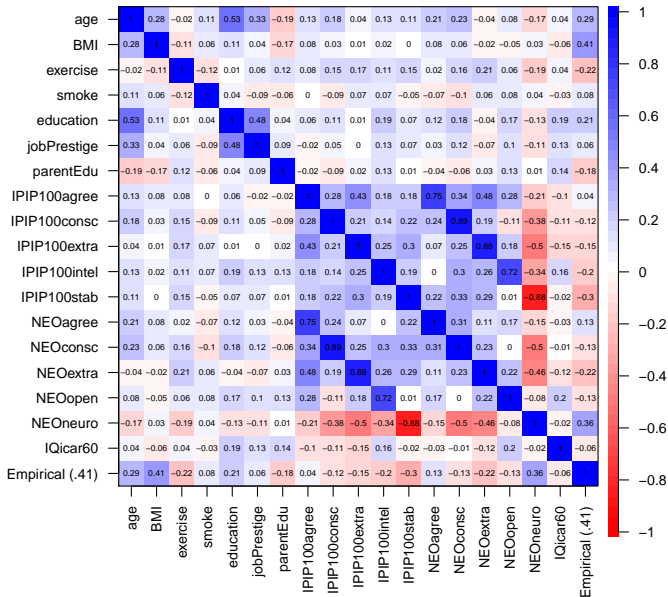
Empirical Scales of BMI – Male Teens Sample

	BMI	Item
q1474	0.34	Often eat too much.
q778	-0.17	Enjoy thinking about things.
q1590	-0.17	Rarely overindulge.
q56	-0.15	Am able to control my cravings.
q4240	-0.14	Tend to keep in the background on social occasions.
q1384	0.13	Love to eat.
q4226	0.13	Am a talkative person.
q1104	-0.13	Have great stamina.
q4288	0.13	Often feel lonely.
q992	0.13	Get to work at once.
q1064	0.13	Have an intense boisterous laugh.
q1052	0.12	Have a slow pace to my life.
q1662	-0.12	Seek adventure.
q722	0.12	Dont understand things.
q1880	-0.12	Try to understand myself.

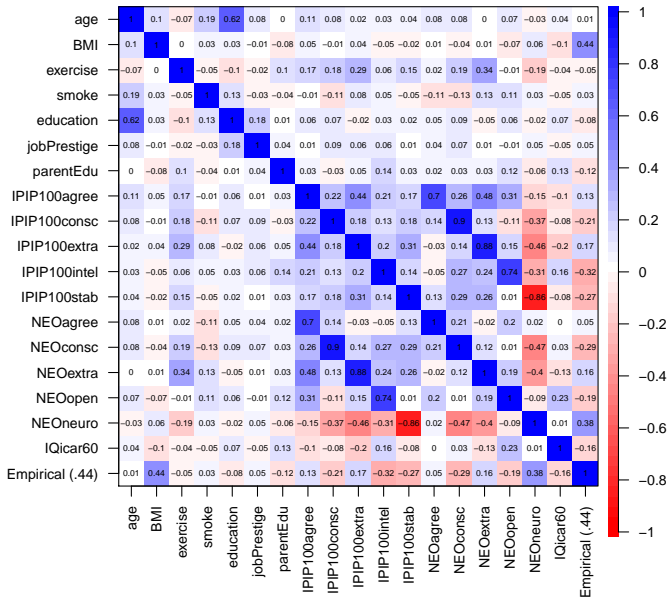
Empirical Scales of BMI – Female Teens Sample

	BMI	Item
q1474	0.18	Often eat too much.
PEdu	-0.17	Parent's educational attainment level.
q1064	0.15	Have an intense boisterous laugh.
q1384	0.14	Love to eat.
q1104	-0.13	Have great stamina.
q1329	0.12	Like to take it easy.
q56	-0.12	Am able to control my cravings.
q1136	0.11	Have some bad habits.
q722	0.11	Dont understand things.
age	0.11	Age
q364	-0.10	Believe that I am better than others.
q20	-0.10	Act comfortably with others.
q1052	0.10	Have a slow pace to my life.
q4282	0.10	Have once wished that I were dead.
q4294	0.10	Am sometimes bubbling over with energy and sometimes very sluggish.
q755	-0.10	Enjoy examining myself and my life.

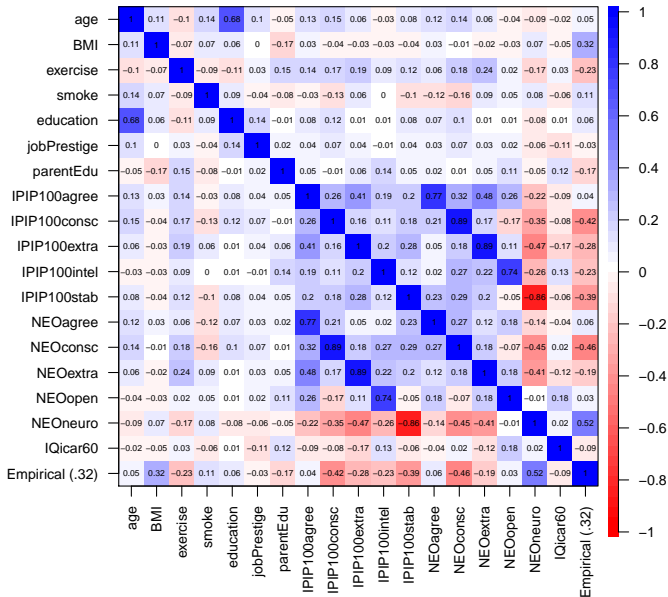
Big Five vs Empirical Scale – Full Sample



Big Five vs Empirical Scale – Male Teens



Big Five vs Empirical Scale – Female Teens



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 - 150 items allow for scoring at multiple levels of specificity

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 - Empirically based blend of public domain items from familiar existing measures
 - 150 items allow for scoring at multiple levels of specificity
 - Utility will be further improved by computer adaptive tools and crosswalk tables (under development)
4. Major shifts in predictive utility for specific applications and contexts will probably require *empirical* scale creation...

SAPA is very well-suited to this task!

Appendix – SPI-15 Items

Item	Soc	Out	Ind	Comp	Vol	Ope	Mac	Int	Bold	Con	Fear	Imp	Trus	Easy	Seri	c_i	h^2
Sociability																	
Am mostly quiet when with other people.	-0.76	0.02	0.00	0.00	-0.06	-0.03	0.04	-0.06	0.10	0.00	0.10	-0.11	0.10	0.12	0.08	1.27	0.67
Tend to keep in the background on social occasions.	-0.75	0.01	-0.05	0.02	0.04	0.10	0.04	-0.03	-0.03	0.14	0.03	-0.08	0.07	0.09	0.01	1.21	0.67
Don't talk a lot.	-0.73	0.02	-0.05	-0.03	-0.10	-0.01	0.06	0.00	0.11	-0.08	0.07	-0.21	0.13	0.16	0.13	1.59	0.70
Like mixing with people.	0.73	0.00	0.02	0.07	-0.07	0.05	-0.01	0.05	0.14	-0.01	0.08	-0.02	0.09	0.17	0.00	1.31	0.70
Talk to a lot of different people at parties.	0.73	-0.08	0.13	0.04	0.03	0.02	0.05	0.04	0.04	-0.05	-0.08	0.06	0.01	0.14	-0.04	1.26	0.63
Keep in the background.	-0.70	-0.06	-0.01	0.07	-0.03	0.02	0.05	-0.14	0.05	0.05	-0.05	-0.05	0.10	0.18	0.01	1.37	0.63
Prefer reading to meeting people.	-0.68	-0.01	0.02	-0.01	0.07	0.23	0.04	0.06	-0.19	0.00	-0.03	0.09	0.01	0.00	0.03	1.5	0.59
Seem to derive less enjoyment from interacting with people than others do.	-0.68	-0.09	0.00	-0.10	0.02	0.09	0.10	0.04	-0.10	0.06	-0.06	0.06	-0.11	-0.03	0.07	1.35	0.64
Outlook																	
Love life.	0.05	0.73	0.07	0.12	0.04	0.07	0.01	-0.01	0.06	0.03	0.09	0.06	0.06	0.03	0.01	1.2	0.62
Feel a sense of worthlessness or hopelessness.	-0.06	-0.72	-0.08	0.03	0.01	0.02	0.06	0.03	0.01	0.00	0.08	0.08	0.06	0.05	0.09	1.16	0.66
Am often down in the dumps.	-0.03	-0.71	-0.14	0.05	0.11	0.08	-0.05	0.06	-0.06	0.02	0.11	0.03	-0.02	0.00	0.13	1.34	0.71
Dislike myself.	-0.07	-0.70	0.00	0.04	0.01	-0.01	0.13	-0.04	0.03	0.08	0.00	0.12	0.06	0.04	-0.02	1.22	0.64
Am very pleased with myself.	0.07	0.69	0.15	-0.03	0.02	0.06	0.06	0.07	-0.05	-0.01	0.05	0.02	-0.07	0.08	0.17	1.39	0.66
Am happy with my life.	0.04	0.69	0.08	0.11	-0.04	0.01	-0.02	-0.05	0.01	0.15	0.01	0.08	0.05	0.08	-0.04	1.3	0.59
Have a low opinion of myself.	-0.05	-0.67	-0.01	0.05	-0.01	-0.02	0.02	-0.14	0.05	0.11	0.02	0.10	0.14	0.05	-0.04	1.36	0.64
Have a dark outlook on the future.	-0.07	-0.65	-0.05	-0.15	0.06	0.13	0.06	-0.07	-0.06	0.08	-0.15	0.07	-0.04	0.05	0.08	1.55	0.65
Industriousness																	
Complete my duties as soon as possible.	0.06	-0.07	0.76	-0.06	-0.04	0.00	-0.04	0.03	-0.07	0.05	0.00	0.04	0.03	0.11	0.03	1.14	0.60
Get chores done right away.	0.10	-0.03	0.75	-0.04	-0.04	0.04	-0.02	-0.11	-0.09	-0.07	-0.03	0.05	0.03	0.10	0.12	1.26	0.55
Start tasks right away.	-0.02	0.03	0.74	-0.02	0.03	0.01	-0.04	0.09	-0.05	-0.06	-0.01	0.12	0.04	0.05	0.09	1.18	0.58
Get to work at once.	-0.03	-0.02	0.68	-0.02	0.04	-0.03	-0.07	0.07	0.04	0.02	-0.07	0.06	0.08	0.08	0.07	1.19	0.52
Keep things tidy.	0.05	-0.02	0.66	0.01	-0.01	-0.02	0.03	-0.10	-0.08	0.00	0.06	-0.09	-0.07	0.11	0.11	1.29	0.48
Find it difficult to get down to work.	0.01	-0.03	-0.62	0.03	0.06	0.14	0.11	-0.08	-0.04	0.11	0.04	-0.01	0.04	0.03	0.06	1.37	0.52
Waste my time.	-0.08	-0.16	-0.56	0.04	0.09	0.08	0.16	-0.01	-0.03	0.07	-0.09	0.09	0.08	0.14	-0.03	1.92	0.58
Neglect my duties.	0.05	-0.10	-0.56	-0.05	0.02	0.10	0.18	-0.04	-0.02	-0.05	0.05	0.09	0.11	0.09	0.10	1.71	0.57
Compassion																	
Am concerned about others.	0.03	-0.05	0.06	0.74	-0.03	0.03	-0.14	0.02	0.04	0.04	-0.04	0.03	0.09	0.00	-0.01	1.17	0.68
Feel others' emotions.	0.00	0.00	0.02	0.70	0.01	0.05	0.03	0.00	-0.04	-0.04	0.10	-0.01	-0.12	0.08	0.03	1.16	0.53
Am sensitive to the needs of others.	0.06	-0.07	-0.02	0.69	-0.06	0.04	-0.02	0.07	-0.03	-0.03	0.06	-0.12	0.10	0.05	0.03	1.23	0.58
Sympathize with others' feelings.	0.07	-0.04	-0.01	0.68	-0.05	0.04	-0.04	-0.02	-0.05	0.03	0.05	-0.05	0.02	0.10	0.01	1.15	0.57
Have a soft heart.	-0.01	0.01	-0.06	0.62	-0.03	-0.03	-0.12	0.01	-0.07	0.04	0.17	0.06	0.04	0.10	0.07	1.42	0.55
Feel sympathy for those who are worse off than myself.	-0.02	-0.02	-0.08	0.62	0.03	0.05	-0.13	0.01	0.01	0.05	-0.03	-0.02	0.04	0.01	-0.04	1.19	0.45

c_i = item complexity; h^2 = communality

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Appendix – SPI-15 Items

Item	Soc	Out	Ind	Comp	Vol	Ope	Mac	Int	Bold	Con	Fear	Imp	Trus	Easy	Seri	c_i	h^2
Can't be bothered with other's needs.	0.02	0.01	0.02	-0.60	0.07	0.08	0.10	-0.01	-0.08	-0.01	0.04	0.04	-0.06	0.17	0.20	1.64	0.49
Inquire about others' well-being.	0.11	-0.01	0.06	0.58	0.06	0.06	-0.07	0.06	0.04	0.09	-0.03	0.01	0.05	0.09	-0.06	1.35	0.49
Volatility																	
Rarely show my anger.	-0.11	-0.08	0.01	-0.04	-0.73	0.05	0.11	0.04	0.04	0.10	0.09	-0.05	0.05	0.01	0.07	1.26	0.52
Get angry easily.	-0.06	-0.05	-0.04	0.00	0.72	-0.09	0.03	0.01	0.07	-0.01	0.03	0.08	0.00	0.02	0.11	1.16	0.64
Lose my temper.	-0.01	0.04	-0.02	0.04	0.71	-0.09	-0.01	0.00	0.02	-0.04	-0.04	0.16	0.01	-0.04	0.11	1.22	0.57
Get irritated easily.	-0.04	-0.08	-0.06	-0.07	0.68	-0.02	-0.02	0.08	0.00	0.05	0.15	0.08	-0.04	0.00	-0.02	1.25	0.64
Can be stirred up easily.	-0.05	0.02	-0.02	0.11	0.59	0.01	0.01	0.00	-0.01	0.09	0.08	0.17	0.15	-0.05	0.06	1.54	0.51
Find that it takes a lot to make me feel angry at someone.	-0.01	0.02	-0.04	0.06	-0.68	0.04	-0.06	0.03	0.02	0.11	-0.01	0.05	0.06	0.09	0.09	1.2	0.54
Seldom get mad.	0.00	0.05	-0.05	-0.05	-0.67	0.12	0.08	-0.01	-0.06	0.04	-0.02	-0.04	0.07	0.06	0.10	1.25	0.51
Get easily agitated.	-0.03	-0.17	0.02	-0.01	0.55	0.01	-0.04	-0.01	-0.06	0.10	0.14	0.15	-0.02	0.05	0.02	1.64	0.54
Openness																	
Enjoy thinking about things.	-0.08	0.07	0.01	0.03	-0.03	0.60	0.01	0.08	-0.08	0.06	-0.02	-0.03	0.09	0.04	0.05	1.24	0.40
Believe in the importance of art.	0.02	-0.03	0.02	0.10	0.07	0.57	-0.05	0.03	0.03	-0.16	0.06	-0.06	0.16	0.08	0.02	1.56	0.40
Am not interested in abstract ideas.	0.04	0.03	0.07	0.01	0.05	-0.55	0.03	-0.02	-0.07	0.02	0.08	0.08	0.02	0.09	0.07	1.3	0.37
Spend time reflecting on things.	-0.10	-0.07	0.01	0.19	0.01	0.54	0.04	-0.04	-0.05	0.10	-0.04	-0.13	-0.05	0.04	0.03	1.67	0.38
Need a creative outlet.	-0.04	0.05	-0.03	0.08	0.07	0.53	-0.05	-0.02	0.09	-0.06	0.11	0.05	0.03	0.02	0.06	1.39	0.34
Have a vivid imagination.	0.04	-0.02	0.01	-0.01	0.03	0.52	-0.07	0.12	0.05	0.02	0.14	0.06	-0.16	0.14	-0.08	1.84	0.39
Love to reflect on things.	-0.08	-0.01	0.02	0.19	-0.04	0.49	0.06	0.06	-0.04	0.10	0.06	-0.05	0.06	0.08	0.04	1.76	0.34
Try to understand myself.	-0.04	0.03	0.02	0.06	0.01	0.46	0.00	0.07	-0.06	-0.02	0.07	-0.09	0.04	0.08	0.00	1.34	0.25
Machiavellianism																	
Tell other people what they want to hear so that they will do what I want them to do.	-0.08	0.03	-0.04	-0.04	-0.05	-0.08	0.68	0.07	0.03	0.03	0.06	0.05	-0.05	0.05	0.03	1.17	0.52
Use others for my own ends.	-0.01	0.03	-0.08	-0.14	0.08	-0.03	0.60	-0.02	0.05	0.01	-0.11	-0.05	-0.03	0.02	0.12	1.42	0.54
Take advantage of others.	-0.03	-0.03	-0.02	-0.16	0.07	-0.01	0.58	-0.03	0.04	-0.06	-0.08	0.02	-0.04	-0.06	0.15	1.46	0.54
Tell a lot of lies.	-0.05	-0.14	-0.10	-0.04	0.00	-0.03	0.57	-0.03	0.06	-0.03	0.00	0.05	-0.05	0.11	-0.02	1.37	0.47
Cheat to get ahead.	-0.02	0.03	-0.10	-0.08	0.02	-0.08	0.57	-0.04	0.07	-0.06	0.02	0.01	-0.07	0.04	0.05	1.29	0.44
Play a role in order to impress people.	0.10	-0.12	-0.04	-0.02	-0.09	0.00	0.54	0.04	0.03	0.13	0.08	0.10	0.20	-0.11	0.04	1.98	0.45
Use flattery to get ahead.	0.16	0.02	-0.01	0.02	0.00	-0.10	0.52	0.12	0.03	0.02	0.06	0.06	-0.02	0.05	-0.02	1.48	0.36
Cannot imagine lying or cheating.	0.06	0.01	0.09	0.04	-0.01	0.00	-0.52	0.03	-0.01	0.12	0.04	0.00	0.10	-0.05	0.23	1.76	0.38
Intellect																	
Am quick to understand things.	-0.04	0.02	0.01	-0.02	-0.05	0.19	0.00	0.61	-0.05	-0.02	-0.03	-0.06	0.00	0.03	-0.06	1.28	0.47
Catch on to things quickly.	-0.04	0.04	0.04	0.01	0.00	0.11	-0.02	0.59	-0.01	-0.01	-0.07	0.03	0.01	0.06	-0.08	1.21	0.42
Think quickly.	0.10	-0.02	0.04	0.04	0.02	0.08	0.01	0.57	0.04	0.03	-0.12	0.05	-0.11	0.06	-0.06	1.4	0.49
Can handle complex problems.	-0.13	-0.03	0.04	0.08	-0.03	0.15	-0.04	0.57	0.08	0.03	-0.14	-0.07	-0.02	-0.10	0.02	1.63	0.49
Can handle a lot of information.	0.00	-0.09	0.15	-0.03	-0.07	0.18	0.09	0.52	-0.03	0.01	-0.10	-0.02	0.02	-0.02	-0.07	1.77	0.42

c_i = item complexity; h^2 = communality

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Appendix – SPI-15 Items

Item	Soc	Out	Ind	Comp	Vol	Ope	Mac	Int	Bold	Con	Fear	Imp	Trus	Easy	Seri	c_i	h^2
Learn things slowly.	0.01	0.02	0.02	0.04	0.06	-0.02	0.02	-0.50	-0.01	0.06	0.03	0.02	0.08	0.20	0.23	1.93	0.38
Come up with good solutions.	0.00	0.06	0.08	0.08	-0.06	0.23	-0.05	0.50	0.01	0.01	-0.04	-0.11	-0.13	0.01	0.04	1.97	0.52
Am more capable than most others.	-0.07	0.14	0.12	-0.10	-0.03	0.11	0.18	0.44	0.02	0.04	0.06	0.01	-0.06	-0.08	0.07	2.35	0.39
Boldness																	
Love dangerous situations.	-0.02	-0.06	0.02	0.03	0.03	0.01	0.13	-0.06	0.69	-0.01	-0.13	0.12	-0.10	-0.04	0.10	1.34	0.62
Seek danger.	0.01	-0.03	0.03	-0.03	-0.01	0.03	0.17	-0.04	0.67	-0.09	-0.09	0.16	-0.05	-0.05	0.04	1.4	0.63
Seek adventure.	0.19	0.05	0.02	0.03	0.01	0.15	-0.05	0.02	0.62	-0.03	0.04	0.04	-0.03	0.08	0.05	1.44	0.58
Would never go hang gliding or bungee jumping.	-0.02	0.06	-0.02	0.02	0.10	-0.05	-0.07	0.05	-0.60	-0.03	0.03	-0.01	0.00	0.00	0.10	1.23	0.38
Like to do frightening things.	0.03	-0.05	0.09	-0.01	0.00	0.07	0.17	-0.08	0.58	0.01	-0.11	0.09	-0.09	0.03	0.07	1.56	0.47
Take risks.	0.10	0.11	0.04	0.07	0.01	0.05	0.05	0.07	0.57	-0.15	0.01	0.11	-0.10	0.01	0.08	1.61	0.58
Love action.	0.26	0.03	0.02	-0.02	0.06	-0.02	-0.05	0.14	0.52	0.00	-0.01	-0.04	0.01	0.06	0.10	1.83	0.47
Am willing to take risks.	0.03	0.09	0.03	0.13	0.03	0.08	-0.01	0.16	0.51	-0.08	-0.09	0.09	-0.06	0.01	0.10	1.84	0.48
Conventional																	
Dislike changes.	-0.15	-0.04	0.01	0.04	0.04	-0.15	0.09	-0.14	-0.27	0.45	0.01	0.14	-0.13	-0.03	-0.01	3.22	0.45
Prefer to stick with things that I know.	-0.10	0.01	0.03	0.00	0.00	-0.21	0.07	-0.18	-0.24	0.43	0.08	0.07	-0.09	0.16	0.02	3.43	0.45
Don't like the idea of change.	-0.08	-0.04	0.02	0.02	-0.01	-0.19	0.05	-0.18	-0.25	0.42	0.03	0.14	-0.15	0.01	0.04	3.53	0.41
Do things by the book.	-0.05	-0.05	0.25	0.01	0.01	-0.15	-0.01	0.04	-0.17	0.40	-0.10	-0.14	0.21	0.07	0.11	4.17	0.49
Want everything to add up perfectly.	-0.03	-0.03	0.19	-0.13	0.06	0.05	0.02	0.14	-0.02	0.40	0.21	-0.05	0.03	0.03	0.09	3.04	0.35
Stick to the rules.	0.03	-0.01	0.20	-0.02	-0.04	-0.13	-0.19	0.08	-0.18	0.39	0.03	-0.15	0.20	0.05	0.09	4.42	0.50
Am a creature of habit.	-0.17	0.04	0.09	0.02	0.07	-0.10	0.11	-0.03	-0.21	0.38	0.01	0.08	0.04	0.10	-0.08	3.16	0.31
Want everything to be "just right."	-0.01	-0.06	0.22	-0.05	0.08	-0.01	-0.02	0.14	-0.06	0.36	0.21	-0.03	0.06	0.02	0.10	3.41	0.35
Fear																	
Begin to panic when there is danger.	0.06	0.00	0.02	0.02	0.13	-0.02	0.01	-0.16	-0.30	0.15	0.47	0.12	0.05	0.04	-0.01	2.73	0.52
Worry a lot about my looks.	0.16	-0.11	-0.01	-0.01	0.01	-0.06	0.30	0.08	0.12	0.15	0.44	-0.16	0.07	0.07	-0.09	3.54	0.43
Panic easily.	0.04	-0.28	0.11	0.03	0.08	0.01	0.03	-0.15	-0.16	0.10	0.44	0.18	0.07	-0.11	0.03	3.48	0.55
Become overwhelmed by events.	-0.11	-0.21	-0.01	0.09	0.12	0.04	-0.01	-0.08	-0.12	0.07	0.40	0.09	0.12	-0.03	0.03	2.9	0.47
Tremble in dangerous situations.	-0.12	0.01	0.07	0.02	0.02	-0.01	0.10	-0.12	-0.25	0.03	0.40	0.11	0.15	0.05	0.01	3.07	0.38
My feelings are easily hurt.	-0.05	-0.15	-0.03	0.22	0.26	0.03	0.05	-0.02	-0.16	-0.01	0.40	0.08	0.12	-0.02	0.06	3.79	0.53
Need protection.	-0.08	-0.06	0.01	0.13	0.03	-0.01	0.11	-0.18	-0.13	0.05	0.36	0.15	0.04	0.01	0.18	3.82	0.38
Am not easily disturbed by events.	0.02	0.02	-0.02	-0.17	-0.21	-0.01	0.08	0.13	0.15	0.04	-0.33	-0.03	-0.06	0.16	0.06	4.34	0.36
Impulsive																	
Do things without thinking of the consequences.	0.05	0.00	-0.08	-0.12	0.17	-0.02	0.04	-0.01	0.21	-0.14	0.04	0.55	0.09	0.12	-0.04	2.1	0.58
Act without thinking.	0.06	0.07	-0.13	-0.10	0.19	-0.08	0.03	-0.04	0.14	-0.09	0.12	0.55	0.12	0.05	-0.02	2.09	0.56
Jump into things without thinking.	0.10	-0.01	-0.21	-0.01	0.19	-0.09	0.00	0.08	0.22	-0.08	0.03	0.46	0.12	0.05	0.02	3.01	0.51
Don't see the consequences of things.	0.06	-0.07	-0.14	-0.18	0.04	-0.07	0.10	-0.06	0.04	-0.11	0.04	0.45	0.23	0.04	0.12	2.99	0.48
Rush into things.	0.08	0.06	-0.13	-0.03	0.17	-0.06	0.08	0.07	0.20	-0.16	0.19	0.44	0.12	-0.04	0.04	3.48	0.52

c_i = item complexity; h^2 = communality

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Appendix – SPI-15 Items

Item	Soc	Out	Ind	Comp	Vol	Ope	Mac	Int	Bold	Con	Fear	Imp	Trus	Easy	Seri	c_i	h^2
Make rash decisions.	0.05	-0.07	-0.13	-0.05	0.20	-0.08	0.04	0.05	0.22	-0.09	-0.03	0.42	0.10	0.13	-0.02	3.12	0.46
People have said that I sometimes act rashly.	0.08	-0.01	-0.11	-0.06	0.28	0.04	0.01	0.00	0.20	-0.04	-0.03	0.41	0.02	0.00	0.08	2.87	0.44
Pay too little attention to details.	0.02	0.03	-0.22	-0.08	-0.02	-0.07	0.07	-0.06	-0.06	-0.16	0.06	0.36	0.15	0.05	0.07	3.38	0.33
Trusting																	
Trust what people say.	0.23	0.15	0.03	0.13	-0.16	0.05	-0.03	-0.03	-0.15	-0.01	-0.04	0.15	0.54	0.04	0.02	2.38	0.54
Trust people to mainly tell the truth.	0.07	0.18	0.00	0.14	-0.10	0.05	-0.08	0.03	-0.05	0.04	-0.06	0.19	0.49	0.05	0.12	2.4	0.42
Trust others.	0.12	0.31	-0.02	0.26	-0.06	0.07	-0.03	-0.08	-0.09	-0.03	-0.07	0.09	0.45	0.05	0.12	3.42	0.51
Believe that others have good intentions.	0.10	0.22	0.01	0.25	-0.15	0.05	-0.11	0.01	-0.04	-0.01	-0.01	0.13	0.43	-0.02	0.08	3.22	0.47
Believe that people are basically moral.	0.02	0.24	0.02	0.22	-0.01	0.08	0.02	0.04	-0.09	-0.06	-0.06	0.13	0.42	0.10	0.00	2.99	0.37
Let myself be influenced by others.	0.04	-0.07	-0.03	0.08	-0.01	-0.02	0.29	-0.11	-0.03	0.13	0.09	0.17	0.41	-0.02	-0.09	3.16	0.42
Distrust people.	-0.16	-0.29	0.15	-0.14	0.15	-0.02	0.08	0.02	0.04	0.14	0.06	0.06	-0.39	0.09	0.07	4.24	0.48
Feel that most people can't be trusted.	-0.09	-0.21	0.08	-0.20	0.18	-0.07	0.07	-0.04	0.15	0.16	0.04	-0.04	-0.38	0.08	0.11	4.63	0.46
Easy-Going																	
Take things as they come.	0.00	0.14	-0.06	0.04	-0.05	0.05	-0.08	0.14	0.13	-0.02	-0.17	0.05	0.02	0.47	-0.05	2.09	0.38
Like to take it easy.	-0.06	0.17	-0.37	0.07	-0.01	0.04	0.03	0.00	-0.15	0.12	0.06	0.03	-0.17	0.46	-0.06	3.18	0.39
Prefer to just let things happen.	-0.15	0.12	-0.32	0.02	-0.07	-0.01	-0.01	-0.01	0.09	-0.02	0.03	0.19	-0.01	0.44	0.07	3	0.42
Let things proceed at their own pace.	-0.07	0.03	-0.20	0.07	-0.12	0.10	-0.08	-0.05	0.01	0.03	-0.08	-0.09	0.05	0.44	0.06	2.25	0.31
Am easy to satisfy.	0.03	0.18	-0.03	0.18	-0.19	-0.04	-0.10	-0.10	-0.01	0.10	-0.08	0.10	0.12	0.36	0.01	4.3	0.39
Value cooperation over competition.	0.00	-0.07	0.01	0.23	-0.06	0.21	-0.12	-0.02	-0.19	-0.06	0.00	0.01	0.14	0.30	0.00	4.87	0.31
Rarely put people under pressure.	-0.03	-0.10	-0.09	0.03	-0.24	0.06	-0.19	0.03	-0.07	-0.02	0.16	-0.02	0.03	0.30	-0.02	4.32	0.26
Am more easy-going about right and wrong than most people.	0.06	-0.02	0.06	-0.10	-0.19	0.04	0.21	-0.01	0.14	-0.23	0.11	0.23	-0.05	0.29	0.04	6.31	0.36
Seriousness																	
Seldom joke around.	-0.15	-0.11	0.14	-0.02	-0.01	-0.10	-0.07	-0.08	0.02	-0.20	0.06	-0.16	0.13	-0.04	0.47	2.85	0.36
Have never engaged in gossip.	-0.16	-0.08	0.03	-0.17	-0.23	0.19	-0.26	-0.07	-0.02	-0.09	-0.11	0.12	0.02	-0.06	0.43	4.45	0.40
Believe in one true religion.	0.07	0.15	-0.12	0.23	-0.01	-0.28	-0.09	-0.08	0.05	0.23	0.05	0.00	-0.14	-0.10	0.40	4.99	0.38
Am not easily amused.	-0.14	-0.26	0.14	-0.15	0.00	-0.06	0.07	-0.01	0.05	-0.15	-0.04	-0.17	0.03	-0.03	0.35	4.51	0.34
Most things taste the same to me.	-0.17	-0.11	0.04	-0.05	-0.07	-0.11	0.15	-0.11	-0.01	-0.04	-0.06	0.13	0.01	-0.02	0.34	3.49	0.26
Rarely overindulge.	0.01	-0.01	0.24	-0.02	-0.12	0.07	-0.20	-0.11	-0.04	-0.07	-0.17	-0.13	0.04	0.05	0.32	5	0.32
Never splurge.	-0.05	-0.14	0.18	-0.10	-0.13	0.17	-0.10	-0.21	-0.11	0.08	-0.17	-0.08	0.03	0.06	0.29	7.14	0.28
There are several people who keep trying to avoid me.	-0.07	-0.16	0.05	-0.01	0.15	0.05	0.12	-0.20	0.11	0.03	-0.13	0.14	0.07	-0.04	0.29	5.87	0.29

c_i = item complexity; h^2 = communality