# Concurrent validity of the SAT and the General Academic Prerequisites Test (GAP)

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## *Abstract*

There are many tests for general skills assessment. Some of them are well-known and widely accepted for admission purpose, like SAT or GRE. But in non-English speaking countries, their usage is doubtful due to country-specific and language-specific issues. Scio, the Czech assessment company, has been developing its study aptitude test called "test Obecných studijních předpokladů (OSP)" (General Academic Prerequisites *test,* abbr. GAP) since 1996. Many universities in the Czech Republic and the Slovak Republic have been using that test (as part of the National Comparative Exams, abbr. NCE) in admission process. The concurrent validity of GAP and SAT tests has been analysed and the outcomes prove high correlation between GAP and SAT results, either in overall score and in Critical Reading and Math sections. SAT ExamSATs are used by many universities in the USA and other countries around the world as one of the admission criteria. More information on: *www.collegeboard.org*.

## *General Academic Prerequisites Test (GAP)*

**Verbal section**
Measures the ability to comprehend long, complex texts and their interpretation, distinguish differences between the meaninsg of words, coming to correct conclusions after reading a text.

**Analytical section**
Evaluation of logical reasoning, analysing and working with data

**Quantitative section**
Tests elementary mathematical skills, working with numbers and values, ability to read and interpret spreadsheets and charts and performing elementary mathematical operations without the use of a calculator.

GAP sample: http://www.scio.cz/1_download/gapsample.pdf

|  | GAP |
|---|---|
| **Testing time (minutes)** | 90 |
| **Number of queries** | 85 |
| **Number of sections** | verbal (35) analytic (25) quantitative (25) |
| **Taking points off for incorrect answers** | YES |
| **Gross success rate** | between 50 - 60% |
| **Average discrimination** | between 31 - 38% |
| **Reliability**<br>    Cronbach alfa<br>    KR-20 | <br>between 0,89 - 0,92<br>between 0,89 - 0,93 |

## *Data and Method*

From December 2009 to June 2012 we asked participants of the GAP test in the NCE, whether they have recently passed the SAT. The other group were participants of the SAT, but not the GAP, who were offered passing the GAP test free of charge. That way we have got the sample of 108 persons with certified results both in the GAP and in the SAT, a few of whom have

passed the SAT test more than once. The most recent date of passing their SAT was 2008 or later for 104 of 108 persons, three passed it in 2007 and one in 2005. However, the majority of persons in our sample have passed their SAT and GAP test within the span of one year.

The SAT gives results as scores for three separate sections: Critical Reading, Math and Writing. There is no overall score. The GAP has three sections, too (see the GAP test specification above), but the outcomes are given as percentiles in each of the sections as well as an overall percentile.

Normally, one may take part in the NCE more than once during the season (from December to June). If so, his or her final result is the best of all attempts. Many of participants utilise that benefit every year and so did many of the members of our sample. On the other hand, the majority of subjects in our sample had taken part in the SAT only once. Therefore, for the sake of properly  comparing their GAP score with their SAT score, we have taken only the first attempt results of the GAP test into account.

To have a good concurrent validity, the GAP test should keep examinees in very similar rank as the SAT test. We therefore computed Spearman correlation coefficients between the SAT and the GAP outcomes.

If the GAP and SAT even were congeneric tests (within the meaning of the classical test theory) and so had a perfect concurrent validity, the Pearson correlation between observed scores would be still lower than 1 – the upper limit is a square root of the product of reliabilities. To compare the real reliability with this optimal case, Pearson correlation coefficients between the SAT and GAP outcomes were computed, too. For this purpose, the GAP outcomes have been transformed from percentiles by normal quantile function to be closer to the normal distribution assumption.


## *Correlation Analysis*

Table 1 presents the Spearman correlation coefficients between sections and overall outcomes of both tests. Table 2 does the same for Pearson correlation coefficients, when GAP outcomes are transformed towards the normal distribution.

*Table 1. Spearman correlation coefficients between SAT scores and GAP percentiles*

| | | SAT scores | | | |
|---|---|---|---|---|---|
| | | **Critical Reading** | **Math** | **Writing** | **Mean** |
| **GAP percentiles** | **Verbal** | **0.697** | 0.572 | 0.552 | 0.687 |
| | **Analytical** | 0.584 | 0.600 | 0.463 | 0.630 |
| | **Quantitative** | 0.410 | **0.707** | 0.362 | 0.533 |
| | **Overall** | 0.681 | 0.729 | 0.536 | **0.739** |

Correlations of overall outcomes are very high and they witness about a strong relationship between the SAT and GAP results. Among test sections, strong relationships are observed both between the SAT Critical Reading and GAP Verbal sections and between the SAT Math and GAP Quantitative sections. Only the SAT Writing section has no strong partner in the GAP test, while the GAP Analytical section has probably some relation to the SAT Math section.

*Table 2. Pearson correlation coefficients between SAT scores and GAP transformed (normalized) percentiles*

| | | SAT scores | | | |
|---|---|---|---|---|---|
| | | Critical Reading | Math | Writing | Mean |
| GAP transf. percentiles | Verbal | **0.711** | 0.583 | 0.603 | 0.713 |
| | Analytical | 0.593 | 0.634 | 0.498 | 0.643 |
| | Quantitative | 0.451 | **0.729** | 0.388 | 0.576 |
| | Overall | 0.702 | 0.755 | 0.585 | **0.761** |

The numbers in Table 2 are similar to those in Table 1, they are even slightly higher. The 95% confidence intervals for highlighted coefficients, under assumption of normal distribution of both SAT and GAP scores, lie approximately between 0.62 and 0.84, so our sample seems to be sufficient for proving the strength of relationship.

As we stated in Data And Method chapter, even in the optimal case of perfect concurrency we would get correlations lower than 1. The upper limit for correlation in optimal case, i. e. at least congeneric tests, is a square root of the product of reliabilities. Table 3 presents mean section and overall reliabilities for the SAT and GAP. The upper limit for possible correlation between tests is computed in the bottom row.

*Table 3. Section and overall reliabilities for the SAT and GAP*

| | sections | overall |
|---|---|---|
| **SAT** | 0,91 | 0,94 |
| **GAP** | 0,83 | 0,91 |
| **correlation limit** | **0,87** | **0,92** |

As we see, reaching correlation 0.761 is very good when more than 0.92 is impossible. The same may be said about correlations between outcomes in particular sections – reaching 0.711 and 0.729 is great when having 0.87 as the upper limit.

## Discussion

The real correlations between the outcomes of SAT and GAP tests may be even higher than computed. There were at least three factors bringing some amount of noise into the relation of he test results for every participant in our sample:

1. The SAT is in English, but the language of the GAP test, as well as of the most of its participants, is Czech or Slovak. So outcomes of the SAT reflect also English language skills while the GAP outcomes do not.
2. The SAT and the GAP were not passed in the same time, there may be a gap of some months or years. So outcomes do not reflect the same exact situation of examinees.
3. There were no participants of SAT with poor results in the GAP test in our sample. If we added participants with poor results in the GAP to the sample, they would probably reach poor results in the SAT too, so the correlation coefficients would probably increase.

## References and links

1. SAT specification:
   http://professionals.collegeboard.com/testing/sat-reasoning/about/sections

2. GAP description and sample tests:
   http://www.scio.cz/nsz/cs/osp.asp

3. Davidshofer; Murphy, K. R.; Charles, O. Psychological testing: principles and applications (6th ed.). Upper Saddle River, N.J.: Pearson/Prentice Hall. ISBN 0-13-189172-3.

4. Correlation at Wikipedia:
   http://en.wikipedia.org/wiki/Correlation_and_dependence

5. Reliability And Validity at Wikiversity:
   http://en.wikiversity.org/wiki/Reliability_and_validity

## *Conclusion*

Correlation analysis proves that overall outcomes of the SAT and GAP tests are highly correlated, either by means of rank correlation (Spearman) or the common Pearson correlation. Moreover, it is very likely that the real correlation is underestimated. The concurrent validity of the overall GAP test score is high with respect to the well-known and certified SAT.
The verbal section of the GAP test has high concurrent validity with respect to the SAT Critical Reading section. The same holds for the quantitative section of the GAP test with respect to the SAT Math section. The only section in the SAT without direct partner in the GAP is Writing; the Analytic section in the GAP tends to both Critical Reading and Math but the relation is not so strong.

## *Should you be interested in further information, please contact:*

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