

Cognitive Basic Skills (Non-Verbal) Data in the Scientific Use File

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Cognitive Basic Skills (Non-Verbal) – Data in the Scientific Use File

1 Introduction

In NEPS, cognitive basic skills are measured with two tests: the Picture Symbol Test (NEPS-BZT) assessing *perceptual speed* and the matrices test (NEPS-MAT) assessing *reasoning*. The results of both tests provide an estimator of basic cognitive skills. In order to administer age-appropriate tests to the subjects, three different versions exist for subjects attending Kindergarten, for subjects attending elementary school and for subjects in secondary school or adults. The versions vary in their number of items per test and the test duration to complete the test.

The test was developed by Frieder R. Lang and his colleagues. A description of the rational, the theoretical framework and the development of the tests is given by Brunner, Lang, & Lüdtke (2009) and Lang, Kamin, Rohr, Stünkel, & Williger (2012).¹

The NEPS-BZT requires to match figures or numbers with graphical symbols. An answer key on top of the testing page shows every graphical symbol in the test with a figure (in Kindergarten and elementary school) or a number (from fifth grade up to adults). Below, bands of symbols are given and the participants have to enter the correct figures/numbers for the preset symbols according to the given answer key. The participants are instructed to match the figures/numbers assigned to the symbols as quickly as possible.

In the NEPS-MAT test, each item consists of several horizontally and vertically arranged fields in which different geometrical elements are shown – with only one field remaining free. The logical rules on which the pattern of the geometrical elements is based have to be deduced in order to be able to select the right complement for the free field from the offered solutions.

This report aims at describing the data of cognitive basic skills available in the Scientific Use File (SUF). In the following sections, we will first give a short description of the composition of the tests for the different age cohorts including number of items and test length. We will then describe the variables measuring cognitive basic skills available in the SUF for the different age cohorts.

2 Composition of the Tests Assessing Cognitive Basic Skills in the NEPS

2.1 Kindergarten

The Picture Symbol Test measuring perceptual speed of the children attending Kindergarten consists of two sets. Each set contains 21 items. The matrices test measuring reasoning comprises two sets each with six items.

2.2 Elementary School

The Picture Symbol Test that is administered to elementary school children is the same as the Picture Symbol Test for children in Kindergarten. It consists of two sets each with 21 items. The matrices test for elementary school children comprises two sets. Each set

¹ Both texts are to appear as NEPS Working Papers within the next months (2013)

contains six items. Eight of the 12 items of the matrices test are the same for the versions in Kindergarten and elementary school, four of them differ.

2.3 Secondary School and Adults

In older age cohorts, starting from fifth grade up to adults, the Picture Symbol Test measuring perceptual speed comprises three sets. Each set consists of 31 items. The matrices test assessing reasoning contains three sets, each with four items.

A summary of the composition of the different test versions including the number of items and the duration time of testing is depicted in Table 1 for the Picture Symbol Test and in Table 2 for the matrices test. In Figure 1 an example item of the Picture Symbol Test is given, Figure 2 presents an example item of the matrices test.

Table 1: NEPS-BZT for different target groups

Picture Symbol Test (NEPS-BZT)				
Target group	Length [Number of items]		Time [in sec]	
Kindergarten	2 sets x 21 items	42 items	45 sec. per set	90 sec.
Elem. school	2 sets x 21 items	42 items	30 sec. per set	60 sec.
Sec. school and adults	3 sets x 31 items	93 items	30 sec. per set	90 sec.

Table 2: NEPS-MAT for different target groups

Matrices Test (NEPS-MAT)				
Target group	Length [Number of items]		Time [in sec]	
Kindergarten	2 sets x 6 items	12 items	3 min. per set	6 min.
Elem. school	2 sets x 6 items	12 items	3 min. per set	6 min.
Sec. school and adults	3 sets x 4 items	12 items	3 min. per set	9 min.

3 Data in the Scientific Use File

3.1 Variable Names

Item scores, sum scores per set and overall sum scores are provided in the SUF. For the matrices test, scores per item and an overall score for the matrices test assessing reasoning are given. For the Picture Symbol Test, sum scores per set and an overall score for the Picture Symbol Test assessing perceptual speed are given. The same items which are administered in different test versions have always the same variable names. For instance, there are some items of the reasoning test which are administered in Kindergarten and elementary school. Therefore, the variable name of the items does not provide information about the number of set and the position of the item in the set. However, the variable label indicates in which set and on which position in the set the item has been posed. Consequently, items may have the same variable name, but different variable names, when they are administered in another position and/or another set in different test versions.

3.1.1 Item scores

Item scores are provided for the matrices test (NEPS-MAT) assessing reasoning (see Table 3).

Table 3: Variable names for item scores

Instrument		Target Group		Item identifier				
D	G	C	I	2	3	3	1	_c
Cognitive Basic Skills		CI – secondary school, adults CJ – Kindergarten, elementary school		2 - reasoning	Number of item			_c - Scored item

3.1.2 Sum scores per set

Sum scores per set are provided for the Picture Symbol Test (NEPS-BZT) assessing perceptual speed (see Table 4).

Table 4: Variable names for sum scores per set

Instrument		Target Group		Item identifier		
D	G	C	I	1	3	0s_c
Cognitive Basic Skills		CI – secondary school, adults CJ – Kindergarten, elementary school		1 – perceptual speed	Number of set	0s_c – Sum score of the set

3.1.3 Overall scores

Two overall scores are provided: one for the Picture Symbol Test and one for the matrices test (see Table 5).

Table 5: Variable names for overall scores

Instrument		Target Group		Identification of sum score
D	G	G	5	sc3a
Cognitive Basic Skills		K1 – Kindergarten, wave 1		sc3a – Sum score of the Picture Symbol Test
		G5 – Grade 5		sc3b – Sum score of the matrices test
		A1 – Adults, wave 1		
		...		

3.2 Data in Kindergarten

3.2.1 Picture Symbol Test

In the SUF, sum scores indicating the number of correctly answered items are provided for the overall test as well as for each item set (see Table 6). Since each of the two sets in the Picture Symbol Test comprises 21 items for children in Kindergarten, the sum scores per set range from 0 to 21. Consequently, the overall sum score has a maximum of 42. A value of 33, for instance, means that 33 of the 42 items of the perceptual speed test were solved correctly within time. In fact, the sum score of the Picture Symbol Test mainly depends on the items that are reached within time.

Table 6: Variables of the NEPS-BZT using the example of the A13

Variable name	Variable label	Maximum score	Description
dgcj110s_c	DGCF (perceptual speed): Set 1: sum	21	Sum of Set 1 of the Picture Symbol Test across 21 items
dgcj120s_c	DGCF (perceptual speed): Set 2: sum	21	Sum of Set 2 of the Picture Symbol Test across 21 items
dgk2_sc3a	DGCF (perceptual speed): sum	42	Overall sum score of the Picture Symbol Test in Kindergarten, wave 2

3.2.2 Matrices test

The matrices test for children in Kindergarten consists of 12 items assessing reasoning. The 12 items refer to two sets. In the SUF, responses for each of the items are provided (see Table 7). The items are scored dichotomously with 0 indicating an incorrect response and 1 indicating a correct response. The sum score of reasoning has a maximum score of 12 points (see Table 7). In fact, most of the children reach the end of the matrices test. Therefore, the sum score mainly depends on the number of items that are solved correctly.

Table 7: Variables of the NEPS-MAT using the example of the A13

Variable name	Variable label	Maximum score	Description
dgci2101_c to dgci2206_c	DGCF (reasoning): Set 1: Item 1 to Set 2: Item 6	1	Scored items (0 = incorrect, 1 = correct) assessing reasoning
dgk2_sc3b	DGCF (reasoning): sum	12	Overall sum score of the matrices test in Kindergarten

Note that the overall sum scores of the Picture Symbol test and the Matrices test might have another variable name, depending on the target group which has been assessed. However, the overall scores of the test in Kindergarten and elementary school are comparable as they always include the same items.

3.3 Data in Elementary School

3.3.1 Picture Symbol Test

In the SUF, sum scores indicating the number of correctly answered items are provided for the overall test as well as for each item set (see Table 8). Since each of the two sets in the Picture Symbol Test comprises 21 items for children in elementary school, the sum scores per set range from 0 to 21. Consequently, the overall sum score has a maximum of 42. A value of 33, for instance, means that 33 of the 42 items of the perceptual speed test were solved correctly within time. In fact, the sum score of the Picture Symbol Test mainly depends on the items that are reached within time.

Table 8: Variables of the NEPS-BZT using the example of elementary school, Grade 2

Variable name	Variable label	Maximum score	Description
dgcj110s_c	DGCF (perceptual speed): Set 1: sum	21	Sum of Set 1 of the Picture Symbol Test across 21 items
dgcj120s_c	DGCF (perceptual speed): Set 2: sum	21	Sum of Set 2 of the Picture Symbol Test across 21 items
dgg2_sc3a	DGCF (perceptual speed): sum	42	Overall sum score of the Picture Symbol Test in Grade 2

3.3.2 Matrices test

The matrices test for children in elementary school consists of 12 items assessing reasoning. The 12 items refer to two sets. In the SUF, responses for each of the items are provided (see Table 9). The items are scored dichotomously with 0 indicating an incorrect response and 1 indicating a correct response. The sum score of reasoning has a maximum score of 12 points (see Table 9). In fact, most of the children reach the end of the matrices test. Therefore, the sum score mainly depends on the number of items that are solved correctly.

Table 9: Variables of the NEPS-MAT using the example of elementary school, Grade 2

Variable name	Variable label	Maximum score	Description
dgcj2101_c to dgcj2206_c	DGCF (reasoning): Set 1: Item 1 to Set 2: Item 6	1	Scored items (0 = incorrect, 1 = correct) assessing reasoning
dgg2_sc3b	DGCF (reasoning): sum	12	Overall sum score of the matrices test in Grade 2

Note that the overall sum scores of the Picture Symbol test and the Matrices test might have another variable name, depending on the target group which has been assessed. However, the overall scores of the test in elementary school are comparable as they always include the same items.

3.4 Data in Secondary School and Adults

3.4.1 Picture Symbol Test

For secondary school children and adults, three sum scores for the three sets of the Picture Symbol Test and an overall sum score for the Picture Symbol Test are given in the SUF (see Table 10). As the sets of the Picture Symbol Test each contain 31 items in the version for secondary school children and adults, the sum scores per set range from 0 to 31, and the overall sum score has a maximum of 93. A value of 45 in the overall sum score, for example, means that 45 of the 93 items in the perceptual speed test were solved correctly within time. In fact, the sum score of the Picture Symbol Test mainly depends on the items that are reached within time.

Table 10: Variables of the NEPS-BZT using the example of A28/A56

Variable name	Variable label	Maximum score	Description
dgci110s_c	DGCF (perceptual speed): Set 1: sum	31	Sum of Set 1 of the Picture Symbol Test across 31 items
dgci120s_c	DGCF (perceptual speed): Set 2: sum	31	Sum of Set 2 of the Picture Symbol Test across 31 items
dgci130s_c	DGCF (perceptual speed): Set 3: sum	31	Sum of Set 3 of the Picture Symbol Test across 31 items
dgg5_sc3a	DGCF (perceptual speed): sum	93	Overall sum of the Picture Symbol Test in Grade 5

3.4.2 Matrices test

The matrices test for children in secondary school and adults consists of 12 items assessing reasoning. The 12 items refer to two sets. In the SUF, responses for each of the items are provided. The items are scored dichotomously with 0 indicating an incorrect response and 1 indicating a correct response. The sum score of reasoning has a maximum score of 12 points (see Table 11). In fact, most of the subjects reach the end of the matrices test. Therefore, the sum score mainly depends on the number of items that are solved correctly.

Note that the overall sum scores of the Picture Symbol test and the Matrices test might have another variable name, depending on the target group which has been assessed. However, the overall scores of the test in secondary school and adults are comparable as they always include the same items.

Table 11: Variables of the NEPS-BZT using the example of A28/A56

Variable name	Variable label	Maximum score	Description
dgci 2101_c to dgci 2304_c	DGCF (reasoning): Set 1: Item 1 to Set 3: Item 4	1	Scored items (0 = incorrect, 1 = correct) assessing reasoning
dgg5_sc3b	DGCF (reasoning): sum	12	Overall sum score of the matrices test (reasoning) in Grade 5

References

Brunner, M., Lang, F. R., & Lüdtke, O. (2009/2013). Expertise: Erfassung der fluiden Intelligenz über die Lebensspanne im Rahmen der National Educational Panel Study.

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Note: Both texts will be published as NEPS Working Papers in 2013.