

# Danish Validation Addendum

to Everything DiSC® Research Report for *Everything DiSC Workplace*® Assessment

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## Danish Validation: *Everything DiSC Workplace*®

The purpose of this **addendum** is to expand the Everything DiSC® Research Report for Adaptive Testing Assessment by John Wiley & Sons, Inc. (2012), with validation results from research conducted on the Danish Everything DiSC Workplace® assessment. Included in this addendum are descriptions of the translation and validation of the Danish Everything DiSC Workplace Adaptive Testing (AT) items and Continua Scale items. For information about the background and research on Everything DiSC® and the circumplex representation of the DiSC® model, including information about the validation process, please consult the *Everything DiSC Research Report for Adaptive Testing Assessment* (hereafter referred to as the AT Research Report).

### Description of the Danish Validation of *Everything DiSC Workplace* Population

From December 7<sup>th</sup> to December 22<sup>nd</sup> 2011, a total of 532 Danish speaking men (49.6%) and women (50.4%) responded to a total of 228 items. The tested items belonged to a pool of potential items for Everything DiSC products including Everything DiSC Workplace, and items used on the Continua Scale in the Everything DiSC Comparison Report. The respondents were all members of the YouGov Panel in Denmark who were invited to participate through e-mail invitations. To ensure a representative sample, data was weighted on: gender, age (18-64 years), geography, and education based on census quotas provided by Statistics Denmark (see Table 1).

Table 1. Everything DiSC Assessment Development Danish Sample Demographics

<b>Gender</b>	Male	49.6%
	Female	50.4%
<b>Age</b>	18-34	32.8%
	35-49	35.1%
	50-64	32.1%
<b>Education</b>	Some High School	24.3%
	High School/General	6.9%
	High School/Trade, Technical	2.7%
	Technical Trade/ Vocational School	36.2%
	College Graduate (less than 5 years)	21.8%
	Graduate/Professional Degree (more than 5 years)	7.6%
Other	.6%	
<b>Citizenship</b>	Danish	99.0%
	Other, all European	1.0%

<b>Employment</b>	Employee (non-managerial)	35.8%
	Mid-level manager	8.8%
	Top-level manager	1.3%
	Self-employed	5.6%
	Student/Apprentice/Trainee	20.0%
	Unemployed/Job-seeking	5.5%
	Retired	14.7%
	Other	8.3%
<b>Location</b>	The Capital Region of Denmark	31.0%
	Sealand	14.6%
	Syddanmark	21.4%
	Midtjylland (middle part of Jutland)	22.6%
	Nordjylland (northern part of Jutland)	10.4%
<b>N=532</b>		

## Translation of Items

The quality of the translation of the items was ensured through a six-step process. 1) The items were translated by a professional translator from English (source language) to Danish (target language). It was required that the translator's native language was the target language. 2) Another professional translator, also a native speaker of the target language, was then tasked with back-translating the items from target language to source language. 3) The original items and the back-translated items were reviewed by two bilingual subject matter experts. 4) In situations where there were differences in meaning/connotations between the source and the back-translation, this was fed back to the first translator. 5) The translator looked at the differences and, when appropriate, argued why a word should remain the same or be substituted with a more suitable word to match the meaning of the original English item. 6) In situations where extra input was needed to aid the translation, the development team was contacted to establish the intended meaning/connotation of an item. When translating the items into Danish, the last step was necessary once.

## Reliability Measure: Internal Consistency for *Everything DiSC Workplace*® Items

In the AT Research Report, an overview of the validation of the DiSC® assessment stresses the importance of testing internal consistency. Analysis of internal consistency was performed on the Danish items. This analysis evaluates the degree of correlation among questions that profess to measure the same thing. That is, each of the eight scales in the DiSC model is measured using a series of different items (i.e. questions in the form of statements, such as *I am direct* (in Danish: **Jeg er direkte**), *I tend to be calm* (in Danish: **Jeg har tilbøjelighed til at være rolig**), *I want things to be exact* (in Danish: **Jeg vil have, at alt skal være præcist**), *I am lively* (in Danish: **Jeg er livlig**). 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 each other to some degree. In other words, all of the items on a scale should be consistent with each other. A statistic called Cronbach's alpha is usually regarded as the best method to evaluating internal consistency. This analysis is performed on the Danish data to ensure that the construct developed and tested on a US population could be adapted to a Danish population using the translated items and the Danish test group.

Hence, in order to leave room for local changes, the number of items tested is much larger than the number of items used in the US sample. As expected, the results show that the best fit of items for the 8 DiSC® scales in English and Danish is similar but not identical. This explains minor differences between the Danish and US construction of the scales, such as the difference in number of extra items on the SC and CD scales for responses with high variance (table 3 in the AT Research Report).

Cronbach's alpha expresses the degree of consistency as a specific number, which typically varies between 0 and 1. If the value of alpha is 0 then there is no relationship among the items/statements that have been grouped as a scale. On the other hand, if all the statements in an assessment measure identically, then the value of alpha will be 1.0, which indicates absolute internal consistency. Cronbach's alpha is calculated separately for each of the assessment's eight DiSC scales.

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, suggesting that the respondent is asked to respond to the same thing many times repeatedly, and that those items are not providing any new information about the respondent.

Alpha coefficients were calculated for the Danish sample (N=532). The scales on the Everything DiSC® instruments demonstrate good-to-excellent internal consistency, as shown by the alpha values listed in Table 2. All reliabilities are well above .70, with a median of .84.

Table 2. Internal consistency of the *Everything DiSC* Scales in Danish

<b>Scale</b>	<b>Number of items</b>	<b>Cronbach's Alpha</b>
<b>DI</b>	9	.86
<b>I</b>	7	.86
<b>IS</b>	9	.81
<b>S</b>	10	.81
<b>SC</b>	12	.88
<b>C</b>	11	.80
<b>CD</b>	12	.82
<b>D</b>	8	.87
<b>N=532</b>		

Analyses were also performed to understand the impact of the extra, adaptive questions that respondents receive if there is a large amount of variation within their responses to a single scale's item. That is, if the variance in a respondent's ratings to the items on one scale is above a certain level ( $SD > .95$  on the scale

based on standardized scores), the respondent is given 5 to 8 extra items that continue to measure the trait assessed by the scale. For convenience, the items that all respondents receive are called “base items” and the items that only inconsistent responders receive are called “extra items.”

Table 3 shows the internal reliabilities for only those respondents who gave the most inconsistent responses to a given scale’s items, measured by a high degree of response variance. In other words, these are respondents whose scale preferences seemed most unclear. In the first bold column are the alphas for those respondents using both the base items and extra items (which reflects how these respondents are measured in the actual assessment). In the second bold column are the alphas for those respondents using only the base items. With only the base items, the median alpha in the Danish sample for individual with high variance is .54. The median alpha when the extra items are included is .73. By comparing these two columns, we can see that the internal consistency is much higher for these unclear respondents when they receive the extra items. In essence, these extra items are used to further gauge the target trait when the base assessment has produced unclear or variable results.

Table 3. Alpha coefficients for high variance respondents

Scale	With extra items			Without extra items			Percent receiving extra items
	Alpha	N	#items	Alpha	N	#items	
<b>DI</b>	<b>.73</b>	136	14	<b>.49</b>	136	9	26%
<b>I</b>	<b>.80</b>	118	12	<b>.52</b>	118	7	22%
<b>IS</b>	<b>.69</b>	180	14	<b>.53</b>	180	9	34%
<b>S</b>	<b>.65</b>	177	15	<b>.46</b>	177	10	33%
<b>SC</b>	<b>.70</b>	140	18	<b>.57</b>	140	12	26%
<b>C</b>	<b>.68</b>	214	19	<b>.42</b>	214	11	40%
<b>CD</b>	<b>.82</b>	136	20	<b>.76</b>	136	12	26%
<b>D</b>	<b>.76</b>	138	13	<b>.53</b>	138	8	26%

### Construct Validity: Scale Intercorrelations for Workplace Scales

As part of examining the construct validity of the DiSC® Scales, the Danish items scores from each respondent on the eight DiSC scales were examined. The DiSC model proposes that adjacent scales (e.g., Di, and i) will have moderate correlations. That is, these correlations should be considerably smaller than the alpha reliabilities of the individual scales. For example, the correlation between the SC and S scale (.58) should be substantially lower than the alpha reliability of the SC (.80) or S (.81). Moreover, scales that are theoretically opposite (e.g., i and C) should have strong negative correlations. Table 4 shows data obtained from the sample of 532 respondents who completed the Everything DiSC® assessment in Danish. The

correlations among all eight scales show strong support for the model. That is, moderate positive correlations among adjacent scales and strong negative correlations between opposite scales are observed.

Table 4. Scale Intercorrelations

	<b>Di</b>	<b>i</b>	<b>iS</b>	<b>S</b>	<b>SC</b>	<b>C</b>	<b>CD</b>	<b>D</b>
Di	<b>.86</b>							
i	.51	<b>.86</b>						
iS	.23	.65	<b>.81</b>					
S	-.09	.22	.65	<b>.81</b>				
SC	-.47	-.33	.11	.58	<b>.80</b>			
C	-.12	-.46	-.13	.20	.55	<b>.80</b>		
CD	.28	.02	-.19	-.33	-.18	.26	<b>.82</b>	
D	.66	.36	.08	-.26	-.50	-.10	.59	<b>.87</b>

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 the two variables are completely unrelated. N=532, as shown in Table 1.

### Reliability Measure: Internal Consistency for Continua Scales

The Everything DiSC® Comparison Report allows any two Everything DiSC participants to see their similarities and differences in six out of nine areas. These scales were also constructed on the Danish items; research findings are shown in Table 5. As this is an addendum, please consult section 7 (Comparison Report Research) of the AT Research Report for information about the background of the scales and selection of the six out of nine possible continua.

Alpha internal reliability coefficients were calculated for each of the nine continua, as shown in Table 5, using the sample of 532 Danish-speaking participants. These coefficients range from .72 to .87, with a median reliability of .79. Therefore, these scales demonstrate adequate to excellent internal consistency. This finding suggests that each of these continua scales is measuring a single, unified construct.

Table 5. Alpha Coefficients of the Continua Scales in Danish

<b>Continua Scale in English</b>	<b>Continua Scale in Danish</b>	<b>Number of items</b>	<b>Alpha</b>
<b>Patient - Driven</b>	Tålmodig – Driftig	10	.79
<b>Soft-spoken - Forceful</b>	Afdæmpet - Slagkraftig	13	.87
<b>Outgoing - Private</b>	Udadvendt – Privat	7	.87

<b>Calm - Energetic</b>	Rolig – Energisk	10	.75
<b>Skeptical - Accepting</b>	Skeptisk – Acceperende	12	.72
<b>Daring - Careful</b>	Dristing – Varsom	7	.78
<b>Tactful - Frank</b>	Taktfuld - Ligeferm	8	.74
<b>Accommodating - Strong-willed</b>	Tilpassende--Viljestærk	9	.73
<b>Lively – Reserved</b>	Livlig - Reserveret	12	.84

N=532

## Summary

Analysis of data collected on the Danish Everything DiSC® Adaptive Testing Assessment using Danish participants indicate that the development of the assessment was successful. The findings shows support of the **eight DiSC® Scales**, which are used as the basis of the Everything DiSC Workplace® profile, and the **nine Continua Scales** used in the Everything DiSC® Comparison Report (***Sammenligningsrapport***).

- With high Cronbach’s alphas (.80-.87) for the eight DiSC scales, the **reliability** of the instrument is shown to be very satisfactory. The assessment is adaptive and these reliability measures are a result of analysis on the scale that only includes the base items. Moreover, the results include all responses, even responses from individuals who received the extra items to increase the precision of their score on a specific DiSC scale. Hence, this is a conservative measure because dependent upon the scale, somewhere between 22 and 40 percent of the respondents show high variance and will be asked to respond to extra items and will receive a DiSC scale score based on responses to both base and extra items.
- The **reliability** of the instrument on the nine Continua Scales, indicated by its internal consistency, shows acceptable to good degrees of consistency with Cronbach’s alphas ranging from .73 to .87.
- The construct **validity** of the eight DiSC scales, indicated by scale intercorrelations, supports the circumplex structure of the DiSC model. Using Danish data, previous findings on the English Everything DiSC assessment were confirmed, with adjacent scales showing moderate correlations and opposite scales showing strong negative correlations, as predicted by the model.
- Further analysis on the circumplex structure including correlations between the Everything DiSC scales and the scales of the NEO PI-R and 16PF® are thoroughly documented in the AT Research Report.