PSYTECH INTERNATIONAL

HSI

Health and Safety Indicator 2009

TECHNICAL MANUAL V1.0

CONTENTS

WHY USE PSYCHOMETRIC TESTS?

Psychometric tests aid selection decisions by providing information that cannot easily be obtained in other ways. Without such tests, our knowledge of the applicant is limited to the information that we can gain from their application form, CV, interview, and references. If we wish to obtain information about their specific aptitudes and abilities, and about their personality, attitudes, and values, then the use of psychometric tests is advised. In fact, psychometric tests do more than simply provide additional information about the applicant. They can add a degree of reliability and validity to the selection procedure that is impossible to achieve in any other way.

INTRODUCTION TO THE HEALTH AND SAFETY INDICATOR

A huge number of organisations share a common goal: to reduce the incidence of workplace accidents and other health and safety incidents. Accidents are costly to organisations, and avoiding them is a legal, moral, and social obligation. Certainly, an organisation's overall management of safety is critical for achieving this goal (Geller, 2000). Nevertheless, contemporary research shows that personnel factors are also important. The purpose of the Health and Safety Indicator (HSI) is to identify individuals who's cognitive and personality characteristics dispose them towards safe behaviour in the workplace.

ACCIDENT LIABILITY

It is important to acknowledge that organisational safety extends far beyond the reach of individual workers. Factors such as organisational safety management (Reason, 1990), organisational climate (Neal, Griffin, & Hart, 2000), safety climate (Neal & Griffin, 2002, 2004), and safety culture (Cox & Flin, 1998) are often seen as the principal determinants of organisational safety (e.g., Geller, 2000). Nevertheless, their contribution is often overemphasised and poorly defined (Clarke, 2006). The role of individual factors, on the other hand, is becomingly increasingly well understood (Clarke & Robertson, 2005; Lawton & Parker, 1998) in spite of some apparent contradictions in the research literature (Hansen, 1988; Salgado, 2002). Although not fully understood, the contribution of personnel factors to organisational safety is now widely acknowledged (e.g., Barling & Frone, 2004).

PERSONNEL FACTORS AND ASSESSMENT

A number of individual personnel characteristics contribute to safety. They include demographic factors such as gender (Frone, 1998; Layne, Castillo, Stout, & Cutlip, 1994), age (Kraus, 1985; Hale & Hale, 1972), and experience (Powell, Hale, Martin, & Simon, 1971). Safety knowledge and training also have a clear influence on accidents (Moizier, 1996; Stranks, 1994) and can be assessed using methods and instruments specific to the roles and work environments under scrutiny. Other personnel factors that have been shown to predict safety appear to be amenable to more general assessment: cognitive ability (e.g., Carty, Stough, & Gillespie, 1999) and personality (e.g., Lawton & Parker, 1998). The Health and Safety Indicator (HSI) focuses on these last two areas.

COGNITIVE ABILITY AND SAFETY

The link between cognitive ability and safety is well established. This is perhaps unsurprising given that high cognitive ability is associated with better job performance (Schmidt & Hunter, 1998) and better performance in controlled tasks (Ackerman, 1986, 1987). Specifically, high cognitive ability has been associated with fewer accidents (Blasco, 1994; Carty et al., 1999; Herrnstein & Murray, 1994), lower accident mortality rates (Hemmingsson, Melin, Alleback, and Lundberg, 2006; O'Toole, 1990; O'Toole & Stankov, 1992), fewer deliberate safety violations (Carty et al., 1999), and lower accident risk

(Hansen, 1989).
Not every cognitive ability test predicts accidents equally well. For example, Carty et al. (1999) found that higher driving accident rates were best predicted by scores on non-verbal, and especially spatial, ability tests. Similarly, Hansen (1989) found a relationship between industrial chemical workers' accident risk and their scores on a mechanical comprehension test, but not their scores on less job-related cognitive ability tests. Such results suggest that cognitive ability tests that are most relevant to safety and the workplace are likely to be the best predictors of safety. Consequently, the HSI assesses ability in two areas that are important for safety in a range of work contexts: the ability to understand safety instructions and safety-related information, and checking and attention to detail. The HSI also includes a general assessment of abstract (symbolic, non-verbal) reasoning ability (e.g., Carty et al., 1999).

PERSONALITY AND SAFETY

A large number of studies suggest a link between personality and safety. For example, Type A personalities (Friedman & Rosenham, 1959) have been associated with workplace accidents (Sutherland, 1993) and traffic accidents (Magnavita et al., 1997). There are, however, some seemingly contradictory findings in this field of research. For example, in a meta-analysis, Clarke and Robertson (2005) found that the Big Five personality measures (Goldberg, 1990) of low conscientiousness and low agreeableness reliably predicted accidents in different contexts (see also Arthur & Graziano, 1996), as did high neuroticism in a work context (see also Hansen, 1989). Salgado's (2002) meta-analysis, on the other hand, found that none of the Big Five factors consistently predicted accidents. It appears that such contradictions might be reconciled by deeper analyses that consider factors such as the effect of context (Clarke & Robertson, 2005), different responses to stress (Lawton & Parker, 1998), and methodological issues (Carty et al., 1999). As research in this area continues, models relating personality to accidents are sure to be refined. The personality measures in the HSI 2009 are designed to reflect the major current themes in contemporary safety and personality research.

CONTEXT AND LIMITATIONS

The factors predicting safe behaviour are not likely to apply to every context. This is suggested by apparent contradictions in the research: some factors are demonstrably related to accidents in some studies but not others (Clarke & Robertson, 2005; Hansen, 1988; Lawton & Parker, 1998). For example, Wagenaar (1992) argued that risk taking may be a better predictor of accidents in traffic situations than in occupational settings. Similarly, Clarke and Robertson (2005) and Lajunen (2001) suggested that extraversion may be more of a factor in non-occupational than occupational settings. Lardent (1991) reported an example of how the factors that usually predict safety can sometimes make opposite predictions for specific occupations – in this case, fighter pilots. Taken together, such evidence also implies that the relative contribution of different factors to safe behaviour is likely to differ between roles and work environments. So, although the Health and Safety Indicator provides a best estimate of safety tendencies, its predictive ability can be enhanced by (a) further research, and (b) validation studies that allow the scoring to be tuned to different, specific work environments.

HEALTH AND SAFETY INDICATOR SCALES AND MEASUREMENT

The Health and Safety Indicator is divided into two main components: ability and personality. Each has its own subcomponents, and all components and subcomponents contribute to the overall score.

ABILITY SCALES

Cognitive ability tests examine a person's ability to complete or learn a particular task. Some cognitive ability tests measure specific abilities, such as reading comprehension or mathematical proficiency. Others are more general. The requirements of the role and the abilities in question determine the tests that are to be used.

The Health and Safety Indicator examines three areas of cognitive ability that are demonstrably important aspects of organisational safety.

Understanding instructions and safety-related information

Organisations with well-managed safety systems are characterised by robust and detailed safety procedures and protocols. In order for organisational safety management to be effective, it is critical that staff be able to understand and execute safety-related instructions given to them (Taylor, Easter, & Hegney, 2004). Without this ability, it is virtually impossible for an organisation to manage safety.

The HSI scale, Understanding Instructions and Safety-Related Information, assesses the ability to understand and follow instructions and information in English, either written or in a table. Low scorers will tend to have more difficulty understanding and following safety instructions than high scorers. Note that this scale does not assess willingness to follow instructions. This is instead assessed by HSI personality scales.

Checking and attention to detail

Many safety procedures are characterised by routine checks and hazard identification exercises (Taylor et al., 2004). Often, these require scrupulous attention to detail and concentration. Clearly, the ability to perform such tasks is critical to their success and to executing the safety management plan as intended.

The HSI scale, Checking and Attention to Detail, assesses an individual's ability to be careful, fast, and accurate when checking safety-related details in their environment. It does this by examining whether a person can quickly and accurately notice small differences in symbolic, numerical, and verbal items. In organisational settings, such tasks may include checking and verifying the presence of hazards in the environment, checking indicators and instruments, and following detailed procedures. Low scorers on this scale are less likely to see details accurately and spot differences quickly than high scorers.

Understanding the safety environment

As outlined above, there is a clear link between cognitive ability and safety. The HSI scale, Understanding the Safety Environment, is a general cognitive ability scale. It is based on a test of symbolic (non-verbal) reasoning that assesses an individual's ability to deduce patterns and themes, draw inferences, and solve novel problems (i.e., fluid intelligence – see Cattell, 1971). It also predicts the potential for new learning.

Situations in which safety is important may often be uncertain and ambiguous. Strong general cognitive ability can help individuals to make sense of information quickly and logically and help them to recognise patterns and themes. This ability is especially helpful in novel or uncertain situations. High scorers on this scale will tend to be more aware of the subtleties of environmental factors and the consequences of events occurring around them than low scorers.

PERSONALITY SCALES

By asking questions that address different facets of a person's character, personality questionnaires attempt to obtain a broad picture of how the person usually acts, thinks, and feels across a broad range of settings. As well as identifying characteristics which are extreme or outstanding, personality tests also assess the ways in which a person is typical of others.

The HSI's safety-related personality scales are designed to be intuitively meaningful whilst being grounded in contemporary research and derived from well-established personality scales.

Although each scale represents a different aspect of the tendency towards safe behaviour, there is necessarily some overlap between scales (specifically Adherence to Rules and Openness to Guidance; and Safety Confidence and Safety Composure). As noted above, however, it is important to bear in mind that different aspects of personality may have a different relationship to safety in different contexts.

Safety motivation

Safety Motivation indicates an individual's preference for behaving safely and avoiding risk. Several studies suggest a likely relationship between this scale and accident involvement (Beirness & Simpson, 1998; Lawton & Parker, 1998; Meadows, 1994, cited in Lawton & Parker, 1998) or unsafe behaviours (Dahlen, Martin, Ragain, & Kuhlman, 2005). Because this scale may be more important in some

settings than others (e.g., Clarke & Robertson, 2005; Wagenaar, 1992), it is important to consider its relevance to the work environment in question: is potential risk-taking and/or avoidance of routine safety procedures likely to be a factor that could affect safety in that role or environment?

Low scorers on the Safety Motivation scale may be excited by risk and find routine uninteresting. High scorers, on the other hand, tend to be cautious and safety-conscious, and are less likely to avoid routine safety procedures.

Safety diligence

Safety Diligence represents the extent to which an individual is likely to complete prescribed procedures and health and safety tasks conscientiously. Many routine safety-related practices require attentiveness, thoroughness, and suitable care, even though they may be tedious. Research has shown such conscientious-ness or thoroughness to be linked to safety across a broad range of settings (Clarke & Robertson, 2005) including the workplace (Wallace & Vodanovich, 2003) and in traffic (Arthur & Graziano, 1996; West, Elander, & French, 1993). Safe practices often require diligent attention, and such diligence can reduce the impact and likelihood of errors (Wallace & Vodanovich, 2003). Note that this scale is less likely to be important in roles in which there are fewer safety implications for a lack of diligence and thoroughness. This may explain why a small number of studies have not found a strong link between this characteristic and safety (e.g., Fallon, Avis, Kudisch, Gornet, & Frost, 2000).

Low scorers on the Safety Diligence scale are less likely to carry out procedures and perform safety related tasks thoroughly and conscientiously than high scorers.

Adherence to rules

Adherence to Rules describes an individual's tendency to respect and follow prescribed health and safety rules and practices. If safety-related processes and procedures are ignored, an organisation's ability to manage health and safety is compromised. In the research, low safety has been predicted by failure to follow rules and regulations (Arthur & Doverspike, 2001), lack of respect for authority and social order (Hansen, 1989; Mayer & Treat, 1977; West, Elander, & French, 1993), and deliberate ignorance of authority (Shaw & Sichel, 1971).

Low scorers on the Adherence to Rules scale are more inclined to reject embedded procedures, shun safety norms, and question authority than high scorers. Adherence to Rules has some overlap with Openness to Guidance.

Openness to guidance

Openness to Guidance refers to an individual's willingness to respond positively to health and safety guidance and training. (Ability, as opposed to willingness, is predicted by the scale Understanding the Safety Environment.) Since many accidents are the result of deliberate violations of safe practices, they can be tackled by persuading and training individuals to behave safely (Parker, Reason, Manstead, & Stradling, 1995; Parker, West, Stradling, & Manstead, 1994). Indeed, Clarke and Robertson (2005) and Cellar, Nelson, York, and Bauer (2001) found that agreeable and accommodating individuals were likely to be safer.

Low scorers on Openness to Guidance tend to ignore others' points of view and tend not to respect rules and authority. High scorers, on the other hand, tend to accommodate others' perspectives, particularly those of authority. High scorers are therefore more likely to have their health and safety behaviour modified by appropriate guidance and training.

Note that Openness to Guidance is not related to the Big-Five scale Openness to Experience. Although that scale can predict training proficiency (Barrick & Mount, 1991; Salgado, 1997), other facets of this personality characteristic – including high imagination, curiosity, and non-conformity – are often associated with unsafe behaviour (Hansen, 1998).

Safety confidence

Safety Confidence predicts how self-assured an individual is likely to be about their safety-related behaviour. Individuals with low confidence are more likely to be nervous and distractible, particularly if emotions affect them strongly. Research shows that nervous individuals are more likely to be involved in accidents or unsafe behaviours (Hansen, 1989;

Shaw & Sichel, 1971). This may be particularly true in impulsive individuals (Dahlen et al., 2005) and in stressful situations (Clarke & Robertson, 2005; Lawton & Parker, 1989). Stressful situations can generate errors through lowered intellectual and task performance (Steffy, Jones, Murphy, & Kunz, 1986) and cognitive failures (Mahoney, Dalby, & King, 1998; also see Broadbent, Broadbent, & Jones, 1986; Broadbent, Cooper, Fitzgerald, & Parkes, 1982; Wallace & Chen, 2005). Individuals that are less affected by their emotions tend to make fewer errors (Westerman, Shryane, Cramshaw, Hockey, & Wyatt-Millington, 1998).

Low Safety Confidence scores indicate less confidence and may be associated with a higher rate of errors when put under pressure. High scores, on the other hand, suggest that such errors are less likely, and also predict that an individual will tend not to be discouraged by criticism or social pressure from following safe practices.

Safety composure

Safety Composure relates to an individual's tendency to remain calm and not let frustration or impatience influence their adherence to safe practices. Stress, frustration, or impatience can lead to deliberate safety violations (Lawton & Parker, 1998), such as taking safety shortcuts (Hockey, Clough, & Maule, 1996, cited in Lawton & Parker, 1998) and deliberate risks (Chappelow, 1989, cited in Lawton & Parker, 1998). Aggression is another manifestation of a lack of composure, and is associated with a higher risk of accidents (Dahlen et al., 2005; Hansen, 1988; Roy & Choudhary, 1985; Sah, 1989; Shaw & Sichel, 1971).

Low scorers in Safety Composure tend to be impatient or short-tempered, and may easily become frustrated or angry. This can lead to safety shortcuts or mistakes. High scorers, on the other hand, tend to remain calm and composed under pressure. Consequently, they are more likely to adhere to good safety practices, and are less likely to make errors that compromise safety.

OVERALL SCORES

The three overall scores in the HSI are weighted arithmetic averages of standardised scores on (a) all scales (Overall Score), (b) ability scales (Overall Ability Score), and (c) personality scales (Overall Personality Score). They are not standard psychometric scales in their own right. Nevertheless, overall scores are likely to be better indicators of overall safety behaviour than scores on individual scales. Whereas individual scales focus on particular safety-related tendencies, preferences, and abilities, overall scores incorporate several underlying ability and/or personality scales that have demonstrably predicted safe behaviour and low accident risk in the research literature. Lemming, Johnson, and Foster (2008) proposed a similar measure of safety behaviour derived from multiple personality scales.

RESPONSE STYLE INDICATORS

The personality component of the HSI contains two response-style indicators: Faking Good and Faking Bad. Faking Good assesses a respondent's tendency to present themselves in a favourable light, and to deny a variety of problem behaviours and difficulties that routinely apply to them. Faking Bad, in contrast, assesses a respondent's tendency to present themselves in an unfavourable light, and to admit a variety of problem behaviours and difficulties that do not generally apply to them.

Faking Good and Faking Bad scores are best interpreted in light of one another. If both scores are low or medium, there is no evidence of unusual responding. Thus, HSI personality scores can be interpreted with confidence. If one score is high and the other is low, however, it is more likely that the high faking score results from dishonest answering (but see other interpretations, below). If both scores are high, it suggests inconsistent responding and casts serious doubt on the validity of the HSI personality scores. These relationships are summarised in Figure 1.

Faking Good Score

Faking Bad Score	Low	Medium	High
Low	✓	✓	✗
Medium	✓	✓	✗
High	✗	✗	???

Figure 1. Relationship between Faking Good and Faking Bad scores showing combinations that should generate confidence or raise caution for interpretation of the HSI personality scores.

Other interpretations

Faking Good and Faking Bad scores are derived largely from items on the Safety Confidence and Safety Composure scales. As a result, genuinely high Safety Confidence and Safety Composure can artificially inflate Faking Good scores while deflating Faking Bad. (The reverse is true for low Safety Confidence and Safety Composure scores.) Interpretations of Faking Good and Faking Bad scores should consider the context in which the test was administered. When Faking Good and/or Faking Bad scores are high, interpretations of the HSI personality scores should consider the demand characteristics of the assessment process in order to identify those factor scores that may be distorted. Relevant information gained from the feedback session can assist in the interpretation.

CONSTRUCTION

The ability scales of the HSI are drawn from the Industrial Proficiency Test (IPT). The IPT is a battery of cognitive ability assessments that were specifically designed for industrial settings. The IPT has been well validated in manufacturing and processing settings.

The personality scales of the HSI are derived from two broader and well-validated personality questionnaires: the Fifteen-Factor Questionnaire plus (15FQ+) and the Values and Motives Inventory (VMI). The scales used were selected based on contemporary research that suggests their relationship to safety across a range of settings. (As noted above, however, these relationships may not transfer to every setting or role.) The HSI's source scales have been combined into six intuitively meaningful, safety-related personality scales.

ADMINISTRATION, SCORING, AND PROFILING

ADMINISTRATION

The HSI can be administered on screen, usually through an internet-based application. Instructions for test administrators are provided on screen. The HSI should be administered supervised.

SCORING

The HSI is scored and profiled automatically by software. It automatically generates raw and sten scores for each scale. Sten scores have a range 1 to 10, a mean of 5.5, and a standard deviation of 2. Sten scores of 5 or 6 are average, while scores of 4 or 7 are, respectively, slightly below, or slightly above, average. Scores of 8, 9, and 10 can be considered to be high, very high and extremely high, respectively. Similarly, scores of 1, 2, and 3 can be considered to be extremely low, very low and low, respectively.

PROFILING

The process of interpreting the personality component of the HSI should begin by reviewing the response style indicators, Faking Good and Faking Bad (see p.7). These scales provide information about whether the personality profile is likely to be valid or not. That is, the meaning of the profile should be interpreted in the context of these response style indicators.

TEST STATISTICS AND TABLE OF NORMS

NORM GROUP COMPOSITION

Because the HSI is derived from different tests, it has different norm groups for different scales. Norm group composition especially differs between ability and personality components. The most inclusive norm group is Respondents. Its general composition is shown in Table 1. Note that the precise composition may vary slightly between scales, or may not apply to all scales

Table 1. General composition of Respondents norm group for HSI ability and personality scales.

Age		
	Ability Components	**Personality Component**
Mean	33	33
Min	16	15
Max	64	65

Sex		
	Ability Components	**Personality Component**
Male	607	7524
Female	240	5490
Unknown	18	186

Education		
	Ability Components	**Personality Component**
Less than completed secondary	98	242
Completed Secondary School yr. 12/13	73	913
Industry, Trade Training	22	462
Certificate, Diploma	31	620
Polytech, TAFE, Institute	14	298
University Degree	24	1969
Post Graduate Qualification	7	616
Masters	2	123
MBA	0	20
PhD	0	50
Unknown	594	7887

Industry		
	Ability Components	**Personality Component**
Accounting	0	250
Advertising, Marketing	2	102
Agribusiness	51	216
Banking, Finance, Investment	2	265
Call Centre 0 83	0	83
Compliance, Law enforcement	0	281
Consulting	19	236
Construction, works, roads	5	67
Defence, Armed Services	0	163
Education, Training	0	241
Emergency Services	0	29
Engineering, Technical	3	162
Entertainment	0	36
Forestry	14	18
Health, Therapy, Care	0	458
Hospitality, Tourism	0	207
Insurance	0	52
Information Technology	0	298
Internet	0	3
Legal	0	148
Manufacturing, Assembly	194	532
Media, Broadcasting	1	92
Mining	3	108
Property, Real Estate	0	34
Public Relations	0	25
Research	2	73
Recruitment	0	108
Retail	3	571

	Ability Components	Personality Component
Service	4	185
Telecommunications	0	66
Trades, Build, Auto, other	4	65
Transport, Shipping	17	69
Utilities, electricity, etc.	0	64
Wholesale, Trading	1	116
Unknown	540	7777

Ethnicity		
	Ability Components	**Personality Component**
Australian	4	408
Aboriginal/Torres Strait Islander	2	4
NZ European	164	4333
Maori	108	584
African	8	28
Asian	9	256
European	28	699
Indian	14	171
Latin, Hispanic	0	8
Middle East	0	8
Pacific Islander	54	225
South African European	2	82
Other	7	117
Unknown	465	6277

Occupation		
	Ability Components	**Personality Component**
Clerical, Administration	2	486
Company Director, Partner, Owner	1	36
Customer Service	5	405
Designer, Creative	4	40
Driver, Operator	43	81
Graduate (within past year)	0	271
Home executive	2	33
Hourly paid Worker	59	123
Human Resources	4	274
Managerial	3	1211
Manager of $60M+ pa	1	52
Marketing	1	200
Process worker, Industrial	138	141
Professional	1	837
Salaried Staff	3	416
Sales	3	489
Student, School leaver	1	218
Supervisor, Team leader	5	211
Trades-person, Certified worker	10	223
Unemployed	13	105
Volunteer	0	1
Unknown	566	7347

Occupation		
	Ability Components	**Personality Component**
Public service, Fed/State Govt	1	1343
Local Government/Authority	10	227
State Owned Corporation	0	256
Private – small/medium	111	476
Corporate, Multinational	90	1245
Unknown	653	9653

NORM FREQUENCY DISTRIBUTIONS

Frequency distributions for the most inclusive HSI norm group, Respondents, are shown for each of the HSI's scales in Figure 2-Figure 12.

Ability norms

HSI Understanding Instructions Respondents: Score

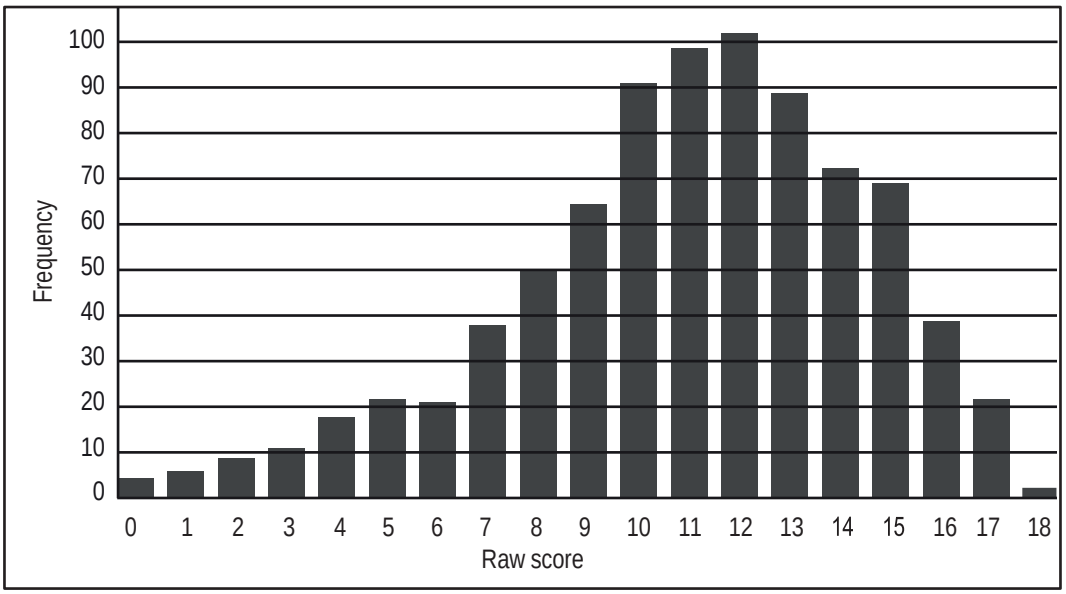

Figure 2. Frequency distribution for Understanding Instructions and Safety-Related Information scores.

HSI Checking Respondents: Score

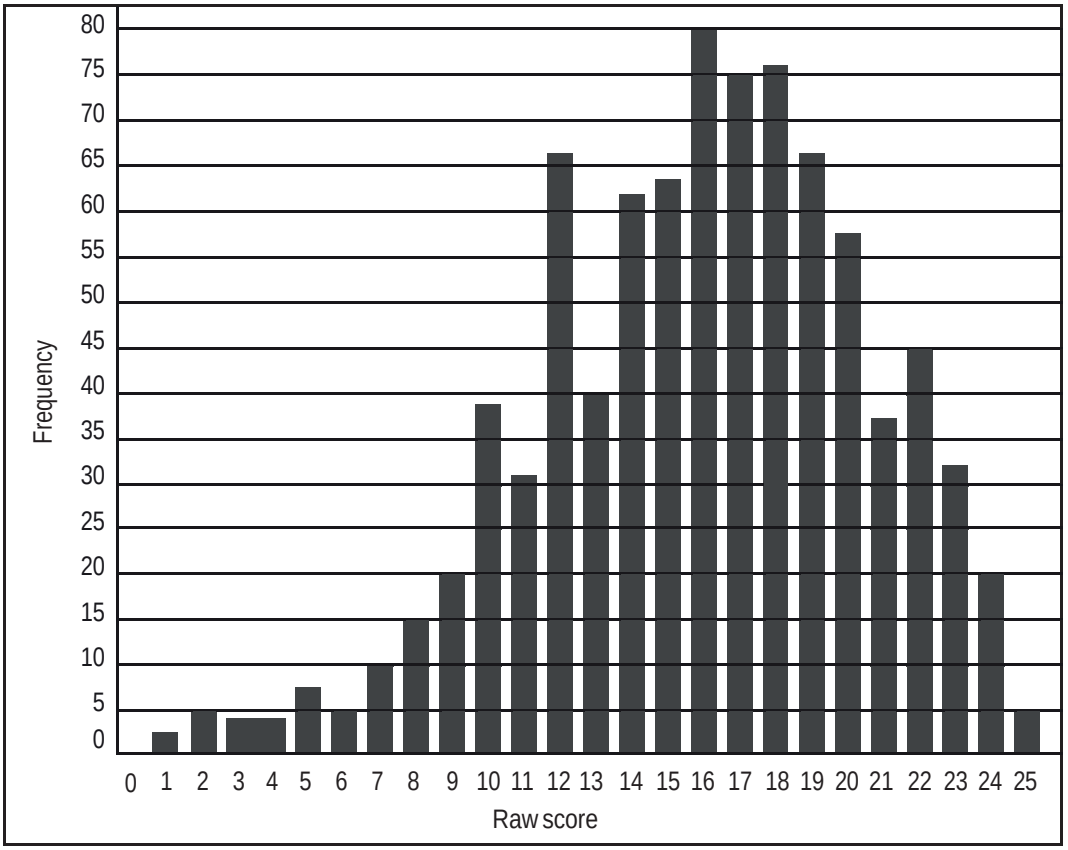

Figure 3. Frequency distribution for Checking and Attention to Detail scores.

HSI Understanding the Environment Respondents: Score

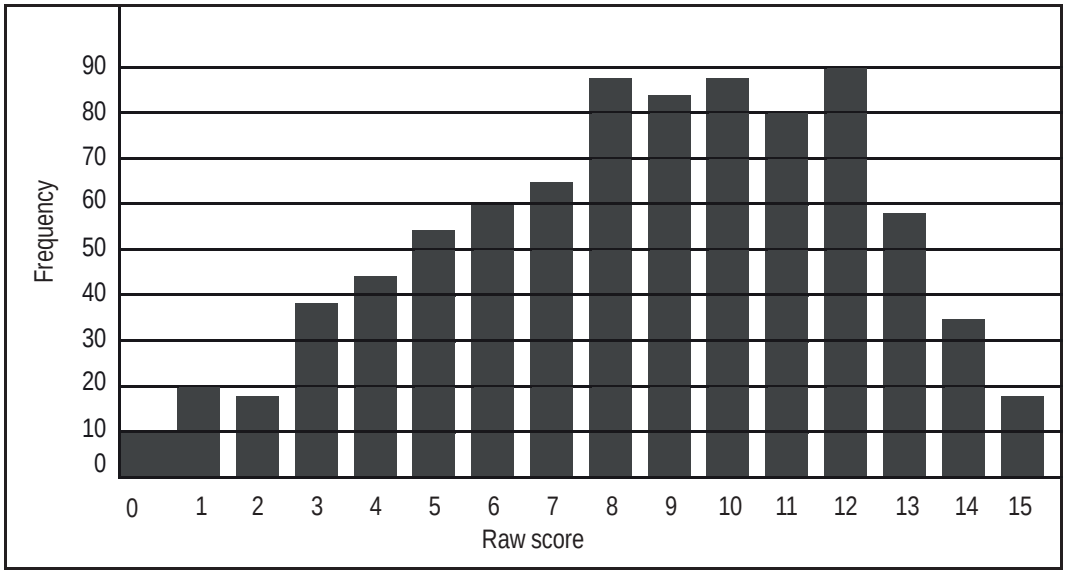

Figure 4. Frequency distribution for Understanding the Safety Environment scores.

Personality norms

HSI Personality 2009 Respondents: SAMO

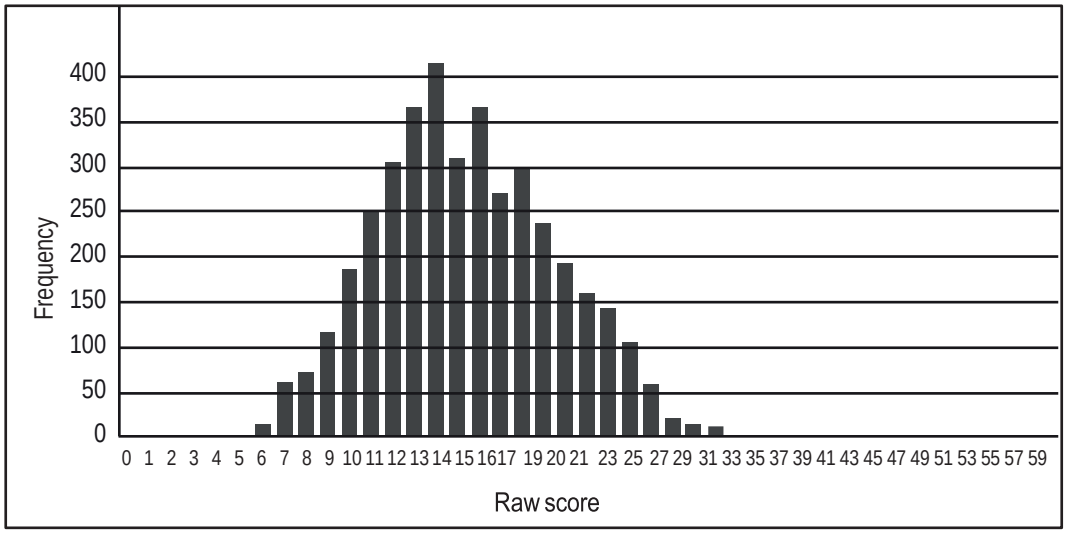

Figure 5. Frequency distribution for Safety Motivation scores.

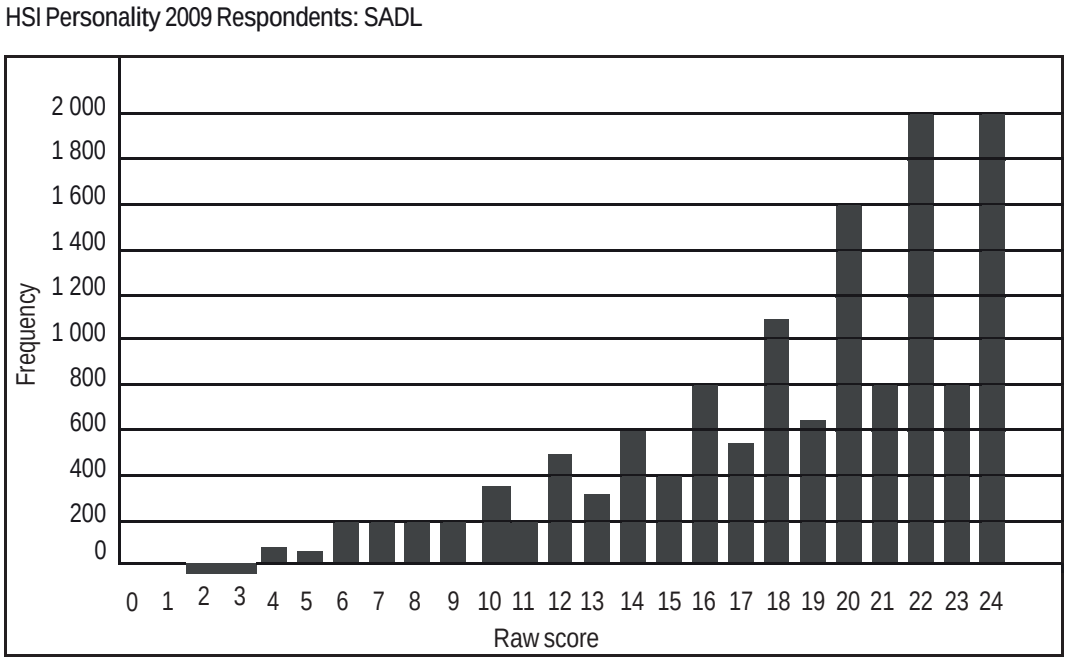

Figure 6. Frequency distribution for Safety Diligence scores.

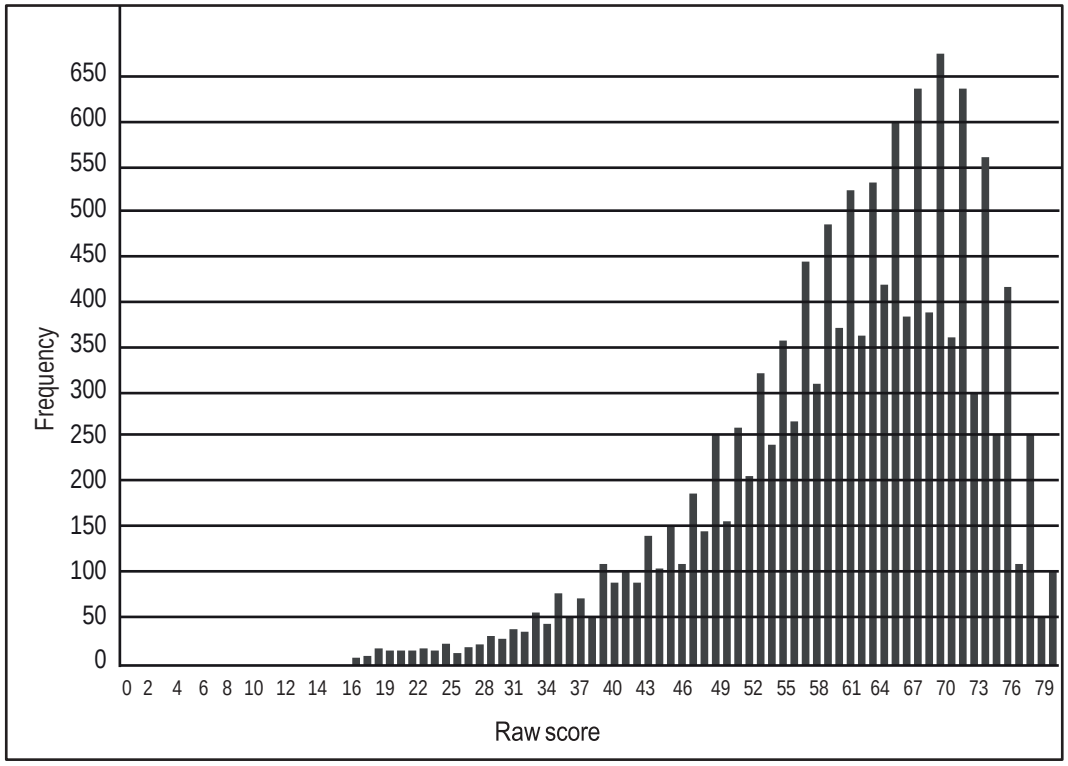

Figure 7. Frequency distribution for Adherence to Rules scores.

HSI Personality 2009 Respondents: OPGD

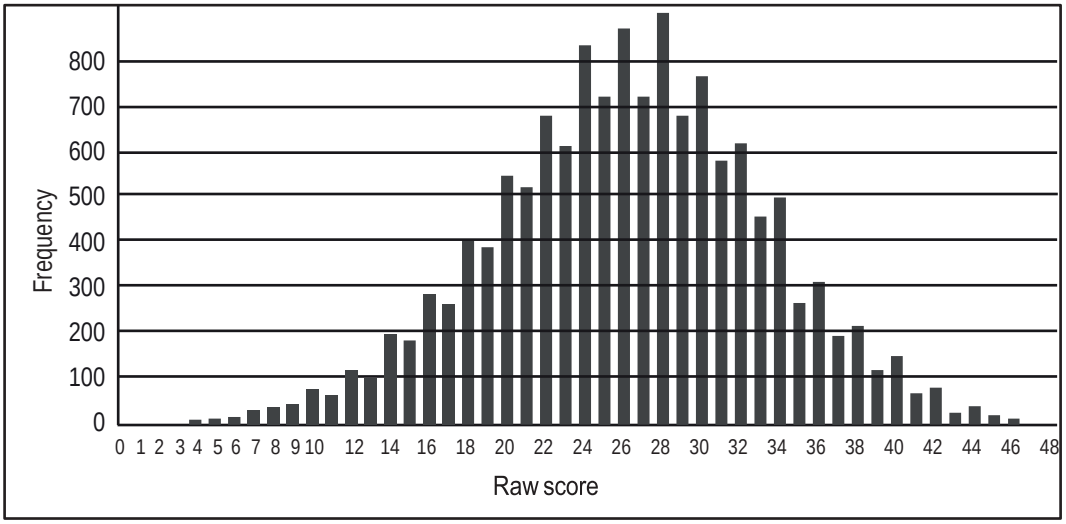

Figure 8. Frequency distribution for Openness to Guidance scores.

HSI Personality 2009 Respondents: CONF

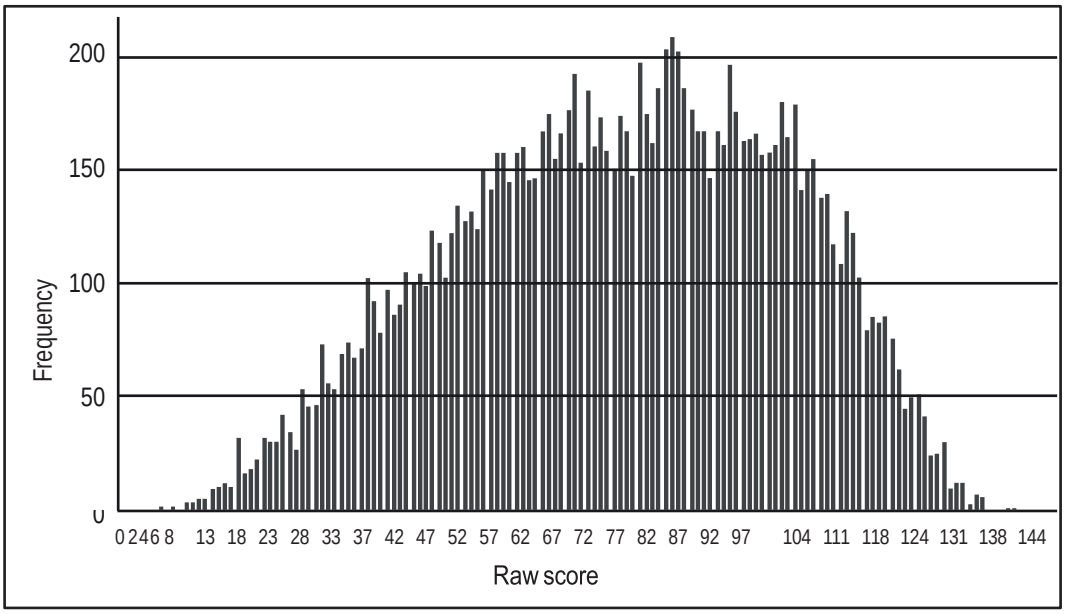

Figure 9. Frequency distribution for Safety Confidence scores.

HSI Personality 2009 Respondents: COMP

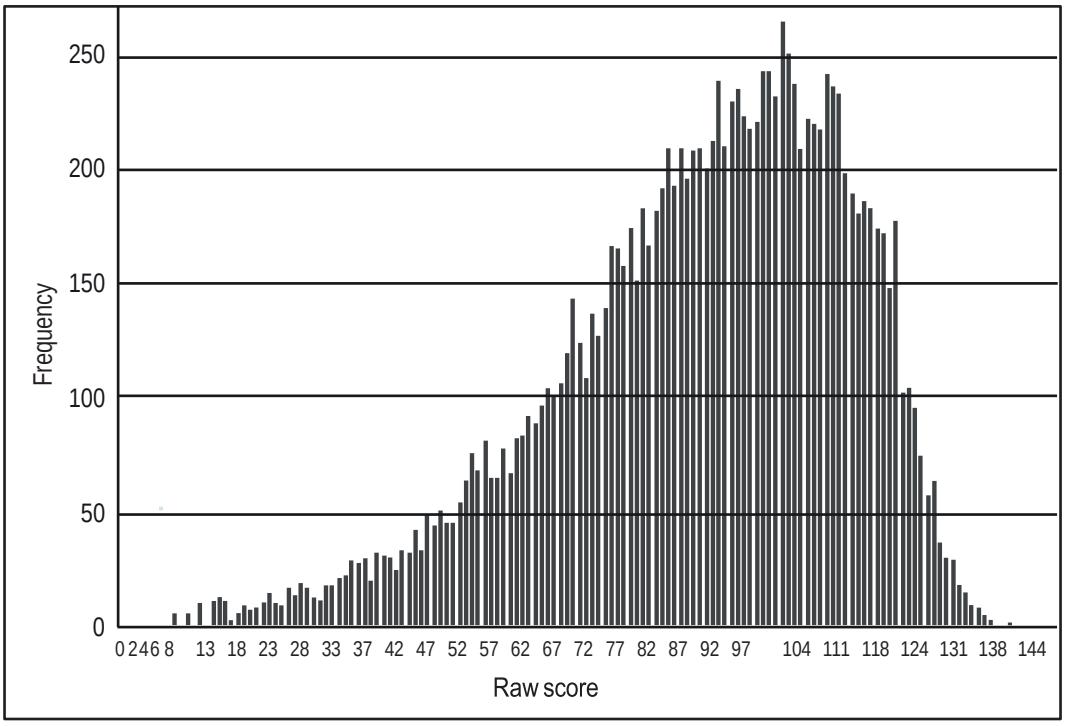

Figure 10. Frequency distribution for Safety Composure scores.

HSI Understanding Instructions Respondents: FGOOD

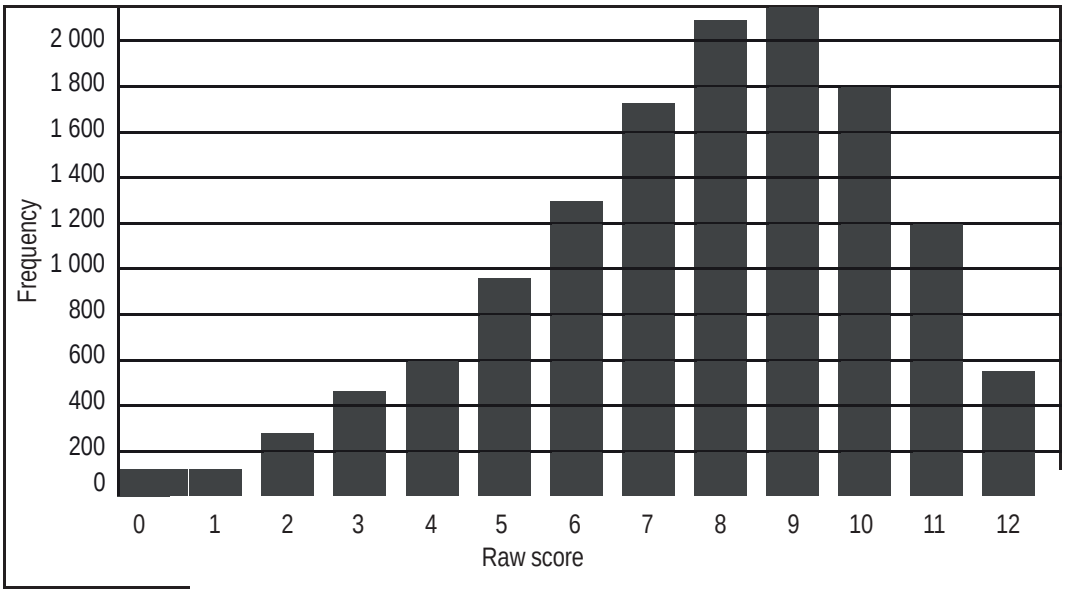

Figure 11. Frequency distribution for Faking Good scores.

HSI Personality 2009 Respondents: FBAD

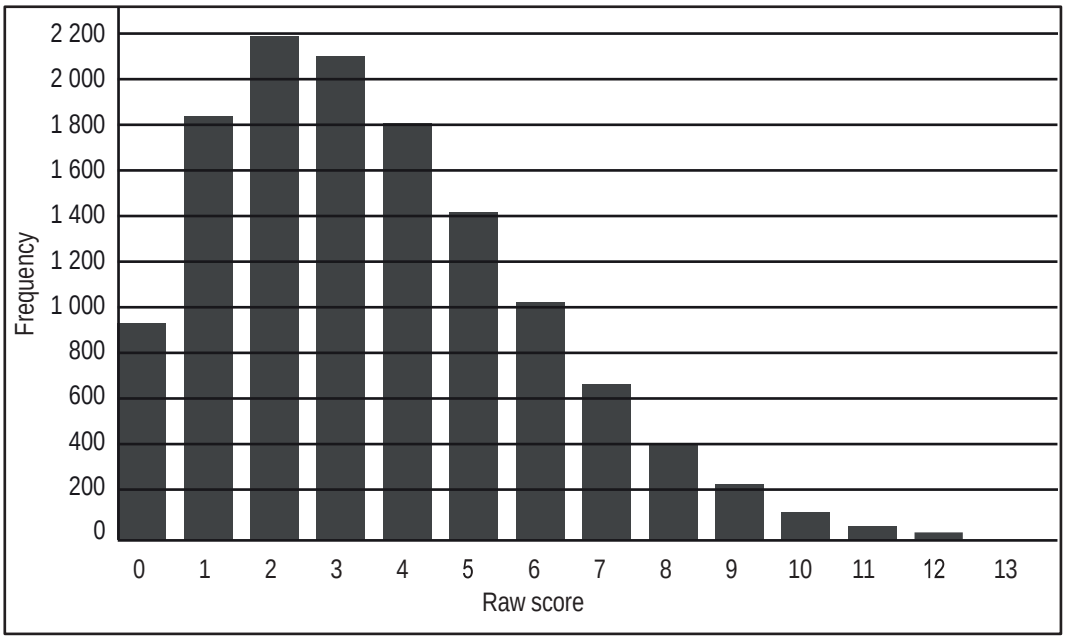

Figure 12. Frequency distribution for Faking Bad scores.

PSYCHOMETRIC PROPERTIES

For further information on the psychometric properties of the tests underlying the HSI, please. consult the 15FQ+, IPT, and VMI technical manuals

RELIABILITY

The reliability of a test measures whether differences in test scores are due to actual personality or ability differences between people, or whether they are merely due to random error. There are two main ways to assess reliability. One is to assess whether items that measure a particular trait are strongly related to each other or not (i.e., whether they are internally consistent or homogeneous). The other is to examine how stable test scores are over time.

Internal consistency

If items in a test measure the same construct, then their scores should correlate well with one another. Cronbach's (1951) alpha coefficient measures the correlation between items that are on the same scale. If Cronbach's alpha is high (i.e., above at least 0.7), it means that items within the scale have a high correlation with each other. The scale then has a high level of internal consistency or reliability, meaning that its items measure the same construct and are not greatly influenced by random measurement error. Cronbach's alpha scores for each of the scales underlying the HSI are shown in Table 2 for up to three different examinations of internal consistency. Cronbach's alpha scores consistently exceed 0.7, suggesting high internal consistency in the HSI's underlying scales.

Table 2. Cronbach's Alpha (internal consistency) values for constituent scales of HSI in different studies.

Source Scale	Study 1		Study 2		Study 3	
	Alpha	N	Alpha	N	Alpha	N
IPT: Following Instructions	.76	134				
IPT: Checking	.87	134				
IPT: Symbolic Reasoning	.73	130				
15FQ+: fC	.80		.77		.78	
15FQ+: fE	.80		.79		.74	
15FQ+: fF	.75		.78		.75	
15FQ+: fG	.85		.81		.82	
15FQ+: fO	.82		.83		.82	
15FQ+: fQ1	.81	183	.79	325	.76	939
15FQ+: fQ3	.78		.76		.76	
15FQ+: fQ4	.84		.81		.79	
15FQ+: Faking Good	.84		.73			
15FQ+: Faking Bad	.78		.72			
15FQ+: Work Attitude	.76		.83			
VMI: Safety/Security	.79	155				

Test-retest reliability

A test may be seen as reliable if people's test scores at an earlier time closely match their scores on the same test taken at a later time. Scores on personality tests should be relatively stable over moderate periods of time. After all, by definition, personality traits describe enduring characteristics. Stability coefficients indicate how well test-retest scores match up with each other. In order for a personality test to be seen as reliable, its test-retest stability coefficient should be higher than about 0.7. Table 3 shows stability coefficients for the 15FQ+ scales that contribute to the personality component of the HSI. In this study, test and retest were separated by four months.

Table 3. Long-term (4 month) test-retest reliability of main personality scales underlying the HSI.

Source Scale	Stability Coefficient
15FQ+: fC	.82
15FQ+: fE	.82
15FQ+: fF	.85
15FQ+: fG	.88
15FQ+: fO	.77
15FQ+: fQ1	.85
15FQ+: fQ3	.84
15FQ+: fQ4	.89
15FQ+ Faking Good	.71
15FQ+ Faking Bad	.69
15FQ+ Work Attitude	.73

Age differences

To examine age differences in the HSI, scores on each scale were correlated with age. Results are shown in Table 4. Although a statistically significant correlation between age and score was found on all scales but one, this is almost unavoidable with such a large sample size. More important is the size of the correlation, was negligible for all personality scales ($r \leq 0.1$). For ability scales, scores tended to decrease as age increased, though the correlation was only moderate ($r = -0.17$ to -0.33). This is consistent with a known general decrease in scores on timed tests as age increases.

Table 4. Correlation of age with each HSI scale.

Scale	N	r
Und. Instructions	737	-0.33
Checking	779	-0.17
Und. Environment	757	-0.29
Safety Motivation	3502	.10
Safety Diligence	11997	0.02 (NS)
Adherence to Rules	11997	-0.03
Open. to Guidance	11997	-0.05
Safety Confidence	11997	0.08
Safety Composure	11997	0.06

Sex differences

To examine sex differences in the HSI, scores on each scale were submitted to an independent samples t-test comparing male and female scores (see Table 5). For most scales, there was a significant difference between male and female scores ($p < 0.05$). When differences were converted into approximate sten score differences, they were found to be relatively small (0.19 to 0.89) and, more importantly, showed no overall advantage for males versus females.

Table 5. Sex differences on each HSI scale showing approximate difference in sten scores.

Scale	Mean M	Mean F	Diff (Sten)
Und. Instructions	11.0	10.9	NS
Checking	15.8	16.4	0.42
Und. Environment	8.75	8.01	0.89
Safety Motivation	15.3	17.3	0.41
Safety Diligence	18.1	19.1	0.20
Adherence to Rules	62.0	60.8	0.19
Open. to Guidance	25.9	26.6	0.55
Safety Confidence	80.0	72.9	0.34
Safety Composure	93.1	89.1	

Ethnic differences

It has previously been established that measured personality traits may differ slightly between ethnicities (e.g., Packman, Brown, Englert, Sisarich, & Bauer, 2005, in the 15FQ+). Consequently, personality scores on the HSI may also differ slightly between ethnicities.

ADMINISTRATION GUIDELINES

The HSI should be administrated using the correct procedures. Ideally, this tool should always be administered face-to-face and by a trained practitioner. Privacy and freedom from interruption are also critical. Some points to keep in mind when administering the HSI are:

- The HSI should be delivered in the same way as a general ability and personality battery. No special mention should be made of the HSI's role

as a Health and Safety assessment. (The question- naire does not contain any such references.)

- The HSI consists of three ability components (following instructions, checking, and symbolic reasoning) and a personality component.
- These results will aid the decision-making process. However, such results are not intended to stand alone. They are intended to be used in conjunction with other job relevant information.
- The ability components are timed. The

personality component is not timed.
• Each question in each ability component has five possible answers. One and only one answer is correct in each case.

• Each question in the personality component has either three or five answers. There are no right or wrong answers, but as in other personality assessments the central answer should be avoided.

DELIVERING FEEDBACK

For many participants, the feedback session can be quite threatening. This is particularly true if they have not been exposed to this kind of analysis before. As the person delivering the feedback, it is important to put the participant at ease and alleviate any stress they may have about the assessment process. Feedback should be less a process of "telling" the participant information about themselves, and more a process of shared exploration.

KEY SKILLS THAT CAN FACILITATE FEEDBACK

Attending skills

Good attention is a necessary component for good communication. It demonstrates to the other person that you respect them and are interested in what they have to say. Some ways to demonstrate your attention are:

• Sit with your body facing the other person.
• Be facially responsive (e.g., appropriate smiling or nodding).
• Occasionally lean towards the person when appropriate to indicate empathy.
• Maintain good eye contact using appropriate glances to express interest.
• Repeat and reflect key words and ideas to indicate understanding.

Encourage questions and the expression of feeling

Questions are a useful tool to help the feedback session move along. They can provide valuable insight into the participant's experience of undertaking the exercise. Questions provide room for the individual to express him or herself. It also allows them to bring additional data into the interpretation of results. In this context, good questions:
• have one focus,
• are open ended,
• are short and succinct, and
• start with "what", "how", and "could" (they allow greater movement around a topic).
Poor questions, on the other hand:
• are closed,
• are long and verbose,
• contain multiple ideas, and
• start with "why" (these questions put people on the spot).

Remain objective and open

Try to avoid making value judgements when feeding back assessment results. Also avoid interpreting the results in light of what else you know about the participant (e.g., avoid making judgements on the basis of comments made by past colleagues or personal friends of the participant).

When you deliver feedback, ensure that you can refer to the profile. This will help you remain factual in any discussion of the results. Although it can be difficult, you have an ethical obligation to inform the participant of the overall picture and pattern that emerges. If you anticipate a negative reaction to any information (e.g., feedback about areas for development), try to plan in advance the best way to respond. Be specific in the interpretations given and try to avoid references to general statements of "high" or "low" scores that have little practical value.

A FINAL NOTE

While the HSI is revealing and informative, it is only a starting point. Take time to understand the candidate by asking questions and making your own observations.
Everyone likes to succeed. Be aware of the particular developmental needs of each candidate and help foster the person's awareness and growth in these areas.

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