NEPS
National Educational Panel Study

Research Data

Starting Cohort 2: Kindergarten (SC2)
Starting Cohort 3: 5th Grade (SC3)
Starting Cohort 4: 9th Grade (SC4)
SUF Version 1.0.0
Competencies: Assessment of Procedural Metacognition

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Assessment of Procedural Metacognition

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Scientific Use File 2012, Version 1.0.0.

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Procedural Metacognition

A major goal of the National Educational Panel Study (NEPS) is the assessment of competencies that are considered to be of particular importance for educational pathways and participation in society. Longitudinal measurements of reading competence, listening comprehension, mathematical competence and science competency have been and will be carried out coherently across the life span. These measurements are supplemented with regular assessments of metacompetencies such as abilities to handle information technologies (ICT) and metacognition (cf. Weinert, Artelt, Prenzel, Senkbeil, Ehmke, & Carstensen, 2011).

Metacognition is conceptualized as cognition about cognition (Flavell, 1979) and encompasses two components. On the one hand, the declarative knowledge component refers to the knowledge about memory, comprehension, and learning processes that an individual can verbalize. The procedural component, on the other hand, focuses on how the learning process is controlled and regulated through planning, monitoring, and metastrategic activities. The NEPS aims at assessing both, that is, declarative and procedural aspects of metacognition over the life span. In the following, we focus on the assessment of procedural metacognition.

1. The assessment of procedural metacognition

Within the framework of NEPS, the procedural aspect of metacognition is not assessed as a direct measure of such planning, monitoring, and controlling activities. Instead, metacognitive judgments of performance are used, and the assessment of procedural metacognition is integrated in various competence domains (cf. Weinert et al., 2011): Single indicators of judgments of performance are implemented directly after the test phase (retrospective judgment/post-diction, cf. Nelson, & Narens, 1990; Schraw, 2009, cf. also Maki, Schields, Wheeler, & Zacchilli, 2005). For each competence domain, participants are asked to estimate their own achievement. Specifically, after completing all items in the respective test, participants are asked to give judgment about the number of correctly given answers. Usually, one question is asked per domain. For competence domains that can be divided into coherent individual parts (e.g., reading competence referring to different texts), the inquiry of procedural metacognition refers to these parts as well.

The assessment of metacognitive judgments is integrated in the following domains:

- Reading competence (global judgment and judgments referring to single texts)
- Mathematical competence
- Listening competence including receptive vocabulary and receptive grammatical competence
- Science competency
- Abilities in handling information technologies (ICT literacy)
- Orthography (2 judgments)
- Competency in language of origin (Russian and Turkish)

Metacognitive judgments are not assessed for speed measures, such as reading speed, or specific tests assessing domain-general cognitive functioning.

After completing the competence tests in the above listed domains, the participants are asked to estimate their own performance. An example of the domain reading competence is given in Figure 1.

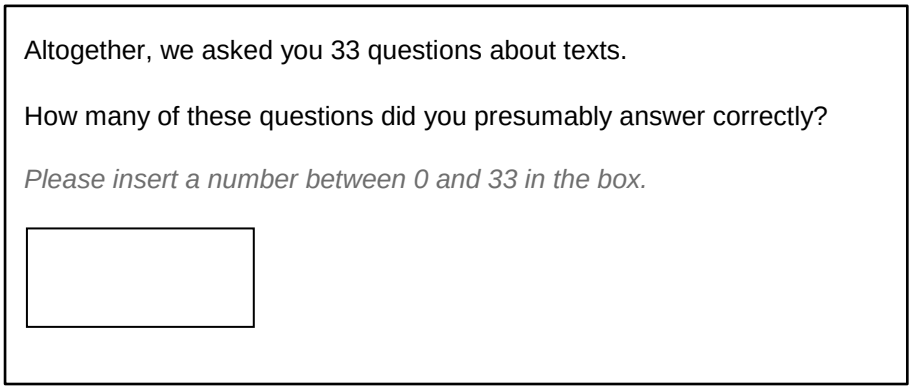

Figure 1: Example of the assessment of a global metacognitive judgment in the domain reading.

The procedure is slightly adapted for Kindergarten children: After completing the corresponding tests, children are shown a five-point smiley scale (see Figure 2) and the survey supervisor asks the children: "What do you think: How many tasks did you do correctly?" The supervisor points to each of the smileys and explains what the individual smiley faces mean (e.g., sad-looking smiley face on the left hand side: no tasks correct, happy smiley face on the right hand side: all tasks correct). Then, the children indicate their answer by pointing at the corresponding smiley face and the supervisor notes down the answer of the children. The children's answers are coded from 1 (no tasks correct) to 5 (all tasks correct).

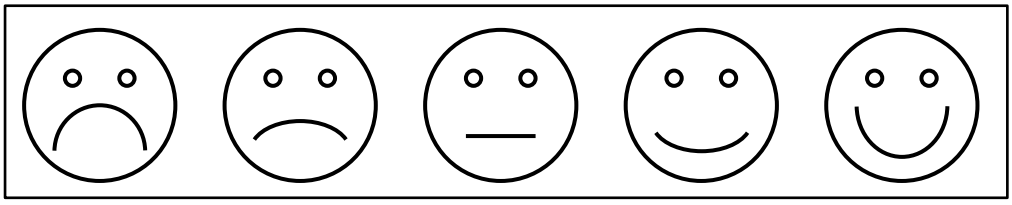

Figure 2: 5-point smiley scale used in the Kindergarten cohort.

2. Calculation of the accuracy score of metacognitive judgments

As a measure of the accuracy of metacognitive judgments, deviation scores between the subjects' judgments and the actual performance in the respective tests are reported in the Scientific Use File (see Schraw, 2009).

The deviation score (d) is calculated as shown below:

$$d = \frac{N\ estimated - N\ correct}{N\ items}$$

This means:

d = 0: perfect estimation of one's own performance

0 < d ≤ 1: overestimation of one's own performance

-1 ≤ d < 0: underestimation of one's own performance

For example, a person estimates that he or she presumably answered 24 out of 30 questions correctly. But in fact, the sum of questions answered correctly is only 15. Thus, the person overestimates his or her own performance and the resulting deviation score = 0.30.

$d = \frac{24-15}{30} = \frac{9}{30} = 0.30$

All items in a competence test are used to calculate the sum of questions answered correctly. In case complex multiple-choice questions or matching items are included in a competence test, an item is only considered to be correctly solved when all subtasks have been solved correctly. Hence, the maximum sum of items answered correctly corresponds to the number of questions that the participants worked on in their tests.

For the calculation of the deviation score in the Kindergarten cohort, the values from 1 to 5 are transformed into proportions of items solved correctly (1 ⇨ 0; 2 ⇨ 0.25; 3 ⇨ 0.50; 4 ⇨ 0.75; 5⇨ 1), and these values are used in the following equation:

$$d = \text{estimated proportion of items solved correctly} - \frac{N\ correct}{N\ items}$$

For example, if a child points at the smiley face on the right hand side and indicates that he or she got all items on science competency correct, the estimated proportion of items solved correctly is 1. If in the test on science competency he or she has got 20 out of 26 items (proportion = 0.77) correct, the child thus overestimates his or her performance, and the resulting deviation score is 0.23.

3. Data in the Scientific Use File

In the Scientific Use File 2012, Version 1.0.0, measures of procedural metacognition are available for the first wave of starting cohorts 2 and 3 and for the first and second wave of starting cohort 4. A description of the design of the studies, the samples, as well as the instruments used can be found on the NEPS-website[1]. Table 1 gives an overview of the assessment of procedural metacognition in the different starting cohorts and domains which are reported in the Scientific Use File 2012, Version 1.0.0. The blanks in the table are due to the fact that not all of the listed domains are integrated in each study (cf. Weinert et al., 2011).

[1] www.neps-data.de

Table 1: Procedural metacognition in different starting cohorts and domains in the Scientific Use File 2012, Version 1.0.0.

			Domains							
Starting Cohort	**Wave**	**Stratum (Type of School)**	**Reading Competence (re)**	**Math Competence (ma)**	**Receptive Vocabulary (vo)**	**Receptive Grammatical Competence (gr)**	**Science Competency (sc)**	**ICT (ic)**	**Orthography (or)**	**Native Language Competence (nt or nr)[c]**
2	1				X	X	X			
3	1	1-6	X[a]	X					X[b]	
4	1	1-6		X	X		X	X		
4	2	1-6	X[a]							X[c]

[a] Global judgment and judgments referring to single texts
[b] 2 judgments
[c] Turkish and Russian

The data sets usually include one variable (global judgment) per domain (except for reading competence and orthography). Examples of the variable names in the Scientific Use File are given below.

Example 1: Global metacognitive judgment for the domain mathematical competence in grade 9:

mp	g9	ma	_sc5
procedural metacognition	grade 9	math competence	deviation score

Example 2: Metacognitive judgment referring to text 1 in the domain reading in grade 5:

mp	g5	re	01	_sc5
procedural metacognition	grade 5	reading competence	text 1	deviation score

There are different reasons why missing responses occur in the deviation scores on procedural metacognition. First, there are nonvalid responses or omitted responses in the metacognitive judgments themselves. Nonvalid responses occur, for example, if participants write down decimals, a number range (e.g., “10-20”), or values greater than the maximum in the corresponding test. Only whole numbers in the specified range are labeled as valid responses. Second, there are missings because participants do not reach the end of the corresponding competence test (e.g., tests on receptive vocabulary or grammatical competence in Kindergarten or test on reading competence in higher grades). These missing responses are labeled as “not-reached missing responses”.

References

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