

Revised Strong Interest Inventory Assessment: Content, reliability and validity

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Introduction

This presentation highlights the new content of the revised Strong Interest Inventory® assessment and the effect of the changes on the Strong's measurement properties. Substantial changes to the measures of basic interests and to the occupational samples reflect a thoughtful reaction to revolutionary shifts in the world-of-work in the late 1990s. Shifts in the work people do and the way they do it is represented on the revised Strong by incorporation of new business, technology, and team related content. The changes, and the measurement properties of the Strong following these changes, are discussed.

The Strong Interest Inventory® assessment is one of the most widely used measures of vocational interests in the United States. The Strong has been used in education settings, public institutions, and private organizations for nearly 80 years. The Strong underwent a major revision over the past few years. Among other goals, the revision attempted to (a) shorten the inventory, (b) add current occupations, (c) increase the level of business, technology, and teamwork measures, (d) broaden the assessment of work and leisure activities, and (e) reflect the diversity of the U.S. workforce in the samples obtained. This presentation will discuss the changes made to the assessment and the impact of these changes on the measurement properties of the Strong. Changes or updates were made to the normative sample, items, response

options, General Occupational Themes, Basic Interest Scales, Occupational Scales, Personal Style Scales, and Administrative Indices.

Method and Samples

Starting with the items on the 1994 version of the Strong, a research form was developed to collect data for the revision. A committee of Strong experts representing both researchers and practitioners made content and structure changes, and worked to develop the research form. At the end of this process, a 361-item research version of the Strong was formalized. In addition, a fairly exhaustive set of demographic and biodata items were developed to enable a description and understanding of the final sample obtained. Additional occupation specific questions were developed for each of the targeted occupation groups included in the sampling efforts. When combined, the lengthy assessment required approximately one hour to complete. In order to take advantage of technological changes of the late 1990's, both a paper version and an Internet based version of the assessment were developed and used for data collection.

The General Representative Sample (GRS) replaced the General Reference Sample in this revision. The General Representative Sample consisted of an equal number of women and men from the U.S. workforce. The distribution of ethnicity in the sample was such that the non-white groups

represented approximately 30% of the total sample of 2,250 employed adults. When compared to the 2000 Census (25% non-white) and reports from The U. S. Department of Labor, Bureau of Labor Statistics (16.5% non-white) the GRS more than sufficiently represented racial and ethnic groups in the U.S. The GRS was also diverse with respect to its representation of the world-of-work. The GRS consisted of working adults from over three-hundred and seventy separate occupations. The average age of the GRS respondents was 35 years of age with over 9 years of experience in their respective occupations. The GRS respondents reported working an average of 41 hours per week.

Inventory Items

The inventory underwent major changes for this revision including changes to the structure, item content, and item response options. Two parts of the 317-item inventory were eliminated from the 1994 Strong, and the associated items either deleted or adapted for use in another section. The revised edition has 6 sections instead of 8. Of the original 317 items included on the 1994 version, 192 items are included in the revision. In addition, there are 99 new or modified items, totaling 291 items on the revised Strong. Response options underwent two changes. First, all response options were converted to Likert-type responses. This occurred to simplify responding and comprehension of the assessment, and was possible due to the elimination of the parts noted above. Second, the prior three-point response option was expanded to a five-point response option for all the items on the inventory. Figure 1 illustrates the use of the five-point response option with icons for Strongly Like, Like, Indifferent, Dislike, and Strongly Dislike. The result of expanding the response options on the Strong was improvement in the reliability and precision of measurement while minimizing length of the inventory and its scales.

General Occupational Themes

The revised General Occupational Themes (GOTs) were intentionally broadened to account for changes in the workplace, especially the use of computers and technology. The Conventional Theme, for example, was broadened to include programming and working with software, while the Realistic Theme was broadened to include working with computer hardware. It

SECTION 3 - ACTIVITIES

As you did for the occupations and subject areas, indicate how interested you are in each of the activities listed. Give the first answer that comes to mind.

- 154 SL L I D SD Making a speech
 155 SL L I D SD Doing research work
 156 SL L I D SD Writing reports

Figure 1. Sample of Revised Item Format

is important to note, though, that these revisions have not altered the basic configuration of the GOTs as shown in Figure 2, and that their meanings remain consistent for counseling use, theory, and research. The new item format and careful item selection resulted in improved Cronbach's alphas (a measure of reliability) for five of the six GOTs, with the Realistic Theme remaining consistent at .93. All six revised GOTs possessed alphas of at least .91, and test-retest reliabilities improved slightly as well (see Table 1). When the individuals in the GRS were scored on the 1994 and revised GOT scales, the median correlation for parallel scales was an impressive .95. The revised GOTs also produced a familiar pattern of inter-scale correlations in accordance with Holland's hexagonal calculus (see Figure 2).

Theme	Alpha	Test Retest
Realistic	.93	.92
Investigative	.92	.89
Artistic	.95	.92
Social	.93	.88
Enterprising	.91	.95
Conventional	.91	.84

Table 1. GOT Reliability Estimates in GRS

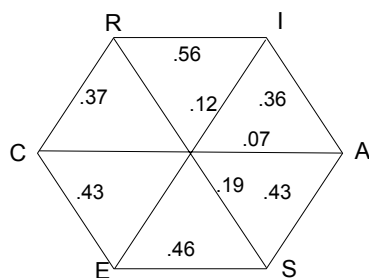


Figure 2. Sample of GOT inter-scale correlations.

Basic Interest Scales

The Basic Interest Scales (BISs) were extensively revised for the second time since their introduction to the Strong in 1968. All BISs were updated, including some name changes, to measure more contemporary specific interests. The revised Strong contained a total of 30 BISs, up from 25 scales in 1994. This included 10 new scales, including Protective Services, Research, and Entrepreneurship. Four outdated scales, such as Data Management, were removed completely. The number of items per scale was reduced to 6-12 items down from 5-21 items per scale in 1994. The median reliability estimate of internal consistency (Cronbach's alpha) for the 30 BISs was .87, identical to that for the 25 BISs from 1994. Initial validity studies of the 30 BISs showed that as a group they explained 68 to 78% of the

variance in broad occupational groups and 92 to 93% of the variance in college major groups. The BISs discriminated these groups in predictable and meaningful ways. Table 2 summarizes the updates to the Basic Interest Scales from 1994 to 2004.

Occupational Scales

An extensive data collection effort was undertaken to update the occupations represented on the revised Strong. The total number of Occupational Scales (OSs) was increased to 244 from the 211 in the 1994 version of the Strong. Technology and business related occupations were emphasized in the revision. The revised Strong contained 244 OSs in 122 pairs with separate scales for women and men. The 122 pairs included scales for women and men for each occupation represented on the revised Strong. One of the goals of the revised Strong was to encourage clients to explore a wide range of occupations, including those that may previously have been dominated by one gender. The fact that there are OSs for both women and men for each and every occupation communicates the appropriateness of these occupations for both genders.

The median test-retest reliability for the revised OSs was .86 for 244 scales across an interval of 2 to 7 months with the middle 50 percent of OSs between .82 and .89. The number of participants for the 2 to 7 month interval was 99. The median test-retest reliability on a smaller sample of 40 respondents was .89 for an interval of 2 months with the middle 50 percent of scales between .85 and .91., which is similar to the results for the four samples reported in the 1994 Strong manual. The median Q statistic on the 244 OSs was 1.53 (45 percent overlap), with the middle 50 percent falling between 1.30 (52 percent overlap) and 1.79 (37 percent overlap) and 90 percent of the scales falling between 1.15 (57 percent

2004 BIS	1994 BIS	Change to 2004 BIS				
		New Scale	Name Change	Merged 2 Scales	Separated 2 Scales	No change
Mechanics and Construction	Mechanical Activities		X			
Computer Hardware and Electronics	n/a	X				
Military	Military Activities		X			
Protective Services	n/a	X				
Nature and Agriculture	Nature Agriculture			X		
Athletics	Athletics					X
Science	Science					X
Research	n/a	X				
Medical Science	Medical Science					X
Mathematics	Mathematics					X
Visual Arts and Design	Applied Arts		X			
Performing Arts	Music/Dramatics		X			
Writing and Mass Communication	Writing		X			
Culinary Arts	Culinary Arts					X
Counseling and Helping	Social Service		X			
Teaching and Education	Teaching		X			
Human Resources and Training	n/a	X				
Social Sciences	n/a	X				
Religion and Spirituality	Religious Activities		X			
Healthcare Services	Medical Service		X			
Marketing and Advertising	n/a	X				
Sales	Sales					X
Management	Organizational Management		X			
Entrepreneurship	n/a	X				
Politics and Public Speaking	Law/Politics Public Speaking		X	X	X	
Law	Law/Politics		X		X	
Office Management	Office Services		X			
Taxes and Accounting	n/a	X				
Programming and Information Systems	n/a	X				
Finance and Investing	n/a	X				

Table 2. Summary of additions and changes to Basic Interest Scales

Administrative Assistant	ESL Instructor	Recreation Therapist
Chiropractor	Financial Analyst	Rehabilitation Counselor
College Instructor	Financial Manager	Retail Sales Representative
Computer & IS Manager	Firefighter	Sales Manager
Computer Scientist	Geographer	Technical Sales Representative
Computer Systems Analyst	Network Administrator	Technical Support Specialist
Editor	Operations Manager	Top Executive
Engineering Technician	Production Worker	Urban & Regional Planner

Table 3. Summary of occupational samples on the Strong.

overlap) and 2.12 (29 percent overlap). To be included on the revised Strong, an OS was required to have a Q statistic of 1.00 or better.

The greatest difference between the 1994 and the revised Strong is in the length of the scales, with the average being 46 items for the 1994 OSs and 28 for the revised OSs. It is noteworthy that an average decrease in scale length of eighteen items resulted in only modest decreases in average reliability or concurrent validity. The scales that contained the fewest items were female Retail Sales Representative, Computer Systems Analyst, Military Officer, and Elementary School Teacher, and male and female Travel Consultant. Even with a relatively small number of items, two of these six scales had Qs greater than 1.50. All of the 244 OS on the revised Strong possessed at least a one standard deviation separation between the occupational and reference samples as measured by Tilton's Q. Table 3 lists the occupational samples that were newly collected for this revision.

Personal Style Scales

The Personal Style Scales were introduced to the Strong in 1994. The goals of this revision were to maintain the quality of the original scales and to explore additional personal style dimensions in the set of inventory items. The revised Strong resulted

in five Personal Style Scales, namely the Work Style, Learning Environment, Leadership Style, Risk Taking, and Team Orientation scales. The Team Orientation scale was one of several constructs identified in the factor structure of the items and considered for inclusion on the inventory as a new scale. The Team Orientation scale was included because it appeared to have the greatest combination of psychometric quality and potential for use in counseling practice. Internal consistency reliabilities (Cronbach alphas) in the GRS were high for each of the five scales. Alphas ranged from .87 for the Learning Environment and Leadership Style scales to .82 for the Risk Taking scale (see Table 4).

Personal Style Scale	Number of Items	Cronbach Alpha
Work Style	29	.85
Learning Environment	41	.87
Leadership Style	16	.87
Risk Taking	10	.82
Team Orientation	9	.86

Table 4. Reliability estimates for Personal Style Scales in the GRS.

With the addition of the Team Orientation scale, there were now five measures of

	WS	LE	LS	RT	TO
Work Style	--	.03	.38	-.20	.32
Learning Environment			.49	.11	.20
Leadership Style				.38	.55
Risk Taking					.24
Team Orientation					--

Table 5. Summary of Personal Style Scale inter-scale correlations.

preferences for living and working on the Strong. The two poles on the new scale were: prefers to accomplish tasks independently and prefers to accomplish tasks collectively. The most significant question about the new Team Orientation scale was its relationship to other scales on the Strong assessment, particularly the Work Style scale. The inter-scale correlations within the five PSSs (Table 5) showed slight to moderate correlations and no coefficients greater than .55 suggesting that each scale was probably adding something unique to the assessment. For instance, the Team Orientation scale emphasized teamwork and shared goals compared to the more general introversion-extroversion dimension measured by the Work Style scale. The correlation between these two scales was a very reasonable .32. While all Personal Styles Scales were updated, the other significant change was in the content of the Risk Taking scale, previously called Risk Taking/Adventure. As the name change notes, this scale was revised to emphasize different types of risk taking behavior, including emotional, financial, and physical risks. Examples of items added to the revised Risk Taking scale were "Making risky commitments", "Investing money in the stock market", and "Taking a chance on a new business idea".

Administrative Indexes

The Infrequency Index included on the 1994 version of the Strong was eliminated during the revision. The Infrequency Index was not particularly effective in identifying truly

problematic profiles. Instead, a new index, called the Typicality Index was added. This index attempted to automate the process of identifying random or atypical response profiles. The computation of the Typicality Index relied on consistency of responses to items included in the Strong assessment. Twenty-four pairs of items that were highly correlated with each other in the GRS were used to construct the Typicality Index. Example item pairs included Accountant/Accounting, Poet/Poetry, and Stockbroker/Trading stocks. A point was added to the Typicality Index score for each pair where the responses were in the same direction. The range of possible scores for the Typicality Index was from 0 to 24. Scores of 17 or higher on the Typicality Index were considered to be reflective of consistent responding to the inventory. In initial studies, the Typicality Index appeared to flag nearly 95% of cases in simulated random data files and 1 to 2% of actual inventory administrations (see Figure 3).

Summary

The Strong has developed a loyal following of users over the years, probably due, at least in part, to a commitment to updating and improving the inventory on the part of everyone associated with it since its introduction, beginning with E. K. Strong, Jr. This presentation highlighted some of the more salient updates resulting from the recent revision. Additional detail is forthcoming and it is hoped that scholars and practitioners will continue to research the implications of these updates.

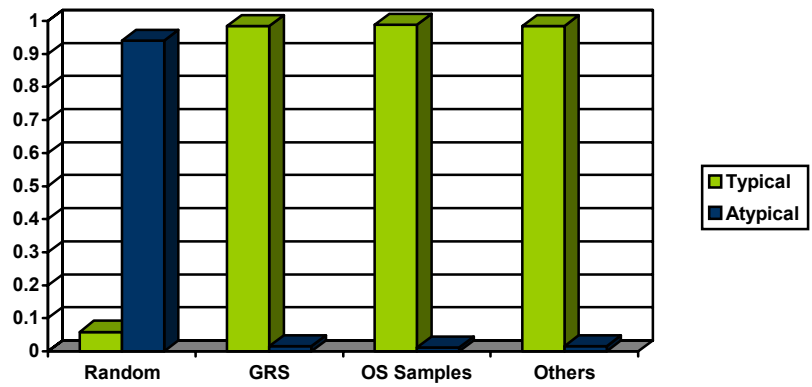


Figure 3. Percent of typical vs. atypical Typicality Index results in four samples