

Verbal- and non-verbal intelligence tests as measures of cognitive aptitudes:

A comparison of privileged and underprivileged elementary school children

EVES

Paedagogische Hochschule Heidelberg

Isabelle Zöllner

Anke Treutlein

Jeanette Roos

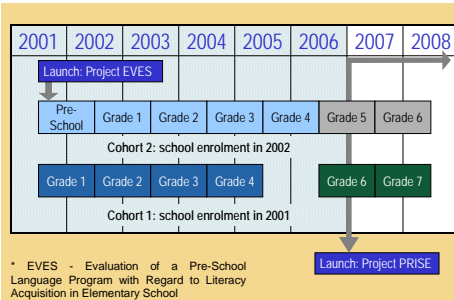
Hermann Schöler

Introduction

Verbal intelligence tests are often considered as biased with regard to socio-economic background and prior language-related learning experiences. Whereas non-verbal intelligence tests are said to neglect important aspects of cognitive aptitudes. Nevertheless, intelligence tests continue to be the most widely used measures of cognitive aptitudes.

In the following, the achievement level of privileged and underprivileged elementary school from German-speaking and non-German-speaking families are compared in regard to performance level in both verbal and non-verbal intelligence tests. In accordance to popular opinion, it is expected that underprivileged children (especially those from non-German-speaking families) score higher on non-verbal than verbal tests of mental abilities.

Design



As part of the EVES* longitudinal study cognitive aptitudes as well as reading and spelling skills of 1520 children (735 girls and 785 boys) were assessed throughout elementary school. As part of the follow-up study PRISE (Transition from Primary to Secondary School) mental abilities as well as academic performance are being observed for two more years in middle school.

Method

Sample

The total EVES-sample consists of 1520 elementary school students (739 girls: 48.6%; 781 boys: 51.4%) from 16 elementary schools in Heidelberg. The children started school in 2001 and 2002 respectively. The age at school enrolment ranges from 5;0 to 8;9 with an average of 6 years and 7 months.

Socioeconomic background:

Socioeconomic status is measured by the Highest International Socioeconomic Index of Occupational Status (HISEI). The average HISEI is $M = 60$. (As a traditional university town, Heidelberg attracts many people with a high level of education. Accordingly, 56 % of the participating students have at least one parent with a university degree.)

Language environment

Approximately 73 % of the children are monolingual with German as their native language, 12 % are multilingual, with one German-speaking parent, 15 % have a migrant background and parents that rate their German skills as poor.

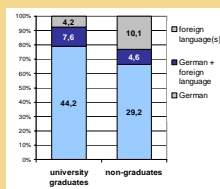


Fig. 1: Family language and educational background

Materials / Methods

Dependent Variables

Cognitive Aptitudes

Grade 1	Grade 2	Grade 4	Grade 5	Grade 6
Culture Fair Test – CFT 1 Cattell, Weiß & Osterland, 1997		Prüfsystem zur Schul- und Bildungsberatung – PSB Lukesch, Kornmann, Mayrhofer, 2002		
non-verbal		non-verbal + verbal		

Independent Variable

Family Background

HISEI – Highest International Socioeconomic Index

- 'underprivileged students' → HISEI ≤ 40
- 'privileged students' → HISEI ≥ 70

Language Environment

- Non-German → for both parents German is not the native language
- German → both parents are native speakers

Results

Family Background

Figure 2 shows the results of a 2-factor analysis of variance with socio-economic background and language environment as main factors:

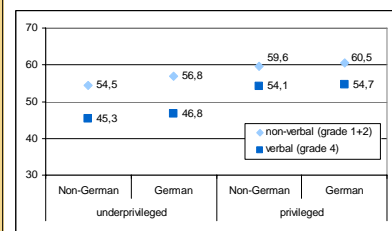


Fig. 2: Performance level in non-verbal and verbal tests of mental abilities (t-scores)

Regardless of prior language-related experiences all students perform better on non-verbal than verbal aptitude tests ($r^2 = .27$).

Compared to children from underprivileged families privileged students achieve significantly better results on verbal as well as non-verbal intelligence tests ($r^2 = .08$). All in all, the difference between performance in verbal and non-verbal test is particularly pronounced for underprivileged children ($r^2 = .02$).

Stability

In each grade children of lower socioeconomic background are outperformed by children growing up in families with a high socio-economic status ($r^2 = .11$).

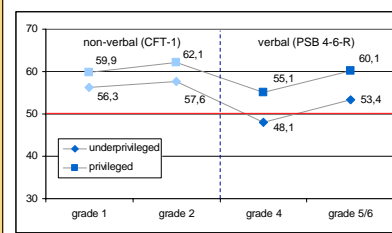


Fig. 3: Stability of performance over time and across different test materials (t-scores)

Over time, test performance of all students varies significantly ($r^2 = .49$). A particular strong decrease in performance can be observed towards the end of fourth grade (Fig. 3).

Despite these variations, the achievement level of privileged and underprivileged students has to be considered as elevated compared to the standardization sample (red line).

Test Materials

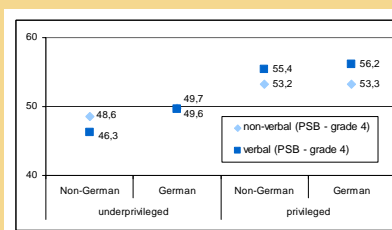


Fig. 4: Comparison of average test performance (t-scores) in verbal and non-verbal subtests of PSB 4-6 (grade 4)

All in all, a comparison of the average score on all verbal (subtest 1, 5, 8 → subtests with highest loading on verbal factor according to test manual) and non-verbal tasks (all other subtests) shows a higher achievement level of privileged children compared to students of low socioeconomic background ($r^2 = .12$) (Fig.4).

In can, however, be observed that regardless of prior language related experiences privileged children tend to score higher on verbal than non-verbal tasks, whereas the opposite effect can be found for underprivileged children.

Conclusion

Growing up in a non-German-speaking family has no significant influence on test performance. Regardless of family language, test materials (verbal / non-verbal) and duration of schooling (grade) underprivileged elementary school students are outperformed by children of higher socioeconomic background. Although, the present findings indicate that test results of underprivileged children tend to be lower on verbal than non-verbal tests the effects are very small and thus contradict the assumption that differences in cognitive aptitudes of privileged and underprivileged children are mainly due to unfairness in tests.

For further information, ...

please contact us

Projekt EVES / PRISE
Paedagogische Hochschule Heidelberg
☎ + (0)621 / 477-422
e-mail: prise@ph-heidelberg.de

or visit our website:

www.ph-heidelberg.de/wp/schoeler/EVES.html