



# Comprehension Aptitude Range Technical Summary



# Contents

1.0	Comprehension Aptitude Range Test Information .....	2
2.0	Norm Groups .....	3
3.0	Reports .....	3
4.0	Practice and Preparation .....	3
5.0	Development .....	3
6.0	Languages .....	3
7.0	Reliability .....	4
8.0	Validity .....	5
9.0	Fairness .....	7
10.0	Appendix 1: Internal Consistency Reliabilities for Sub-Tests in Swift .....	11
11.0	Appendix 2: Method for Calculating Criterion Related Validity of a Single Test from the Equivalent Sub-Test in Swift Comprehension Aptitude .....	12



# 1.0 Comprehension Aptitude Range Test Information

## Key information

The tests in this range measure the ability to reason with information presented in different formats:

- **Verbal Comprehension** assesses the ability to understand and interpret written information
- **Numerical Comprehension** assesses the ability to understand and interpret numerical data
- **Error Checking** assesses the ability to proofread text, check figures and verify codes

## Technical Information

- Technology supporting individual time limit for groups of four questions (testlets)
- Linear-on-the-fly (LOFT) testing
  - Fixed-length test
  - Based on Item Response Theory (IRT) methodology and scoring mechanism
  - Draws items of equivalent difficulty from a bank of items for different candidates
- Available for unsupervised use online (Invited Access, IA)
- Compatible with tablets, laptops and desktop computers, with Swift Comprehension Verbal & Numerical also being compatible with smartphones

Test	Total / Sub-Test	No. of Questions	Time Limit (mins)
Swift Comprehension Aptitude	Total	24	9.5
	Verbal Comprehension	8	4
	Numerical Comprehension	8	4
	Error Checking	8	1.5
Swift Comprehension Verbal & Numerical	Total	24	12
	Verbal Comprehension	12	6
	Numerical Comprehension	12	6
Verbal Comprehension Aptitude	Total	32	16
Numerical Comprehension Aptitude	Total	32	16
Error Checking Aptitude	Total	32	6

*Note: Supervised Access (SA) Comprehension Aptitude Range tests using fixed content presented in a fixed order are available for follow-up testing but are not covered in this summary document.*

## 2.0 Norm Groups

A range of international, regional and country specific norms are available for the tests in this range. Information on the the latest norm availability, norm group descriptions and other support documentation for norms can be found in the Client Area on the Saville Assessment website ([www.savilleassessment.com](http://www.savilleassessment.com)).

## 3.0 Reports

Example reports for all the tests in this range can be found in the Client Area on the Saville Assessment website.

## 4.0 Practice and Preparation

Online practice tests are available for all the tests in this range. They are designed to provide a realistic set of example questions in order to help familiarize the test taker with the format and style of the aptitude assessment questions, as well as additional information about the assessment process.

The online practice tests also provide individual feedback on the responses given, featuring realistic time limits which replicate a real assessment scenario.

The aptitude practice and preparation materials can be found on the Saville Assessment website.

## 5.0 Development

The Comprehension Aptitude Range consists of large banks of Verbal Comprehension, Numerical Comprehension and Error Checking items. Items are drawn from these banks to form the single Verbal Comprehension, Numerical Comprehension and Error Checking tests and the corresponding sub-tests of Swift Comprehension Aptitude and Swift Comprehension Verbal & Numerical.

## 6.0 Languages

We are engaged in an ongoing, active program of translation and localization for all of our aptitude assessments. For the latest availability information, please contact Saville Assessment.

## 7.0 Reliability

The internal consistency figures presented here are Separation Indices. This method produces similar figures to Cronbach's Alpha (Andrich, 1982<sup>1</sup>) and allows for an internal consistency calculation to be made in item-banked tests, rather than fixed-form tests.

This section presents internal consistency reliability figures for each of the Comprehension Aptitude Range tests.

For Swift Comprehension Aptitude and Swift Comprehension Verbal & Numerical, it is worth noting that the greatest level of reliability is found at the total score level, which is designed to be the decision-making score. The sub-test scores provide additional test-taking information, but we would not recommend that these are used in isolation for decision making.

The mean percentage correct figures broadly reflect the design aim of giving a positive candidate experience where many candidates answer around 50% of questions correctly.

The large standard deviation values seen in these tables reflect the ability of the items to differentiate performance through a wide score range. This is required to give an accurate representation of test-takers' ability.

### Swift Comprehension Aptitude Internal Consistency Reliability (N=35949)

	Mean % Correct	SD (%)	SEm Sten	SEm 'T'	r
Total	54.69	18.31	.82	4.09	.83

### Swift Comprehension Verbal & Numerical Internal Consistency Reliability (N=35949)

	Mean % Correct	SD (%)	SEm Sten	SEm 'T'	r*
Total	N/A	N/A	.88	4.41	.81

\*Based on the internal consistency reliability for the shorter Swift Comprehension Aptitude Verbal and Numerical sub-tests combined, and corrected for length with the Spearman-Brown Prophecy Formula.

### Verbal Comprehension Aptitude Internal Consistency Reliability (N=31549)

	Mean % Correct	SD (%)	SEm Sten	SEm 'T'	r
Total	68.30	15.05	.95	4.75	.77

<sup>1</sup> Andrich, D. (1982). An index of person separation in latent trait theory, the traditional KR-20 index, and the Guttman scale response pattern. *Education Research and Perspectives*, 9(1), 95-104.

**Numerical Comprehension Aptitude Internal Consistency Reliability (N=20094)**

	Mean % Correct	SD (%)	SEm Sten	SEm 'T'	r
<b>Total</b>	55.65	16.59	.81	4.03	<b>.84</b>

**Error Checking Aptitude Internal Consistency Reliability (N=25801)**

	Mean % Correct	SD (%)	SEm Sten	SEm 'T'	r
<b>Total</b>	60.51	19.00	.64	3.20	<b>.90</b>

## 8.0 Validity

This summary document includes criterion-related validity information for the total score and three sub-tests in Swift Comprehension Aptitude, based on a sample of 308 individuals for whom third-party ratings of workplace performance were collected. The criteria used here represent a priori predictions of the areas of work performance which each test was designed to predict.

The internal consistency of the summed criterion used is .74, which suggests that it is an acceptable assumption to combine the three separate workplace criteria to make a total criterion measure. Because N=263 of this sample of respondents also engaged a second rater of their workplace effectiveness, it was possible to take into account the inter-rater reliability of the criterion, which can artificially limit the validity estimate. The inter-rater reliability measure takes into account the fact that there is always going to be some degree of difference between multiple raters' judgments of effectiveness on the criteria of interest, which can force the validity coefficient down.

The greatest validity contribution comes from the Verbal Comprehension sub-test, with the least coming from the Numerical Comprehension sub-test.

For further information about the criterion-related and other forms of validity evidence for Comprehension Aptitude Range assessments, please contact Saville Assessment.

**Swift Comprehension Aptitude Criterion-Related Validity (N=308)**

	Correlation with Sum of Working with Words, Numbers and Details (Rater)	
	Uncorrected r	Corrected r
<b>Total</b>	<b>.29</b>	<b>.50</b>
	Correlation with Working with Words (Rater)	
	Uncorrected r	Corrected r
<b>Verbal</b>	<b>.24</b>	<b>.43</b>
	Correlation with Working with Numbers (Rater)	
	Uncorrected r	Corrected r
<b>Numerical</b>	<b>.18</b>	<b>.31</b>
	Correlation with Working with Details (Rater)	
	Uncorrected r	Corrected r
<b>Error Checking</b>	<b>.18</b>	<b>.36</b>

*Note: Any raw correlation higher than .12 is statistically significant at the  $p < .05$  level (two-tailed) and any raw correlation higher than .10 is statistically significant at the  $p < .05$  level (one-tailed).  $N=308$ . The criterion inter-rater reliability figures from Project Epsom ( $N=263$ ) and the corrected figures are based on the inter-rater reliability figures for each of the Working with Words, Numbers and Details criteria (.31, .34 and .25 respectively). The criterion internal consistency of ratings ( $N=308$ ) was .74. Other than taking into account the unreliability of the criterion measure, there has been no other adjustment for any statistical artefacts applied.*

Swift Comprehension Verbal & Numerical shares the same content bank as Swift Comprehension Aptitude and has four more items in each sub-test than Swift Comprehension Aptitude. Therefore, it is appropriate to assume that the validity figures for Swift Comprehension Verbal & Numerical will be aligned to those presented for Swift Comprehension Aptitude. Given the increased reliability of the longer Swift Comprehension Verbal & Numerical test, the Swift Comprehension Aptitude validities should be considered a lower-bound estimate of the validities of Swift Comprehension Verbal & Numerical.

Similarly, the Verbal Comprehension, Numerical Comprehension and Error Checking single tests are longer than the Swift Comprehension Aptitude combined assessment and cover the same areas of aptitude in greater depth. It is appropriate to assume that the Swift Comprehension Aptitude validities are a conservative and lower-bound estimate of the validity of the Comprehension Aptitude single tests, which are likely to show incremental validity over the Swift assessment (see Appendix 2).



## 9.0 Fairness

### Gender Group Differences

#### Total Score - Swift Comprehension Aptitude & Swift Comprehension Verbal & Numerical

Test	Male N	Male Mean	Male SD	Female N	Female Mean	Female SD	Pooled SD Difference
SCA Total	13885	-.08	.63	9031	-.09	.63	.02
SCVN Total*	13885	-.03	.64	9031	-.10	.63	.10

\*Estimated based on the Verbal and Numerical sub-tests in SCA

#### By Measure

	Test	Male N	Male Mean	Male SD	Female N	Female Mean	Female SD	Pooled SD Difference
Verbal	SCA Verbal sub-test	13885	-.06	.75	9031	-.04	.75	-.03
	Verbal Comprehension Aptitude	3689	.27	.86	3547	.27	.85	.01
Numerical	SCA Numerical sub-test	13885	.00	.76	9031	-.16	.73	.20
	Numerical Comprehension Aptitude	2153	.01	.14	1662	.01	.15	.01
Checking	SCA Error Checking sub-test	13885	-.17	.91	9031	-.08	.92	-.09
	Error Checking Aptitude	1496	.39	1.03	1756	.59	.87	-.21

The tables above present the gender group differences on the Swift Comprehension Aptitude Total Score, Swift Comprehension Verbal & Numerical estimated Total Score, and separately the relevant tests that measure each of the three aptitude areas in the Comprehension range - verbal, numerical and error checking.

Expressed in terms of raw theta (ability) scores, there was no notable difference between men and women on the Swift Comprehension Aptitude or Swift Comprehension Verbal & Numerical Total Score. There was also no notable difference between the two gender groups on the Swift version or the full-length verbal comprehension tests. In the numerical tests, there was a small difference (.20 of a standard deviation) with men tending to score slightly higher than women in the Swift sub-test, but this was not shown in the full-length version. In contrast, a small difference (.21 of a standard deviation) was found with women slightly outperforming men on the single Error Checking Aptitude test, yet the two gender groups did not differ in their performance on the corresponding Swift sub-test.

## Age Group Differences

### Total Score - Swift Comprehension Aptitude & Swift Comprehension Verbal & Numerical

Test	Under 40 N	Under 40 Mean	Under 40 SD	Over 40 N	Over 40 Mean	Over 40 SD	Pooled SD Difference
SCA Total	15546	-.04	.64	5306	-.18	.61	.23
SCVN Total*	15546	-.03	.64	5306	-.13	.61	.16

\*Estimated based on the Verbal and Numerical sub-tests in SCA

### By Measure

	Test	Under 40 N	Under 40 Mean	Under 40 SD	Over 40 N	Over 40 Mean	Over 40 SD	Pooled SD Difference
Verbal	SCA Verbal sub-test	15546	-.03	.75	5306	-.08	.74	.06
	Verbal Comprehension Aptitude	4651	.31	.86	1846	.22	.80	.11
Numerical	SCA Numerical sub-test	15546	-.02	.76	5306	-.18	.72	.21
	Numerical Comprehension Aptitude	2845	.02	.14	636	-.04	.15	.40
Checking	SCA Error Checking sub-test	15546	-.07	.93	5306	-.29	.87	.25
	Error Checking Aptitude	2217	.65	.90	628	.29	.85	.41

The tables above present the age group differences on the Swift Comprehension Aptitude Total Score, Swift Comprehension Verbal & Numerical estimated Total Score, and separately the relevant tests that measure each of the three aptitude areas in the Comprehension range - verbal, numerical and error checking.

Expressed in terms of raw theta (ability) scores, there was a small difference (.23 of a standard deviation) between the younger group and the older group on the Swift Comprehension Aptitude Total Score. Small differences (ranged from .21 to .41 of an SD) were also found between the two groups in the tests that measure numerical comprehension and error checking. In all of these cases, the younger age group overall scored slightly higher than the older age group, which is consistent with the extant research literature. However, there was no notable difference between the young group and the older group on the estimated Swift Comprehension Verbal & Numerical Total Score or all the verbal comprehension tests.

## Ethnic Group Differences

### Total Score - Swift Comprehension Aptitude & Swift Comprehension Verbal & Numerical

Test	White N	White Mean	White SD	Other Ethnicities N	Other Ethnicities Mean	Other Ethnicities SD	Pooled SD Difference
SCA Total	10854	.09	.61	8714	-.28	.60	.62
SCVN Total*	10854	.12	.61	8714	-.26	.61	.61

\*Estimated based on the Verbal and Numerical sub-tests in SCA

### By Measure

	Test	White N	White Mean	White SD	Other Ethnicities N	Other Ethnicities Mean	Other Ethnicities SD	Pooled SD Difference
Verbal	SCA Verbal sub-test	10854	.17	.71	8714	-.29	.73	.65
	Verbal Comprehension Aptitude	3942	.51	.78	783	-.17	.84	.86
Numerical	SCA Numerical sub-test	10854	.06	.75	8714	-.22	.73	.38
	Numerical Comprehension Aptitude	1639	.02	.13	716	-.02	.18	.24
Checking	SCA Error Checking sub-test	10854	.04	.91	8714	-.34	.88	.42
	Error Checking Aptitude	1812	.70	.84	661	.33	1.00	.41

The tables above present the ethnic group differences on the Swift Comprehension Aptitude Total Score, Swift Comprehension Verbal & Numerical estimated Total Score, and separately the relevant tests that measure each of the three aptitude areas in the Comprehension range - verbal, numerical and error checking.

Expressed in terms of raw theta (ability) scores, there was a moderate difference between the white group and other ethnicities on the Swift Comprehension Aptitude Total Score and Swift Comprehension Verbal & Numerical Total Score (.62 and .61 of a standard deviation respectively). Moderate to large differences (.65 and .86 of an SD) were found between the two groups on tests that measure verbal comprehension, while the differences between the two groups were small (ranged from .24 to .42 of an SD) on the tests that measure numerical comprehension and error checking. In all of these cases, the white group overall scored higher than other ethnicities.

These results are consistent with ethnic group difference findings for cognitive ability tests, with the differences for Verbal Comprehension being largest.

## Group Differences Summary

The data presented on the differences between the means for different groups reveal a number of group differences on the total scores. The differences here are broadly in line with the research literature and in some cases tend to be less pronounced than has been found in other studies. The differences on gender tend to be small (to almost non-existent). Small differences are seen on age with younger people, on average, achieving slightly higher overall scores. The largest differences are seen between white and other ethnicities with white groups on average performing higher.

The information presented here is from actual usage data of the Comprehension Aptitude Range and as a result the differences on some variables may reflect differences in the composition of the various groups. For example, age differences could be related to longer tenure in organizations and generational differences. Similarly, observed gender and ethnic differences could be a reflection of other biographical differences in the composition of these groups (e.g., level and type of education), rather than actual group differences.

Moreover, the performance differences reported are at the group level, rather than being reflective of specific individuals. In all cases, the average group-levels of performance represent largely overlapping performance distributions, with greater variation in performance within any group than between groups. Based on these average group-level data, it is inaccurate and inappropriate to make any predictions or decisions about any given individual's performance as a result of their membership of a particular ethnic group.

It is also important to bear in mind that each sample of individuals is different and group differences should not be generalized beyond these specifically-reported samples in an excessively broad manner. For example, the ethnic differences seen with cognitive tests are likely due, at least in part, to a difference in socioeconomic status, education and language proficiency across the specific groups of people sampled. While those group differences which do exist are interesting, it is worth noting that it is frequently difficult to isolate these variables as the sole determinant of the apparent difference.

As measures of cognitive ability, Comprehension Aptitude Range tests will occasionally reveal small to moderate differences between groups. To ensure that any group differences shown are meaningful, relevant and fair, it is important to make sure that the use of such tests can be justified. This is especially true when using a test in selection with a cut-off score. Justifying the use of any test involves making sure that the skills being assessed by the test are relevant and valid and that the level of any cut-off applied is demonstrably appropriate. The use of job analysis and, where possible, local validation studies is particularly important for demonstrating the link between a test and the job it is being used to select for.

In particular, the use of high cut-offs (e.g. above the 50th percentile) may require justification and analysis to ensure that this does not lead to adverse impact against any group. A further precaution is to use a behavioral measure, e.g. Work Strengths or Match 6.5, alongside aptitude to create a weighted overall fit score which can be expected to mitigate against the potential for adverse impact.

It is one thing for an assessment to be designed to be fair and valid, and another for it to be used fairly. The clearer and more consistent the structure and process presented for aligning the Comprehension Aptitude Range to a job and agreeing consistent criteria for decision making based on the test, the less likely it is that the assessments will be unfairly applied by using different standards for candidates in different groups.

In general, the differences between age, gender and ethnic groups are small or moderate and we do not therefore advise that specific differences in profile interpretation should be warranted when considering test results from different groups defined according to these variables.

We do not, unless local legal frameworks permit or mandate such an approach, recommend using separate norms for age, gender or ethnic groups. For further information, please contact Saville Assessment directly.

## 10.0 Appendix 1: Internal Consistency Reliabilities for Sub-Tests in Swift

The following tables show the internal consistency reliability coefficients for the sub-tests in Swift Comprehension Aptitude and Swift Comprehension Verbal & Numerical. The sub-test scores provide additional test-taking information and should not be used in isolation for decision making. Therefore, we are not seeking the sub-tests to necessarily have reliability estimates higher than .70.

### *Swift Comprehension Aptitude Internal Consistency Reliabilities (N=35949)*

Sub-Test	Mean % Correct	SD (%)	SEm Sten	SEm 'T'	r
Verbal	61.72	22.07	1.30	6.49	<b>.58</b>
Numerical	52.48	22.59	1.23	6.17	<b>.62</b>
Error Checking	49.86	25.49	1.00	5.01	<b>.75</b>

### *Swift Comprehension Verbal & Numerical Internal Consistency Reliabilities (N=35949)*

Sub-Test	Mean % Correct	SD (%)	SEm Sten	SEm 'T'	r
Verbal	/	/	1.14	5.72	<b>.67</b>
Numerical	/	/	1.08	5.39	<b>.71</b>

*\*Based on the internal consistency reliability for the shorter Swift Comprehension Aptitude Verbal and Numerical sub-tests, and corrected for length with the Spearman-Brown Prophecy Formula.*

## 11.0 Appendix 2: Method for Calculating Criterion Related Validity of a Single Test from the Equivalent Sub-Test in Swift Comprehension

It is possible to calculate the criterion-related validity of each of the full-length, single tests based on validity evidence from the equivalent Swift sub-test. The variables used to derive the validity figures presented in this document are outlined below.

Test	Criterion Related Validity	Raw Criterion Related Validity of Equivalent SCA Sub-Test (Epsom N=308)	Reliability of Equivalent SCA Sub-Test*	Inter-Rater Reliability of SCA Sub-Test's Equivalent Criterion (Epsom N=308)	Reliability of Single Tests**
Verbal Comprehension Aptitude	.50	.24	.58	.31	.77
Numerical Comprehension Aptitude	.36	.18	.62	.34	.84
Error Checking Aptitude	.39	.18	.75	.25	.90
		$(r_{xy})$	$(r_{xx})$	$(r_{yy})$	$(r_{zz})$

\*Reliability figures for the equivalent Swift sub-tests are all internal consistency figures from the largest sample size available.

\*\*Reliability figures for the single tests are all internal consistency figures from the largest sample size available.

## Saville Assessment

CI Tower  
1st Floor  
St George's Square  
New Malden  
KT3 4HG  
United Kingdom

Tel +44(0)20 8619 9000

[info@savilleassessment.com](mailto:info@savilleassessment.com)