DiSC® Validation

Research Report

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Validation

Psychological instruments are used to measure abstract qualities that we can't touch or see, like intelligence, dominance, or honesty. So how do researchers evaluate these instruments? How do we know whether such tools are actually providing accurate information about these characteristics or just generating haphazard feedback that sounds believable? Simply put, if an instrument is indeed useful and accurate, it should meet a variety of different standards that have been established by the scientific community throughout the years. Validation is the process through which researchers assess the quality of a psychological instrument by testing the tool against these different standards. This paper is designed to help you understand these different standards and see how Inscape's DiSC® instruments perform under examination. Note that the research referenced here has been done on the *DiSC Classic* instrument. Because it uses the same response page, this research is equally relevant to the *DiSC PPSS* instrument.

Validation asks two fundamental questions:

1. **How reliable is the tool?** That is, researchers ask if an instrument measures in a way that is consistent and dependable. If the results from a tool contain a lot of random variation, it will be deemed less reliable.

2. **How valid is the tool?** That is, researchers ask if an instrument measures accurately. The more that a tool measures what it proposes to measure, the more valid the tool is.

The following analogy usually helps people understand the importance of reliability and validity. Imagine that you get on your bathroom scale today and weigh yourself. Tomorrow you do the same thing, only to discover that your weight has dropped by 30 percent. Although you may be delighted at first, reality will eventually set in. Your weight didn't change; the scale did. Would you trust such a scale? No, it's not reliable.

But now let's imagine a second instance in which you weighed yourself twice and both times the scale shows that you weigh about half of what you expected. So although you may have a reliable scale, it's reliably wrong. The scale doesn't measure what it proposes to measure: your weight. It's not valid.

In the first instance, the scale is neither reliable nor valid. That is, the scale can't be a valid measurement of your weight if it fluctuates randomly and unreliably in its results. Therefore, an instrument cannot be valid if it is not reliable. In the second instance, however, we have a scale that is reliable but not valid. It does measure consistently (i.e., reliably), but that measurement is not accurate (i.e., valid.)

Note that no psychometric tool is perfectly reliable or perfectly valid. All psychological instruments are subject to various sources of error. Reliability and validity are matters of degree on continuous scales, rather than reliable/unreliable and valid/invalid on dichotomous scales. Consequently, it is more appropriate to ask, "How reliable is this tool?" than "Is this tool reliable?"

DiSC VALIDATION

Reliability

When we talk of reliability in relation to profiles such as Inscape Publishing's DiSC® assessments, then we are referring partly to the tool's **stability** and partly to its **internal consistency**.

Stability refers to the tool's ability to yield the same measurements over a period of time. This is generally tested by having the same people fill out the tool's questionnaire twice, with a suitable time interval between the two measurements (the so-called test-retest.) The results are then compared to determine how strongly they relate to each other (or correlate). If a person's DiSC style has remained unchanged, a stable tool should produce results that are quite similar between two different administrations. In reality, however, it is almost impossible to obtain perfect test-retest reliability on any sophisticated psychological test, even if the individual in question does not change on the measured attribute. This is because test results are influenced by a variety of extraneous factors that are unrelated to the characteristics that the test intends to measure. For instance, someone who is tired during one testing will answer differently than she will on a second testing when she is well rested. Similarly, another person will respond to a test differently depending on the mood he is in. Generally speaking, the longer the interval between two test administrations, the more that these random variables can artificially lower the test-retest reliability of an instrument. In other words, the longer the time period between two testings, the lower we would expect the test-retest reliability to be.

In practical terms, the stability of DiSC (i.e., test-retest reliability) is measured by asking a group of respondents to take a DiSC instrument on one occasion and then asking those same respondents to take the same test again a couple of weeks later. If the instrument is stable, the results of the instrument shouldn't change much. This stability can be quantified in the form of a reliability coefficient, which is a statistic that is generated by looking at the mathematical relationship between a group's initial scores on an instrument and its subsequent scores. Reliability coefficients range between -1 and +1. The closer that a correlation coefficient is to +1, the more stable the instrument is considered to be. Researchers generally use the following guidelines to help them interpret these test-retest reliability coefficients: coefficients above .70 are considered acceptable, and coefficients above .80 are considered very good.

The four scales of *DiSC Classic* (D-Dominance, i- Influence, S- Steadiness, and C-Conscientiousness) have been assessed for their test-retest reliability over varying periods of time, and the following coefficients were found:

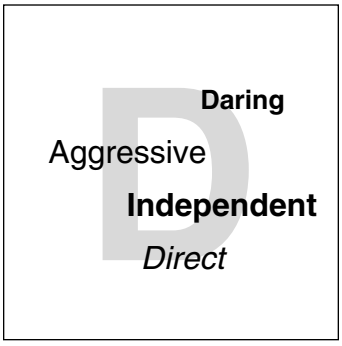
1 week[t] (N*=142)	**5-7 months**[tt] (N*=174)	**1 year**[tt] (10-14 months) (N*=138)
D: .89	**D: .84**	**D: .79**
i: .87	**i: .82**	**i: .80**
S: .89	**S: .77**	**S: .76**
C: .89	**C: .73**	**C: .71**

* N indicates the number of participants
[t] UK English Version
[tt] US English Version

These results suggest that *DiSC® Classic* is quite stable over time. Consequently, test takers and test administrators should expect no more than small changes when the instrument is taken at different times. As the period between administrations increases, however, the results of these administrations will become more noticeable.

Note that even over very short intervals an instrument's results can show small changes. In fact, it is unlikely that two administrations of a test will yield the exact same results on any sophisticated psychological instrument. When such changes are observed in DiSC, however, the exact elevation of a profile is more likely to change than the basic shape of a profile. Consequently, the fundamental interpretation of the results will usually be the same.

Internal consistency evaluates the degree of correlation among questions that profess to measure the same thing. That is, each of the four scales in *DiSC Classic* is measured using a series of different items (i.e., questions in the form of adjectives, such as *Daring, Independent, Aggressive,* or *Direct*). Researchers recognize that if all of the items on a given scale (e.g., the D scale) are in fact measuring the same thing (e.g., Dominance), they should all correlate with one another to some degree. In other words, all of the items on a scale should be consistent with one another. In most cases, a statistic called *Cronbach's Alpha* is usually regarded as the best method of evaluating internal consistency.



Much like the reliability coefficients described above, Cronbach's Alpha expresses the degree of correlation as a specific number, which typically varies between 0.0 and 1.0. If the value of Alpha is 0.0, then there is no relationship among the items/statements on a given scale. On the other hand, if all the statements in a questionnaire are identical, then the value of Alpha will be 1.0, which indicates absolute internal consistency. Cronbach's Alpha is calculated separately for each of the tool's scales (i.e., D, i, S, and C.)

The following guidelines are frequently used to evaluate the quality of a scale's internal reliability: Alpha values above .70 are generally considered acceptable and satisfactory, alpha values above .80 are usually considered quite good, and values above .90 are considered to reflect exceptional internal consistency. In fact, Alpha values that are too high may indicate that the items on a scale are redundant or too similar. In such cases, many of the instrument's items may provide very little new information about a respondent.

DiSC Classic has repeatedly shown good-to-excellent internal consistency. The development sample of the US English version of *DiSC Classic* demonstrated the following Alphas when it was revised in 1996 (sample size=812):

D: .92
i: .87
S: .88
C: .85

Repeated research since that time has produced similar Alpha coefficients on the US English version, as well as on other language versions that have been developed throughout the world. Appendix 1 contains a sample of the alpha coefficients for different language versions of *DiSC® Classic*. All of these coefficients are above the .70 cutoff, and the majority of them are well above this cutoff.

Validity

As already mentioned, validity indicates the degree to which a tool measures what it has been designed to measure. Assessing the validity of a psychological tool that measures abstract qualities (like intelligence, dominance, or honesty) can be tricky. There are, however, a number of basic strategies that researchers use to answer the question "How well is this instrument measuring what it says it's measuring?" The validation strategies that will be discussed here fall under the heading of **construct validity**.

Construct Validity

Construct validity examines the validity of a tool on a highly theoretical level. A *construct* is an abstract idea or concept (such as intelligence, dominance, or honesty) that is used to make sense of our experience. The D scale of DiSC, for example, measures the construct of Dominance. This construct of Dominance, in turn, is theoretically related to a variety of other constructs. For instance, it is reasonable to assume that someone who is very dominant will be rated as more aggressive by their peers. Thus, Dominance and peer ratings of aggressiveness are theoretically linked. Consequently, if our measure of Dominance has high validity, it should correlate highly with peer ratings of aggressiveness. This is essentially what researchers do when they examine construct validity. First, they specify a series of theoretical relationships (e.g., the construct of Dominance is theoretically rated to the constructs of X, Y, and Z). Then they test these theoretical relationships empirically to see if the relationships actually exist. If the proposed relationships exist, the instrument is thought to have higher validity.

Scale Intercorrelations

As you might imagine, there are a variety of different ways to test construct validity. First, we can examine the validity of an instrument as a whole. Instruments like DiSC propose an underlying model in which the scales within the tool have a specific relationship to one another. Researchers examine the actual relationship among the scales to see if it reflects the theoretical relationship proposed by the model.

The DiSC model proposes that adjacent scales (e.g., C/S or C/D) will have weak to moderate correlations. That is, these correlations should be considerably smaller than the Alpha reliabilities of the individual scales. For example, the correlation between the D and i scales (-.11) should be substantially lower than the Alpha reliability of the D scale (.87). On the other hand, complementary scales (e.g., D/S or C/i) are theoretically opposite, and so they should have strong negative correlations. **Table 1** shows data obtained from a 2002 sample of 7,038

respondents who completed the US English version of *DiSC® Classic*. The correlations among the D, i, S, and C scales support this model. That is, strong negative correlations are observed between C and i, and between S and D. Further, weak correlations are observed between adjacent pairs of scales.

Table 1. Intercorrelations among the *DiSC Classic* scales

	D	i	S	C
D	**.87**			
i	-.11	**.81**		
S	-.82	-.22	**.82**	
C	-.37	-.71	.30	**.77**

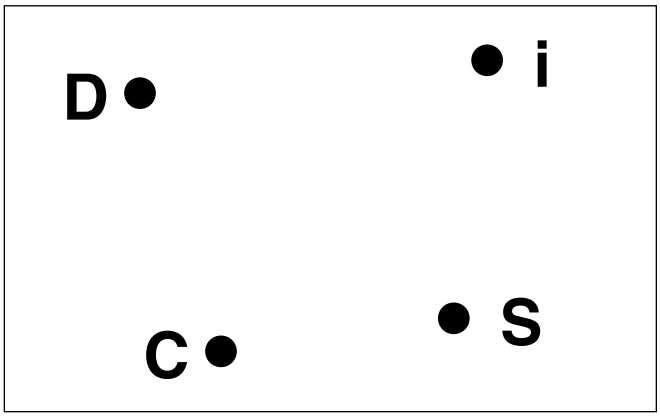
Cronbach's Alpha reliabilities are shown in bold along the diagonal, and the correlation coefficients among scales are shown within the body of the table. Correlation coefficients range from -1 to +1. A correlation of +1 indicates that two variables are perfectly positively correlated such that as one variable increases, the other variable increases by a proportional amount. A correlation of -1 indicates that two variables are perfectly negatively correlated, such that as one variable increases, the other variable decreases by a proportional amount. A correlation of 0 indicates that two variables are completely unrelated. The following guidelines can help you interpret the relative strength of these correlation coefficients (both positive and negative): very weak correlations range from 0.0 to .2, weak correlations range from .2 to .4, moderate correlations range from .4 to .6, strong correlations range from .6 to .8, and very strong correlations range from .8 to 1.0.

Multidimensional Scaling

A statistical technique called multidimensional scaling also adds support to the DiSC model. This technique has two advantages. First, it allows for a visual inspection of relationship among the four scales. Second, this technique allows researchers to look at all of the scales simultaneously. To obtain a large sample size, 45,588 respondents who had taken the online DiSC profile were used in this analysis. In **Figure 1** below, scales that are closer together have a stronger positive relationship. Scales that are farther apart are more dissimilar.

As seen in Figure 1, scales are arranged in a way that is predicted by the DiSC model. All scales are closest to the scales that are theoretically adjacent to them in the DiSC model. Further, all scales are farthest from scales that are theoretically opposite them in the DiSC model. Consequently, this analysis adds strong support for the DiSC model and the ability of *DiSC Classic* to measure that model.

Figure 1. Multidimensional Scaling Solution for the *DiSC Classic* Scales



Factor Analysis

Another method used to assess the validity of *DiSC® Classic* is factor analysis. Unlike the correlational analysis and multidimensional scaling analysis described above, the factor analysis described here was used to examine the DiSC instrument on the level of items rather than at the level of scales.

Generally speaking, factor analysis helps researchers understand which items are highly correlated and thus group together to form a scale. This statistical technique takes into account the correlations among all of the items within a test and identifies independent factors (or dimensions) that explain those correlations. The DiSC model proposes that two primary factors (or dimensions) underlie the four DiSC scales. If this model is sufficiently measured by *DiSC Classic*, items on the i and C scales should correlate highly with one factor, and items on the D and S scales should correlate highly with the other factor.

The results of a factor analysis on 7,038 respondents demonstrated that for each of the DiSC scales, items grouped together in the expected fashion. In a two-factor solution, the vast majority of the DiSC items were most strongly correlated with their expected factor. These results support the existence of the DiSC model and the appropriateness of the *DiSC Classic* items to measure that model.

Correlations with Other Instruments

When validating an instrument, test developers recognize that it is important to understand the relationship that a given instrument (e.g., DiSC) has with other psychological tools in the field. In particular, researchers identify instruments that measure constructs (such as aggressiveness, playfulness, or emotional stability) that are theoretically related to constructs measured by the instrument in question (such as Dominance, Influence, or Steadiness.) For instance, the Influence scale of DiSC is theoretically related to the construct of extraversion. Consequently, the Influence scale should correlate highly with scales on other tools that measure extraversion. This type of construct validity is often called *convergent validity*.

The 16PF

One of the instruments with which DiSC has been correlated is the Cattell 16 Personality Factor Questionnaire (16PF). This instrument was developed by Raymond Cattell in the 1940s using a largely factor analytic methodology. It proposes to measure 16 traits that represent the major dimensions of differences within human personality. These traits describe a person's individual style of perceiving, thinking, and acting in a wide variety of different situations over a relatively extended period of time.

For the purposes of DiSC® validation, we are only interested in those scales that are theoretically related to the constructs measured by DiSC. A group of 103 participants were asked to take both the DiSC instrument and the 16PF. (The DiSC instrument used was the predecessor to the current *DiSC Classic*.) The scales of the two instruments were then correlated. The following paragraphs describe a series of hypothesized correlations based on the theoretical DiSC model, along with the empirical support for these hypotheses.

The **Dominance scale** of the 16PF should be positively correlated with the D scale of DiSC and negatively correlated with the S scale of DiSC. Analyses confirmed that the Dominance scale of the 16PF was strongly and positively correlated with the D scale of the DiSC instrument (r= .62) and strongly and negatively correlated with the S scale (r= -.52).

The **Liveliness scale** of the 16PF should be positively correlated with the i scale of the DiSC instrument. Data supports this hypothesis and shows a strong positive relationship between these two scales (r=.61). The Liveliness scale also demonstrated a moderate negative correlation with the C scale of DiSC (r= -.45).

The **Sensitivity scale** of the 16PF measures people on a continuum that ranges from utilitarian, unsentimental, and tough-minded on the low end to sensitive, sentimental, and tender-minded on the high end. This sensitivity construct is touched upon in the D and S scales of DiSC, but only indirectly. Therefore, the D scale of DiSC should show a negative, but moderate correlation with the Sensitivity scale, and the S scale should show a positive, but moderate relationship. The data support this hypothesis. The D scale demonstrated a negative and moderate, but statistically significant relationship with the Sensitivity scale. The S scale showed a positive correlation with the Sensitivity scale, although this relationship was not statistically significant.

The **Rule Consciousness scale** of the 16PF measures people on a continuum that ranges from self-indulgent and rule-disregarding on the low end to dutiful and rule-conscious on the high end. This rule-consciousness construct is measured indirectly by the C scale of DiSC, so we would expect a positive, but moderate relationship between these two scales. The data indicate a small, but statistically significant relationship between the C scale of DiSC and the Rule Consciousness scale of the 16PF.

The **Social Boldness scale** of the 16PF measures people on a continuum that ranges from shy and threat-sensitive on the low end to bold and adventurous on the high end. From a theoretical perspective, this Social Boldness scale should correlate moderately with each of the four DiSC scales. The S and C scales should show moderate negative correlations, and the D and i scales should show moderate positive relationships. The data support three of these four hypothesized correlations. The S and C scales both showed negative, statistically significant correlations with this scale. In addition, the i scale showed a positive, statistically significant correlation with the scale. Although the D scale did have a positive correlation with the Social Boldness scale as expected, this correlation was smaller than theorized.

The **Privateness scale** of the 16PF measures people on a continuum that ranges from forthright and open on the low end to discreet and non-disclosing on the high end. The DiSC® scales touch indirectly on this construct. Specifically, we would expect that the i scale of DiSC would have a negative, but moderate relationship with this scale. Further, we would expect that the C scale would have a positive, but moderate relationship with privateness. The data support these hypotheses. The i scale showed a moderately negative correlation with the Privateness scale that was statistically significant. In addition, the C scale showed a moderately positive correlation with the Privateness scale that was statistically significant.

The MBTI

The Myers-Briggs Type Indicator (MBTI) is a personality inventory based on the theoretical work of Carl Jung. It proposes to measure an individual's stable, personal preferences on four primary scales (i.e., Introversion /Extraversion, Sensing/Intuition, Thinking/Feeling, and Judging/Perceiving). Based on the theoretical DiSC model, only one of the MBTI scales (i.e., Introversion/Extraversion) was proposed to have a strong relationship with the scales of the DiSC profile. Another MBTI scale (i.e., Thinking/Feeling), however, was expected to have a moderate or weak relationship with the scales of the DiSC profile. To examine the relationship between these two instruments, 103 people were asked to take both the MBTI and the DiSC profile. (The DiSC instrument used was the predecessor to the current *DiSC Classic*.) The following paragraphs describe the research hypotheses in more detail and document the results.

The **Introversion/Extraversion scale** (I/E) of the MBTI proposes to measure the source of one's personal energy. Introverts (i.e., those who score low on this scale) are thought to derive their energy from reflecting on an inner world of information, ideas, or concepts. People who receive low scores on the I/E scale are often described as contained, reflective, or quiet. These same adjectives are frequently used to describe individuals who score highly on the C scale of the DiSC profile. Consequently, we should expect a negative correlation between these two scales. On the other hand, Extraverts (i.e., those who score highly on this scale) are thought to derive their energy from interaction with the outer world of people or things. People who score highly on this scale are often described as expressive, gregarious, or enthusiastic. These same adjectives also are often used to describe people who score highly on the i scale of the DiSC profile. Consequently, these two scales should be positively correlated. The data support these hypotheses. The i scale of the DiSC profile correlated strongly and positively (r=.65) with the I/E scale. The C scale demonstrated a negative correlation with the I/E scale (r=-.35), although this correlation was more moderate in strength. Both correlations were statistically significant.

The **Thinking/Feeling scale** (T/F) of the MBTI proposes to measure the method by which a person makes decisions or draws conclusions. Those who make decisions based on objective, logical analysis are described as Thinking. This is indicated by a low score on the T/F scale. Similarly, the D and C styles within the DiSC model are also proposed to make frequent decisions based on these criteria. Consequently, we would expect weak-to-moderate negative correlations between the T/F scale and both the D

and C scales of the DiSC® profile. Those who make decisions based on personal values for the purpose of creating harmony are described as Feeling. This is indicated by a high score on the T/F scale. In the DiSC model, the i and S styles are also proposed to make frequent decisions based on these criteria. Therefore, we would expect to see weak-to-moderate positive correlations between the T/F scale and both the i and S scales of the DiSC profile. The results of the data analysis show that the T/F scale did, in fact, have a negative correlation with the D scale, but had a slightly positive correlation with the C scale. (This correlation, however, was not statistically significant). The i and S scales of the DiSC profile, however, did demonstrate the expected positive correlations with the T/F scale.

Norms and Group Comparisons

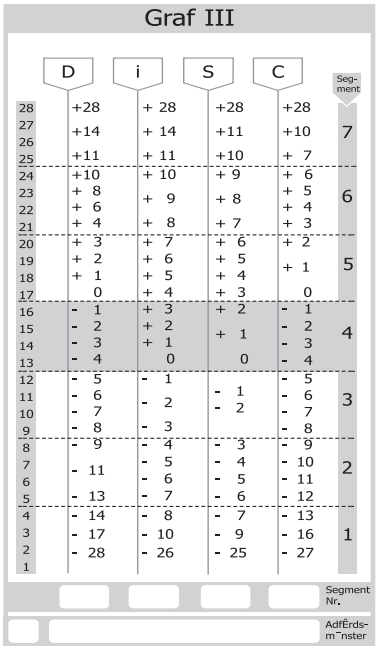
Norms are an important concept in psychological testing. They allow you to compare your results on a test with the average person within a given population (e.g., your country, your age group, your occupational group). And from this, norms allow us to understand what scores should be considered average, what scores should be considered high, and what scores should be considered low. This section will take a brief look at the use and relevance of norms on the DiSC profile.

When people take a psychological test, they receive what is called a raw score. This usually involves adding the number of items answered in a certain way and/or subtracting the number of items that are answered in a different way. For example, Graph III raw scores on *DiSC Classic* are derived by adding the number of a participant's "most" responses and subtracting the number of a participant's "least" responses. The raw score on each DiSC scale ranges from roughly -28 to +28 on Graph III of the profile. This range may be smaller depending on the language version of the instrument (see **Scoring of the DiSC Profile** for more information.) Test designers need some way, however, to interpret the meaning of that raw score. That is, what does a score of 9 mean in practical terms? Is it high? Is it low? Consequently, tests are "referenced" so that test designers can make sense of raw scores and attach some practical meaning to the results. There are a variety of ways to reference a test. DiSC is "norm-referenced," which means that a person's raw scores (ranging from roughly -28 to +28) are interpreted relative to how everyone else in the population scores on that scale. This is a very common way to reference a psychological instrument. So, for example, if the average person in a population receives a raw score of -6 on a scale, a raw score of +5 may be considered quite high.

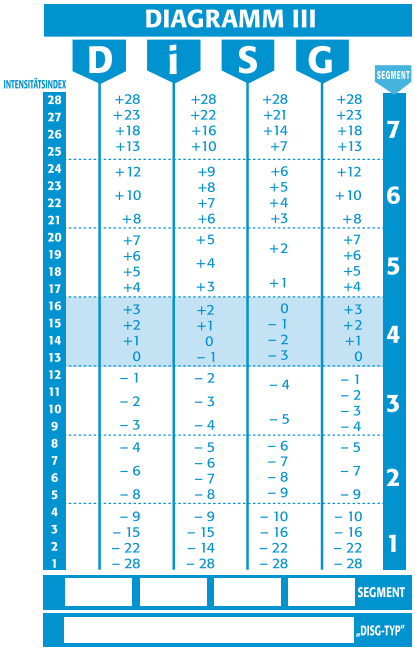
Because *DiSC Classic* is norm-referenced and scores derive their meaning, in part, by comparing an individual's scores with those within a population, it is important that test results are compared with the appropriate population. If a profile is to be used to allow the average German to compare herself/himself with other Germans, then he or she should take a version of *DiSC Classic* that was normed and validated on a a representative sample of the German population (also called a "German norm-group"). *DiSC Classic* is published in a wide variety of different languages. Each language version of the profile has been validated using a representative sample from a given country or region. Consequently, not only do these different versions of the profile measure DiSC using a different language, they also use a

different population of respondents. The three tables below show how Graph III appears in three different language versions of *DiSC® Classic*. Notice that the placement of raw scores changes on the different versions. For example, a raw score of 3 on the D scale will place a person in Segment 4 of the German version, Segment 5 of the Danish version, and Segment 6 of the American English version.

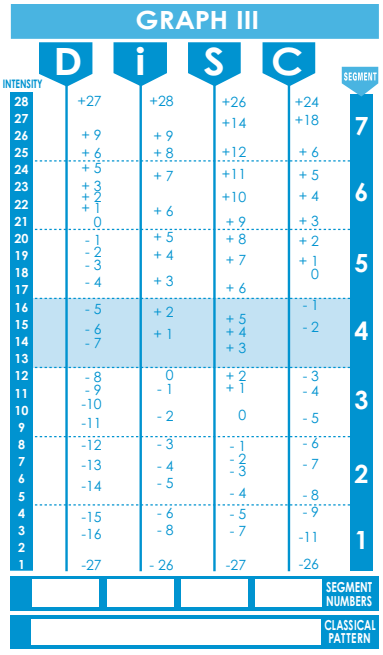
Denmark



Germany



USA



One can easily see the differences among the three graphs above. These differences underscore the importance of using a DiSC instrument that was normed on a population relevant to the respondents in a group. As mentioned above, raw scores on the D scale are plotted differently on each of the three graphs. Consequently, the behaviors that are perceived as Dominant in one culture may be seen differently in another culture. If we measure a person's DiSC style using a language version of *DiSC Classic* that was not developed on the appropriate norm group, the accuracy of measurement and feedback is likely to go down.

Cross-cultural comparisons using the DiSC® profile, however, are difficult because profile norm differences could be due to number of different factors. For instance, differences in profile level or shape can be due to differences in the population (e.g., Danish citizens could actually have a higher average level of Dominance in their behavior and emotion than Americans.) It is equally likely, however, that differences among cultures on the graphs are due to the social desirability of the words involved in the measurement. That is, even if we attempt to use the same translated word in both countries (and sometimes the words themselves change), these words will have slightly different flavors in each country. The words we use to measure Dominance, for instance, may be more socially desirable in Denmark compared to the words used to measure that scale in the US, even if the two populations actually have the same average level of Dominance. Consequently, it might be tempting to conclude that the United States has fewer high-D individuals than Denmark, even though this is only one of many possible explanations for the differences in profile norms.

If you had to describe yourself with one of the two words below, which one would you choose?

Eager
Impatient

The two words can be used to describe the same thing, but most people would consider the word "Impatient" as less desirable than "Eager".

Social Desirability Illustration

When, however, comparisons are made among cultural groups within the same larger population (using the same language version of the DiSC® profile), few significant results are found. For example, comparisons of ethnic groups within the United States show that there are no meaningful differences among the traditionally defined ethnic groups (i.e., Asian American, African American, Caucasian, Hispanic, or Native American.) In statistical terms, the percent of variance accounted for race (i.e., eta squared) in the US population on any given DiSC style is well below 1 percent. What does this mean in practical terms? Knowing a person's ethnic classification will tell you next to nothing about his or her DiSC style.

Similarly, people's DiSC patterns do not appear to be significantly related to their age. In the US English version, age differences appear to be largest on the i scale of the DiSC profile, but even on this scale those differences are small. A data analysis of 7,038 respondents to the US English version showed that older respondents had slightly lower scores on the i scale, but these age differences accounted for only about 1 percent of the variation in scores. Differences on the other scales were substantially smaller. Although this pattern of results does change slightly from culture to culture, research suggests that sizable and important age-related differences on *DiSC Classic* are rare across all language versions. Even the largest age-related differences are usually less than one segment apart.

Gender-related differences on *DiSC Classic* have also been explored. Women and men do seem to show small but noticeable group differences on two of the four DiSC scales in the US English version. Using the data set described above, women showed higher scores than men on the S scale, and men showed higher scores than women on the D scale. In both cases, however, gender differences were less than one segment score and accounted for less than 3 percent of the variation in DiSC scores. Although men and women differ as a group on the D and S scales, these results suggest that a person's gender will tell you very

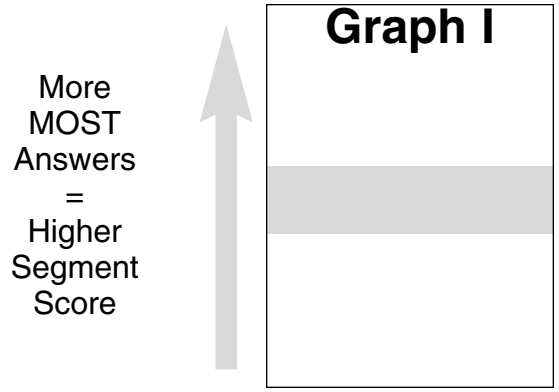
little about his or her expected DiSC® profile. Other analyses showed that although women scored higher than men on the i scale, this difference was not practically meaningful. In addition, women and men, on average, received almost identical scores on the C scale. This general pattern of gender-related results is similar across a variety of different language versions of *DiSC Classic* (e.g., German, Danish, UK English), although slight variations are sometimes observed.

For reference purposes, Appendix 2 provides a sample of the demographic makeup of three different *DiSC Classic* language versions (US English, UK English, and German). The demographics within these samples are designed to provide a rough reflection of the actual demographics within the larger population. Subsequently, analyses on larger datasets support the validity and reliability that were found in these developmental samples. For instance, a sample of over 7,000 respondents took the US English version of *DiSC Classic*. These respondents were roughly equivalent to the developmental sample on all major demographic categories. As mentioned above, analyses of this newer, larger sample provides continued support for the reliability and validity of the instrument.

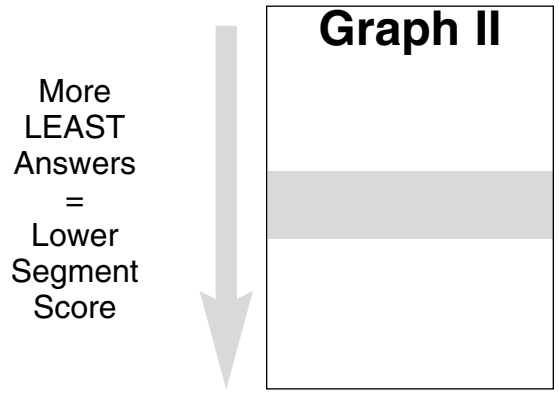
Scoring of the DiSC Profile

DiSC Classic uses a measurement technique that is referred to as "forced-choice." Within *DiSC Classic,* this forced-choice format means that respondents are presented with four adjectives (or phrases in some language versions) and asked to choose one that is most like them and one that is least like them. The primary advantage of this format is that it reduces social desirability of responding. Social scientists have long recognized that when most people take a psychological instrument, they tend to respond in a way that makes them look good. This isn't necessarily a conscious attempt to deceive the instrument or test administrator. Rather, it is a natural desire to think about oneself and present oneself in the most positive light. This is true of most psychologically healthy adults, across almost all cultures. The forced-choice format reduces the influence of this tendency by forcing them to choose only one of many socially desirable choices. For instance, the first response box in the US English version of *DiSC Classic* asks people to choose among the words *enthusiastic*, *daring*, *diplomatic*, and *satisfied*. Each of these words is a positive quality and therefore socially desirable. DiSC respondents, however, can only choose one that is *most* like them. Further, they also are forced to choose one that is *least* like them. Consequently, they cannot choose every positive quality, but rather must choose their relative highs and lows.

After people have completed the 28 forced-choice boxes, their 28 *most* responses are charted on Graph I. On this graph, if a person has a high score on a given DiSC® scale, this means that the person endorsed many items that belonged to that scale as being *most* like them. For instance, a high score on the D scale of Graph I means that a person endorsed many D items (e.g., *daring, determined, outspoken*) as *most* like him or her.



On the other hand, the individual's 28 *least* responses are inverted and then charted on Graph II. If a person has a high score on a given DiSC scale of Graph II, this means that the person did not endorse many items that belong to that scale as *least* like him or her. For instance, a high score on the D scale of Graph II means that a person endorsed very few D items as least like him or her. Conversely, that same person may have a low score on the S scale of Graph II, which means that he endorsed many S items as *least* like him or her. Ultimately, Graphs I and II reflect two different methods of measuring DiSC. The results of these two methods are combined to form Graph III, which is shown to be the most reliable measurement of DiSC.



Most people who have hand-scored a paper and pencil version of *DiSC Classic* have probably noticed that some DiSC items have been assigned the symbol of "N" and are not included in the scoring of a person's DiSC profile. In some cases, it is a *most* response that is not scored. In other cases, it is a *least* response that is not scored. In either case, N responses are not scored because they are not as accurate in their ability to measure the DiSC model as the other items in the profile. For instance, in the US English version of *DiSC Classic*, data analysis showed that a *most* response to the word *observant* was a good measure of the C scale, but a *least* response to that same word was not a good enough measure within the DiSC model. Consequently, a *most* response to *observant* is scored, but a *least* response is not scored (and is treated as an N response.)

N responses also have implications for the range of raw scores on the DiSC graphs. For example, if you look at the D scale on Graph III of the US English version, you will see that the range of raw scores goes from -27 to +27. On the i scale, however, the raw scores range from -26 to +28. This discrepancy occurs because the D scale and I scales have a different arrangement of N responses. More specifically, the D scale has one *most* response that is not scored and so the highest possible score on the D scale is +27 (i.e., 28 most responses minus the one N response that is not scored). The i scale, however, has no *most* responses that are not scored, and consequently, the highest possible score is +28.

Appendix 1

Sample of alpha coefficients for different language versions of Inscape's DiSC® profile*.

Language	D	i	S	C	Sample Size
Chinese	.90	.91	.89	.89	807
Danish	.89	.79	.81	.81	1912
English (US)	.92	.87	.88	.85	812
English (Australian)	.87	.84	.77	.82	406
English (UK)	.89	.91	.85	.87	743
Estonian	.78	.84	.81	.82	908
Finnish	.86	.84	.77	.87	805
German	.90	.92	.82	.91	1111
Hungarian	.87	.83	.81	.82	501
Italian	.84	.84	.77	.83	704
Japanese	.90	.87	.84	.85	813
Korean	.83	.85	.76	.83	1009
Latvian	.76	.73	.77	.71	1041
Lithuanian	.78	.74	.75	.70	852
Norwegian	.87	.83	.80	.83	823
Portuguese	.87	.91	.87	.86	1100
Spanish (Mexican)	.83	.81	.85	.79	901
Spanish (Chile, Columbia)	.79	.74	.76	.74	412
Swedish	.80	.79	.72	.77	1007
Turkish	.75	.75	.77	.72	932

* Results based on development sample of the most recent version of each language version.

Appendix 2

Demographic characteristics of the development samples of the various language versions of *DiSC® Classic*.

US English

Gender:	Male	45%
	Female	55%
Education:	High school diploma or less	28%
	Some post-secondary	27%
	College graduate	30%
	Graduate or professional degree	15%
Employment:	General clerical	8%
	Secretarial/administrative	7%
	Sales	8%
	Technical	7%
	Warehouse or general labor	6%
	Supervisory	6%
	Mid-level management	10%
	Executive	4%
	Professional	25%
	Other	22%
Heritage:	African-American	10%
	Asian-Pacific	2%
	Caucasian	80%
	Hispanic	5%
	Native American	2%
	Other	2%

Total Sample size = 812

Appendix 2 (Continued)

United Kingdom English

Gender	Male	57%
	Female	43%
Age	18-25	18%
	26-35	31%
	36-45	26%
	46-55	19%
	56 and older	6%
Heritage	British	73%
	Irish	21%
	Asian	3%
	European (EU National) other than British or Irish	1%
	European (non-EU National)	1%
	Other	2%
Education	Some secondary education	8%
	GCSE/'O' Level or equivalent	20%
	'A' Level or equivalent	14%
	Technical college or equivalent	13%
	HNC/HND or equivalent	11%
	University graduate or equivalent	25%
	University post-graduate or equivalent	9%
Employment	Secretarial/Clerical	8%
	Executive	5%
	Mid-level management	28%
	Supervisory	10%
	Professional	17%
	Mechanical/Technical	4%
	Skilled trades	1%
	Production worker	1%
	Customer service	7%
	Sales/Marketing	4%
	Health care sorker	4%
	Teacher/Educator	3%
	Homemaker	1%
	Other	9%
Location	Ireland	22%
	U.K.	78%

Total Sample Size = 743

Appendix 2 (Continued)

German

Gender	Male	50%
	Female	50%
Age	16-18	1%
	19-25	18%
	26-40	47%
	41-55	28%
	56-65	4%
	65+	1%
	Missing	2%
Education	No school	1%
	Main school	22%
	Secondary leading to intermediate	29%
	Grammar school	44%
	Missing	5%
Job Status	Head of department	6%
	Worker/Mechanic	6%
	Civil servant	4%
	Self-employed	6%
	Company management	4%
	Unskilled worker	1%
	Clerical services	2%
	Mid-level management	5%
	Educator/Social worker	3%
	Official in charge	12%
	Engineering	7%
	Sales	10%
	Industrial classification	23%
	Missing	11%
Heritage	German	72%
	Swiss	11%
	Austrian	11%
	Other	3%
	Missing	4%

Total Sample Size = 1070

DiSC VALIDATION

