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## Abstract

*Based on a brief review of models and empirical results concerning the acquisition of language, a conceptual framework for assessing language competencies within the German National Educational Panel Study (NEPS) is outlined. Language-component-oriented approaches and functional-integrative perspectives on language competencies are compared, and their importance for the investigation of language development as well as for the measurement of language competencies is highlighted. Further, implications for a comprehensive assessment and design for measuring language competencies within a large-scale educational study will be presented, and the concrete measures of the NEPS will be mentioned. Finally, results of a small preliminary study are reported to show a theoretical and data-driven approach to select instruments for the NEPS surveys.*

## Keywords

*Language acquisition; Models of language competencies; Language assessment; Phonological awareness*

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# Die Erfassung von Sprachindikatoren über die Lebensspanne im Nationalen Bildungspanel


## Zusammenfassung

*Ausgehend von einer kurzen Darstellung verschiedener Modellvorstellungen und Befunde zum Spracherwerb wird eine Rahmenkonzeption zur Erfassung von Sprachkompetenzen im Rahmen des Nationalen Bildungspanels (National Educational Panel Study, NEPS) vorgestellt. Kontrastiert werden funktional-integrative und subkomponenten-bezogene Perspektiven auf den Erwerb von Sprache und die Messung sprachlicher Kompetenzen. Dabei wird die Relevanz beider Zugänge beleuchtet und die daraus resultierenden Implikationen für die Messung sprachlicher Kompetenzen und das Erhebungsdesign des Nationalen Bildungspanels dargestellt sowie die konkret eingesetzten Verfahren kurz beschrieben. Abschließend werden Ergebnisse einer Vorstudie vorgestellt, die beispielhaft zeigt, wie sowohl theorie- als auch datenbasiert vorgegangen wird, um Aufgaben im Bereich der phonologischen Bewusstheit für die NEPS-Studien auszuwählen.*



## Schlagworte

*Spracherwerb; Modelle des Spracherwerbs; Erfassung sprachlicher Kompetenzen; Phonologische Bewusstheit*


## 1. Introduction

The National Educational Panel Study (NEPS) is implementing a large-scale multi-cohort sequence design to build data sets for examining educational careers, their preconditions, their consequences, and moderating variables in Germany. All data will be made available to the national and international scientific community (e.g., as a scientific use file). NEPS data should serve to trace the consequences of education for individual biographies and to describe important educational processes and career trajectories throughout the entire lifespan. Hereby, data on competencies and their development across the lifespan (see Weinert et al., 2011, for an overview; also see Artelt, Weinert, & Carstensen, 2013, this issue) serve as a central point of reference for all other parts of the study. The development of competencies relevant to education and participation in social and political life are being analyzed in relation to important aspects of the learning environment, educational decisions, and educational returns. In addition, special attention is being given to target persons with immigration backgrounds. The aim is to examine how competencies influence educational careers, how competencies are influenced by learning opportunities, and the extent to which these influences occur. Moreover, a further aim is to clarify which competencies play decisive roles in determining a successful personal and social life.

Without doubt, proficient language skills including reading literacy are among the most central education-relevant cognitive competencies. Language is an important means for communicating, storing, and retrieving information as well as for school performance in various school subjects. School instruction and exams draw heavily on oral and written language. Thus, being linguistically competent is highly relevant for taking advantage of educational opportunities as well as for participating in a society's political and cultural life. Moreover, the language environment and language competencies impact cognitive, social, and sociocognitive development (for a summary, see Weinert, 2006). In fact, language is "*the* central medium for the acquisition of content- and problem-solving-related knowledge including important self-regulated learning abilities" (Weinert et al., 2011, p. 75). Though the acquisition of language is a genetically anchored primary human ability (Geary, 1995), it is influenced in a lasting way by social and education-related family background and by institutional variables (e.g., Huttenlocher, 1998).

Based on the fact that the lingua franca of a society plays a crucial role in educational achievement and academic careers, the assessment of German language competencies across the lifespan is one major focus of the measurement of competencies in the newly created German National Educational Panel Study (NEPS). In addition, indicators of foreign-language (English) and first-language skills (focusing on Turkish and Russian) for people with immigration backgrounds are being assessed. In this article, we focus on the assessment of German-language competencies within the NEPS. Based on a brief sketch of some major steps in language acquisition and a succinct presentation of various conceptual models of language competencies (functional models, models focusing on partially separable language components), we will present a short overview of interrelations between the acquisition and developmental impact of different indicators of language[1] competencies. Drawing on these results, we will outline a conceptual framework for assessing language competencies across the lifespan within the NEPS. Finally, we will present a study that was employed to decide which indicators of language development were to be assessed in preschool-age children.

## 2. A brief sketch of major milestones in language acquisition

Language acquisition begins prenatally. From birth on, babies are able to distinguish their mother tongue from other languages by drawing on its prosodic (i.e., rhythmic-melodic sound) patterns (see Weinert, 2011, for a review). Based on a

1 The term "language indicators" refers to variables/test instruments that provide information about language competencies and processes. Two types of indicators can be distinguished: direct indicators, which refer directly to specific language competencies or components (e.g., vocabulary), and indirect indicators, which refer to more general individual capacities relevant to language (e.g., indicators of phonological working memory such as digit span or pseudoword repetition).

set of initial perceptual and learning abilities, infants rapidly acquire their first (or even more than one) language(s) by exposure to that or those language(s) within communicative contexts. Generally speaking, at 6 months of age, infants start babbling, and by the age of 3 years, they master full sentences. Following a – more or less universal – language timeline of speech perception and speech production, the child turns into a specialist with regard to his or her native language(s) within the first year of life. Thus, for example, whereas newborns are able to discern a universal set of phonetic contrasts relevant to any natural language, this universal sensitivity (categorical perception) diminishes and becomes more and more adapted to the specific patterns of his or her native language(s), thus optimizing the processing of this or these particular language(s). Infants' sensitivity to prosodic patterns and phonemic categories and the acquired knowledge of the phonological and prosodic sound structure of their native language(s) build the foundation for their acquisition of words. At approximately 9 months of age, the basic ability to comprehend words is in place (for more details, see Weinert, 2006, 2011).

At approximately 1½ years of age when the child can productively manage about 50 words, the child's receptive and productive vocabulary begins to expand rapidly. According to Nelson (1973), children between 19 months and 2 years of age acquire about 25 words per month. Thereafter, they learn even more quickly: At the age of 5, they know about 2,000 words, and the estimated increment in vocabulary in school children between 7 and 16 years of age can range up to 3,000 words per year (Nagy & Herman, 1987).

When vocabulary rapidly expands at about 18 months of age, children also begin to produce their first word combinations. Over the next 2½ years, basic sentence construction and syntactic principles are acquired (Weissenborn, 2000). At the age of 4–5 years, the syntactic competencies increase and more and more complex sentence structures (e.g., temporal clauses, relative clauses) and connectors (e.g., "after", "before", "since", "although") can be understood (Weinert, 2006, 2010a).

During the late preschool years, children also start to increasingly reflect – though not necessarily consciously – on language structures and meaning, thereby acquiring more explicit language representations. These are reflected in tasks that require increasing metalinguistic awareness. This process as well as the acquisition of even more complex language structures and more elaborate literal and sophisticated pragmatic competencies, which are characterized as "academic language skills" (see the section 4.3 "Grammar development: A basic skill and an important component of 'academic' language" in this paper), are promoted while they are of school age.

In addition, drawing upon oral language and strongly influenced by instruction and literacy promotion, an educationally important new quality of language use arises when children begin to learn how to read and write.

## 3. Models of language competencies: Functional and component-oriented views

Seen from linguistic, psychological, educational, and didactic perspectives, different models regarding how to conceptualize language competencies have been proposed. Within educational research, functional models of language competencies differentiating between productive and receptive competencies in oral and written language have been most prominent (see Table 1).

Table 1: Language assessment according to functional models of language competencies (modified after Jude & Klieme, 2007, p. 11)

| Mode | Production | Reception |
|---|---|---|
| Oral language | Speech production and language use | Listening comprehension |
| Written language | Writing literacy | Reading literacy |

At this juncture, researchers tend to focus on (a) context-adequate speech production and (communicative) language use, (b) writing literacy, (c) listening comprehension (i.e., oral text and discourse processing), and (d) reading competence. Most notably, these competencies are conceptualized from a functional-integrative perspective.

By contrast, linguistic and psychological research often emphasizes models that differentiate between various language components (or qualifications, abilities, or knowledge systems),[2] that is, between partially separable but intertwined language subdomains such as phonological, morpho-syntactic, lexical, and semantic knowledge as well as pragmatic competencies (see Table 2).

Whereas the rhythmic-prosodic component refers to the suprasegmental intonation, stress, and rhythmic characteristics of a given language, the phonological component addresses the segmental patterns including such elements as phonemes (the smallest entity used to differentiate meaning: ***l***and – ***s***and) and the regularities of phoneme combinations within words (phonotactics). At a higher level, morpho-syntactic knowledge entails regularities of word and sentence formation, whereas lexical and semantic knowledge refer to word and sentence meaning. Pragmatics comprises language use and thus knowledge about discourse, speech acts, and text structures among others. All these components are – despite some universals – highly specific to a given language and thus have to be acquired.

2 In this article, we will not differentiate between these terms although they refer to rather different theoretical conceptualizations of language within linguistic and psychological theory building. Nevertheless, they converge on different language subdomains that all contribute to language development and competent language use.

Table 2: Language assessment according to component models of language (modified from Weinert, 2010a, p. 228)

| Component | Function/knowledge domain[a] |
|---|---|
| Prosody/rhythmic-prosodic component | Intonation, stress, rhythmic structuring |
| Phonology | (Language specific) organization of speech sounds (phoneme: sound categories that differentiate meaning; and phonotactic rules of combination) |
| Morphology | Word formation (morpheme: smallest meaningful unit; e.g., "dogs" consists of two morphemes "dog" and "s," the latter being the plural morpheme) |
| Syntax | Sentence formation (word order rules and hierarchical structure of sentences) |
| Lexicon/vocabulary | Word meaning and structure of the lexicon |
| Semantics | Sentence meaning |
| Pragmatics | Context-adequate use of language |

[a]The respective knowledge systems are not necessarily consciously available.

Models that focus on separable language components have demonstrated their worth in the fields of language diagnosis and disorders and with regard to disentangling and analyzing language progress by specifying the impact and interrelation of various qualifications relevant to competent language processing and use (see Weinert, 2007, 2010a). However, functional perspectives that focus on the functional-integrative level of language production and comprehension are most authentic for real life situations. In communication, all components (i.e., all kinds of language knowledge and qualifications) interact to allow for context-adequate language processing and use. Thus, measures of functional-integrative language competencies reflect the integration and interactions of language components.

In agreement with the literacy orientation (OECD, 2001), the basic idea of the NEPS conceptualization of measuring competencies is to use (quasi)authentic tasks. However, from an analytical point of view as well as from the perspective of language promotion, relying only on measures that reflect the functional-integrative level does not suffice. Thus, measures of language components like vocabulary (lexical knowledge), grammar (morpho-syntactic knowledge), and phonological information processing are assessed as well. Some of the complex interrelations between language components and their impact on future developmental progress are detailed in the next section.

# 4. Interrelations between language acquisition processes

In the following section, we will present a brief overview of the complex interaction of language acquisition processes as a theoretical and empirical background for the rationale of measuring language competencies and components within the NEPS.

## 4.1 Phonological development as a prerequisite and consequence of vocabulary development and its relevance for language acquisition in general

As already mentioned, early word learning draws heavily on the acquisition of language-specific phonological, phonotactic, and prosodic knowledge acquired within the first year of life. Likewise, the child's rapidly increasing vocabulary forms the basis for the development of further phonological competencies in preschool-age children, specifically for the acquisition of phonological awareness. Phonological awareness refers to the metalinguistic ability to reflect on and manipulate the phonological structure of words independent of their meaning (Tunmer & Hoover, 1992), and this awareness has been found to be of special relevance to literacy acquisition and restrictions to be an important predictor of reading and spelling difficulties (Landerl & Wimmer, 1994).

Intercorrelations between children's vocabulary and their performance on various phonological awareness tasks have been reported for children who differ in their socioeconomic family background as well as for different languages and age groups (Lonigan, 2007). In line with these results, Marx, Weber, and Schneider (2005) found that children with reduced vocabulary knowledge perform significantly worse on phonological awareness tasks than children with average vocabulary skills. Puolakanaho, Poikkeus, Ahonen, Tolvanen, and Lyytinen (2004) were able to show that receptive and expressive vocabulary measured between 14 and 26 months of age significantly predicted phonological awareness skills at the age of 3½ years.

Taken together, on the one hand, "developmental phonology is primary to semantics" and word learning with the consequence that deficits in early phonology can delay or impair the development of other language components (Hagtvet, 2003, p. 527). On the other hand, accumulating vocabulary seems to foster the acquisition of phonological awareness (Metsala, 1999). Metsala (1999) offers the *lexical restructuring hypothesis* to explain the relation between phonological awareness skills and vocabulary size. According to this hypothesis, vocabulary growth prompts a process of lexical restructuring from holistic global representations toward finer segmental representations of words, thus leading to a better awareness of phonological units.

Additionally, there is some evidence that phonological awareness is also associated with syntactic skills (Scarborough, 1990). It is assumed that the connection between semantic and syntactic competencies and the processing of phonological information can be traced back to underlying phonological representations. Joanisse and Seidenberg (1998) state that "degraded phonological representations are the proximal cause of deviant acquisition of morphology and syntax" (p. 241; see also Hagtvet, 2003).

With regard to literacy acquisition, the impact of phonological information processing on reading and – at least partly – on spelling deficits has attracted much attention in psychology as well as in psycholinguistic research (e.g., *phonological processing deficit hypothesis*, Snowling, 1998; *phonological core deficit model*, Stanovich, 2000). Further details concerning this relation will be outlined later in this article.

Because phonological awareness can be well improved by training (e.g., Schneider, Küspert, Roth, Visé, & Marx, 1997; see Bus & van Ijzendoorn, 1999, for a meta-analysis), it has received a great deal of attention in practice as well as in research.

## 4.2 Vocabulary development and its interrelation with the acquisition of grammar and reading

The acquisition of vocabulary is not only linked to phonological and prosodic development as already detailed. It also seems to be one of the prerequisites for developing morpho-syntactic qualifications, and it is – at the same time – promoted by advanced morpho-syntactic skills. Thus, some theoretical accounts of language acquisition assume that the accumulation of lexical knowledge is a precondition for a more analytical process of inducing formal language structure (Locke, 1994). Although the exact interrelations between lexical learning and the acquisition of morpho-syntactic regularities of one's own mother tongue is by no means clear, there is in fact empirical evidence that at least some lexical knowledge has to be in place to allow for age-typical language progress (Grimm & Wilde, 1998). For instance, children whose vocabulary comprises fewer than 50 words at 2 years of age, the so-called "late talkers", are at risk for language disorders (Grimm, 2003). At the same time, morpho-syntactic regularities promote lexical learning. New word meanings are incidentally inferred from the sentence context (e.g., Gleitman, 1990), and in addition, as the child grows up, explanations of specific word meanings and terminology may become more and more important (e.g., in the school context).

With regard to literacy acquisition, the relevance of lexical knowledge changes over time. Whereas early reading competencies seem to depend mostly on phonological skills (see the section 4.5 "Learning to read: The importance of various language components"), advanced reading can be predicted by children's vocabu-

lary (see Berendes, Schnitzler, Willmes, & Huber, 2010). In turn, advanced reading competencies are highly predictive of further word learning (Perfetti, 2010).

## 4.3 Grammar development: A basic skill and an important component of "academic" language

Grammar is a core feature of language. Although basic morpho-syntactic regularities are acquired even in unfavorable environmental conditions, individual differences and social disparities in the reception and production of more complex sentence structures are to be observed from early on and turn out to be rather stable across, for example, the preschool years (Weinert, Ebert, & Dubowy, 2010; Weinert & Ebert, 2013).

Seen from an educational point of view, the comprehension of complexly structured sentences is an important indicator of the so-called "academic" language skills (also called *cognitive-academic language proficiency*; CALP; see Cummins, 1979). A rather complex grammar, in addition to a demanding vocabulary and partly specific terminology, has been proposed to be one of the central characteristics of academic language. In contrast to conversational language (also called *basic interpersonal communication skills*; BICS; see Cummins, 1979), academic language is more independent of contextual support and often more cognitively demanding. Academic language is, for example, thought to be characteristic of formal classroom instruction, exercises, and text books and therefore necessary for coping with academic tasks.

Next to its relevance for oral academic language competencies, grammatical skills are important for reading comprehension. Grammar is necessary for identifying syntactic relations within complexly structured sentences and for constructing meaning from a given text (e.g., Martohardjono et al., 2005; see also Ebert & Weinert, 2013).

## 4.4 Listening comprehension: An integrative skill

Listening comprehension requires the integration of several skills to process information "from a wide range of sources: phonetic, phonological, prosodic, lexical, syntactic, semantic, and pragmatic" (Osada, 2004, pp. 55f.). Hagtvet (2003) showed that poor listening comprehension is associated with weaknesses in phonology, syntax, and semantics at the age of 9. He showed that two different measures of listening comprehension (ability to draw anaphoric references, ability to retell a story) were associated with vocabulary, syntax, and phoneme awareness (correlations between $r = .39$ and $r = .66$, $p < .01$). Note, however, that the interrelation between language components and listening comprehension is not a "one-way road". Thus, analyzing data of Dutch elementary school children, Verhoeven

and van Leeuwe (2008) found a reciprocal relation between vocabulary acquisition and listening comprehension, especially in the lower grades.

## 4.5 Learning to read: The importance of various language components

Spoken and written language are thought to be based on the same underlying processes to a great extent. Thus, it makes sense to expect oral and written language to be interrelated. A variety of studies have been conducted to investigate this relation, and various models have been developed to specify the influence of different language components on learning how to read as well as on proficient reading competencies (Whitehurst & Lonigan, 2001).

With respect to the early phases of the development of reading skills, it has been proposed and empirically demonstrated that these skills are directly affected by phonological awareness, whereas other "oral language skills, specifically semantics, syntax, and morphology, affect beginning reading indirectly through their relationship with phonological awareness skills" (Cooper, Roth, & Speece, 2002, p. 413). Specifically, phonological awareness helps the reader to grasp the alphabetic principle underlying written language and thus is of primary importance when a person first begins to read. However, "the influence of individual differences in phonological awareness is not developmentally limited to beginning reading but in fact extends at least through fourth grade" (Wagner et al., 1997).

As the process of learning how to read proceeds, syntactic skills become more important because more and more complex sentences and texts are read (Goldammer, Mähler, & Hasselhorn, 2011). Moreover, the amount of vocabulary gradually becomes a more relevant factor with regard to its influence on reading skills. The results of several studies have demonstrated a substantial connection between both receptive and expressive vocabulary and reading skills, especially reading comprehension (Ricketts, Nation, & Bishop, 2007; Nation & Snowling, 1998). However, the importance of vocabulary differs depending on the specific aspect of reading skills being investigated (i.e., decoding, reading accuracy, or reading comprehension). Ricketts, Nation, and Bishop (2007) investigated the relation of vocabulary and reading literacy in children aged 8 to 10 years. In their regression analyses, "vocabulary accounted for unique variance in exception word reading and reading comprehension, but not text reading accuracy, decoding, or regular word reading" (p. 235). In addition, the relation between reading skills and vocabulary seems to be reciprocal in principle (e.g., Stahl & Shiel, 1992). Depending on the student's grade level, the probability of acquiring words from reading texts increases from Grade 4 to Grade 11 (Swanborn & de Glopper, 1999).

In line with the assumption that syntactic and semantic skills are highly relevant for reading comprehension, comprehension deficits are mostly associated with poor vocabulary and syntactic skills (e.g., Catts, Adlof, & Weismer, 2006).

## 5. The development of interindividual differences in language competencies: The impact of working memory and language promotion

When considering children's characteristics and individual prerequisites that are relevant to language learning, differences in working memory have been emphasized. The functional importance of the individually different capacity of phonological working memory has been demonstrated for oral language development and particularly for vocabulary acquisition in the learning of first and second languages as well as for learning to read and write. It even remains relevant for language processing and reading comprehension in advanced readers (Gathercole & Baddeley, 1993).

The strong link between vocabulary growth and phonological working memory span has been demonstrated in longitudinal, experimental, and neuropsychological studies and for the learning of first and second languages (see Weinert, 2010b, for an overview). To mention just a few results, Gathercole and Adams (1993) showed a strong relation between phonological working memory span and vocabulary size in 2- and 3-year-old children. Drawing on data from longitudinal studies, Gathercole and Baddeley (1989) and Weinert, Ebert, Lockl, and Kuger (2012; see also Ebert, Lockl, Weinert, Anders, Kluczniok, & Roßbach, 2013) demonstrated that the relation between phonological working memory span and vocabulary growth changes over time. Thus, phonological working memory seems to be especially relevant for the early phases of first and second language learning. After accumulating greater amounts of lexical knowledge regarding a given language, the developmental relation turns around. Then the impact of vocabulary on phonological memory performance and progress becomes more pronounced. In fact, measures of phonological working memory capacity (even performance on most nonword repetition tasks) draw on the child's phonologic and phonotactic knowledge and sometimes even on lexical knowledge (Gathercole, 2006; Weinert, 2010b).

In addition, an association between syntactic competencies and phonological working memory capacity has been suggested, especially in children with specific language impairments (SLIs). For example, based on data from a study of school children, Norbury and colleagues (Norbury, Bishop, & Briscoe, 2002) stated that "limitations on working memory [...] are critically related to syntactic deficits in SLI" (p. 265). For 6- and 8-year-old German children, Hasselhorn and Körner (1997) reported medium to high correlations (ranging from $r = .33$ to $r = .59$, $p < .05$) between nonword repetition and two different syntactic tasks (imitation of sentence structures, sentence construction).

Additionally, is has been demonstrated that early reading skills depend on the individual's phonological working memory capacity. It is assumed that phonological working memory is important because graphemes must be converted into phonemes, and the single phonemes must be maintained in working memory un-

til the whole set of a word's graphemes are recoded and synthesized (Schneider & Näslund, 1992).

However, language progress is influenced not only by the individual characteristics of the child but also by the language-learning environment (Huttenlocher, 1998; Ritterfeld, 2000; Weinert & Lockl, 2008). Language and literacy promotion at home, preschool/kindergarten,[3] and school have been shown to significantly enhance language learning. Significant social disparities in language status have been shown as early as age three, and these have demonstrated high stabilities across preschool years (Weinert, Ebert, & Dubowy, 2010; Weinert & Ebert, 2013). Intervention studies have highlighted environmental and interactional conditions that promote language learning (Weinert & Lockl, 2008). These results are highly important from the stance of education and underline the necessity of including measures of language competencies and of the learning environment in the NEPS.[4]

## 6. Language indicators within the NEPS

Before detailing the selection and measurement of language indicators assessed in the NEPS, we will briefly present a selected overview of some aspects of the NEPS design and the assessment of competencies in general (see also Artelt, Weinert, & Carstensen, 2013, this issue). This information will serve as a background for the selection and measurement issues presented and discussed in the following sections.

### 6.1 Excursus: A brief overview of some aspects of the NEPS design and assessment of competencies within the NEPS

As a longitudinal large-scale study implementing a multicohort sequence design, assessment within the NEPS begins in parallel with several cohorts at different stages of the life course and educational system. Specifically, five of the six cohorts (preschoolers who were 4 to 5 years old, fifth graders who were 10 years old, ninth graders who were 14 years old, college students in their first semester, and a cohort that began in adulthood with an age range of 25–67) began the study in 2009/2010 respectively, whereas the infant cohort began in 2012. These cohorts altogether comprise a total of about 60,000 persons who are being followed across their educational and life courses with measurements taking place nearly every year.[5]

3 In this article, we use the German term kindergarten as a generic term for the different forms of institutional child care at the ages of 3 or 4 and above and until school entry. For an overview of regulations and the organization of preschool and elementary school education in Germany, see EURYDICE (2009).

4 Because the main focus of this article is on competence measures, we will not go into detail on language-learning environments in this paper.

5 Concrete information concerning each of the starting cohorts (e.g., concerning sample sizes) can be found on the NEPS website (https://www.neps-data.de/).

The assessments are conceptualized from the stance of five intertwined perspectives that are organized by five different "pillars" within the NEPS. These pillars focus on the development of competencies (Pillar 1), family education, education in and outside of institutions (Pillar 2), educational decisions and their distal and proximal determinants (Pillar 3), issues of immigration (Pillar 4), and educational returns (Pillar 5; for a more comprehensive overview, see the chapters in Blossfeld, Roßbach, & von Maurice, 2011).

With respect to the measurement of competencies, the NEPS focuses on educationally relevant domain-specific functional competencies, which are subject to educational influence and are thought to be especially relevant to educational careers, a successful responsible individual life, and a well-functioning society. Specifically, in addition to language competencies, mathematical literacy and scientific literacy are also being assessed coherently across the lifespan (i.e., based on a conceptual framework and linking procedures, the assessment of each of the domains should allow researchers to trace cumulative developmental changes across broad sections of the lifespan). Further, domain-general cognitive abilities (nonverbal figural reasoning, perceptual speed) as well as metacompetencies (metacognition and self-regulation, literacy with regard to information and communication technologies) and social competencies are being assessed (see Weinert et al., 2011, for a more in-depth overview).

In kindergarten and school, fixed combinations of these competencies are being measured every year, whereas adults are being asked to participate in a testing situation only every second year.

## 6.2 Overview and rationale of the assessment of German language competencies within the NEPS

As already detailed in the introduction, assessing competencies in the lingua franca used by the majority of society is of high significance in an educational panel study. Within the NEPS, some indicators are being assessed coherently across the lifespan (or, more precisely, across large parts of the lifespan), whereas other important language indicators are being assessed during critical time periods when they have a major impact on educational processes and further language development in general.

### 6.2.1 Language indicators coherently assessed across the lifespan

When considering which specific language indicators should be assessed longitudinally across large parts of the lifespan, indicators of functional literacy seem to be of special relevance because of their ecological validity across a broad age range. They lead to an assessment that relies heavily on everyday problems. Thus, with re-

spect to language competencies, functional measures as already detailed in Table 1 are of special relevance. However, with regard to the selection of specific indicators, many different factors have to be taken into account.

In fact, although productive as well as receptive competencies of language use (functional perspective) are important from an educational point of view as well as from a lifelong learning perspective, due to constraints related to test administration, assessment, and coding, large-scale educational studies often focus on receptive language indicators to ensure that the measurement of competencies is objective, reliable, and valid (Jude & Klieme, 2007). This is also predominantly true for the NEPS. Amongst others, the measurement of receptive competencies has the advantage that no time-consuming and potentially less reliable coding is required. In addition, receptive tests are comparatively easy to administer.[6]

Bearing all this in mind, the assessment of reading competence (reading literacy) across the lifespan is, without doubt, one of the important aims of the NEPS because reading literacy is regarded as one of the most important competencies with regard to its relevance to education, educational careers, and to participation in society. In addition, the assessment of reading literacy will allow for national and international comparative research.

However, the assessment of reading competence alone is not sufficient as a measure of language competency within a large-scale longitudinal educational study. In addition, the assessment of listening comprehension is important. Although listening comprehension and reading competence are closely interrelated in general, oral language competencies do not necessarily imply elaborate reading literacy. Obviously, there are age-related differences: Competencies in listening comprehension ontogenetically precede and predict comprehension measures of reading skills in later elementary and secondary school (Verhoeven & van Leeuwe, 2008). In addition, the discrepancy between reading and listening comprehension may vary with educational status and may be of special importance when people with immigration backgrounds are considered. Thus, the differentiation between listening comprehension and reading competence is important as it allows researchers to distinguish, for example, between people with general restrictions in (German-)language processing and people with reduced competencies or even specific difficulties in the domain of reading. In addition, there are major differences between oral and written language that are important. Amongst others, spoken language contains elements that could not be found to the same extent in written language such as colloquial expressions or incorrect syntax. Overall, "listening is vital in language learning, as it is essential providing the input for the learner. Without understanding inputs, students cannot learn anything" (Osada, 2004, p. 63). Obviously, the importance of comprehending oral language input is not restricted

6 Nevertheless, test administrators have to be well trained to ensure a standardized test procedure. In the NEPS, for example, extensive train-the-trainer programs including video feedback of test administration are set up for testing in kindergarten as well as special trainings for group and individual testing in school and in the adult cohorts.

to early language acquisition and school learning but extends to adult learning and participation in society in general.

Thus, the NEPS focuses on the assessment of functional measures of receptive language (reading competence) that are being assessed coherently across the lifespan. In addition, listening comprehension (at the text and word levels) is being assessed repeatedly in each of the NEPS cohorts.

### 6.2.2 Assessment of language components and language indicators assessed at specific educational stages or measurement points

From a language promotion and training point of view, assessing integrative functional competencies is not sufficient. As already detailed, reading literacy and listening comprehension both require the integration of sets of different skills that involve or tap lexical, morpho-syntactic, phonological, and pragmatic knowledge as well as phonological working memory. As a corollary, deficits may be traced back to some or all of these language components.

Although measures of the various language components are not in the focus of all stages of the educational panel study, they are being assessed in certain stages when they are of special importance to allow for further – theoretically and practically relevant – analyses of the interrelation between different language indicators and education.

For instance, in kindergarten, in addition to listening comprehension at the text/discourse and word levels (i.e., functional measures of listening comprehension and orally tested indicators of receptive vocabulary), indicators of receptive grammar as well as of phonological information processing (phonological working memory, phonological awareness), early literacy (letter knowledge), and orthography were assessed (see Table 3 for an overview).

Table 3: Overview of the NEPS measures of German language competencies: Language indicators and their most important precursor variables

| Mode | Functional language measures[a] | Language components | Precursor variables[c] |
|---|---|---|---|
| Oral language | Listening comprehension | Receptive vocabulary[b, e] | Capacity of phonological working memory |
| | | Receptive grammar[b] (sentence comprehension) | Phonological awareness |
| Written language | Reading competence[d, e] | Orthographic skills | Early letter knowledge |

[a] Integrative measures. [b] Predictive of oral and written text comprehension. [c] Predictive of learning to read and write.
[d] Additionally, reading speed is assessed. [e] Coherent assessment over the lifespan.

Table 4 presents the specific measurement points for the first 5 years of assessment for the different starting cohorts.

Table 4: Measurement points according to the six initial cohorts (I–VI) and the assessed language competencies

| | | Starting cohorts | | | | | | A | | B | C | D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Age in years | Educational stage/ institution | I (Infants) | II (Kiga) | III (Grade 5) | IV (Grade 9) | V (Univers.) | VI (Adults) | Listening comprehension | Reading | English | Turkish/ Russian | Stage-specific measure |
| 0 | Family | I-2012 | | | | | | | | | | Precur./indir. |
| 1 | Family | I-2013 | | | | | | | | | | Precur./indir. |
| 2 | Family | I-2014 | | | | | | | | | | Precur./indir. |
| 4 | Kindergarten | | II-2010 | | | | | Voc/gram | | | | |
| 5 | Kindergarten | | II-2011 | | | | | | | | | Phonol. |
| 6 | Grade 1 | | II-2012 | | | | | Voc/gram | | | | |
| 7 | Grade 2 | | II-2013 | | | | | | Rc/rsp | | List. comp. | |
| 8 | Grade 3 | | II-2014 | | | | | Text | | | | |
| 10 | Grade 5 | | | III-2010 | | | | | Rc/rsp | | | Orthog. |
| 11 | Grade 6 | | | III-2011 | | | | Voc | | | | |
| 12 | Grade 7 | | | III-2012 | | | | | Rc | | List. comp. | Orthog. |
| 13 | Grade 8 | | | III-2013 | | | | | | | | |
| 14 | Grade 9 | | | III-2014 | IV-2010 | | | 2010: Voc<br>2014: Text | Rc/rsp | | List. comp. | Orthog. |
| 15 | Grade 10 | | | | IV-2011 | | | | | Read. comp. | | |
| 16 | Grade 11 | | | | IV-2012 | | | | | | | |
| 17 | Grade 12 | | | | IV-2013 | | | | Rc | Read. comp. | | |
| 15 | Vocational training | | | | | IV-2011 | | | | | | |
| 16 | Vocational training | | | | | IV-2012 | | | | | | |
| 17 | Vocational training | | | | | IV-2013 | | | Rc | | | |

*continued*

Table 4: *(continued)*

| | | Starting cohorts | | | | | | A | | B | C | D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Age in years | Educational stage/ institution | I (Infants) | II (Kiga) | III (Grade 5) | IV (Grade 9) | V (Univers.) | VI (Adults) | Listening comprehension | Reading | English | Turkish/ Russian | Stage-specific measure |
| 18–24 | 1. Academic year | | | | | V-2010 | | | Rc/rsp | | | |
| 19–25 | 2. Academic year | | | | | V-2011 | | | | | | |
| 20–26 | 3. Academic year | | | | | V-2012 | | | | | | |
| 21–27 | 4. Academic year | | | | | V-2013 | | | | | | |
| 22–28 | 5. Academic year | | | | | V-2014 | | Voc | | Read. comp. | | |
| 23–65 | | | | | | | VI-2009 | | | | | |
| 24–66 | | | | | | | VI-2010 | | Rc/rsp | | | |
| 25–67 | | | | | | | VI-2011 | | | | | |
| 26–68 | | | | | | | VI-2012 | | | | | |
| 27–69 | | | | | | | VI-2013 | | | | | |
| 28–70 | | | | | | | VI-2014 | Voc | | Still open | | |

*Note*. The gray lines illustrate the educational stages; A: Domain-specific cognitive competencies (German language competencies: listening comprehension (vocabulary = voc; grammar = gram; text level); reading (rc = reading comprehension, rsp = reading speed); B: English language competencies; C: Turkish and Russian language competencies depending on first language; D: Stage-specific competencies (to be specified for each of the eight stages – in infants and toddlers: precur./indir. = precursors (via habituation paradigm; mother-child interaction) and indirect measures (parents' interview including a vocabulary check list at age 2) of child language (not detailed in this paper); in kindergarten: phonological awareness and phonological memory = phonol.; in school: orthography = orthog.). Note that Cohort 4 (ninth grade students) will split into students attending upper secondary school and students starting vocational training.

The rationale behind this selection will be presented in the following sections.[7]

*6.2.2.1 Receptive vocabulary*. Within many educational studies, measures of receptive vocabulary are used as "the" central and sole indicator of language competencies. In fact, receptive vocabulary is one of the best indicators of language competencies on the one hand and of accumulated knowledge and crystallized intelligence on the other (see, for a short summary, Weinert, 2010a). In addition, knowledge of word forms and their meaning is a requirement for – and later, a result of – reading comprehension (Perfetti, 2010). Vocabulary growth is strongly influenced by the quantity and quality of language input (e.g., Huttenlocher, 1998) and thus depends heavily on the language behavior of the family ("family literacy", Leseman, Scheele, Mayo, & Messer, 2007) as well as on the quality of educational institutions, such as kindergarten and preschool (Roßbach & Weinert, 2008). Most notably, receptive vocabulary can be assessed in a comparable way across the lifespan; its assessment is rather easy and does not necessarily draw on reading competencies. Last but not least, it offers the potential for international comparative research because many international large-scale panel studies (British Cohort Study, Bynner, 2004; the European Child Care and Education Study, ECCE Group, 1997) apply the Peabody Picture Vocabulary Test (PPVT; Dunn & Dunn, 1981, 2004) in their data collection. Therefore, within the NEPS, vocabulary is being assessed in each cohort. In fact, during the early years of funding, vocabulary has been used as a proxy for oral language competencies and as an important component that is relevant to the comprehension and processing of oral and written texts/discourses.

*6.2.2.2 Receptive grammar*. The processing of increasingly complex sentences is important for reading comprehension as well as for the emergence of "academic" language (i.e., for the language used in school and therefore for school achievement). Social disparities and a high stability of individual differences in receptive grammar have been shown from early on (Weinert et al., 2010; Weinert & Ebert, 2013) with a potentially high impact on individual disparities in school learning. In addition, together with vocabulary knowledge, grammatical skills are a good predictor of measures of reading comprehension later in elementary school (Ennemoser, Marx, Weber, & Schneider, 2012; Ebert & Weinert, 2013). Therefore, within the NEPS, an indicator of receptive grammar was assessed in kindergarten (4 to 5 years of age) and in early elementary school (the first grade).

*6.2.2.3 Orthographic skills*. Students' orthographic skills can be regarded as a reliable predictor of their educational career (Schneider, Marx, & Hasselhorn, 2008). However, at the end of elementary school, a considerable number of students show serious spelling problems (Löffler & Meyer-Schepers, 2005). These def-

7 In the infant cohort, indicators of early language competencies will be assessed as well. Because the description of these measures needs detailed information and because some of the measures are still tested in feasibility studies, we will not report on these measures in this paper.

icits last across the entire secondary school period and seem to increase over time (Schneider et al., 2008). Including the assessment of students' orthographic skills in the NEPS design is also motivated by the fact that orthography has been repeatedly emphasized by representatives of the labor market and employers in Germany to be an important prerequisite for the job and is thus regarded as a critical benchmark for the selection of trainees. Moreover, as a directly observable and rather objective indicator, a student's ability to spell words correctly crucially affects first impressions gleaned from applications. Within the NEPS, orthographic skills are being assessed at least twice in secondary school.

*6.2.2.4 Phonological processing*. Both phonological awareness and phonological working memory are important precursors to reading development and school learning. The early phases of learning to read, in particular, are influenced by phonological processing, and deficits are prominent in persons with dyslexia. Phonological awareness is, for example, necessary for grasping the alphabetic principle that underlies our system of written language (Schnitzler, 2008). In addition, Krajewski and Schneider (2009) published results that suggest that phonological awareness is not only associated with literacy development. They state that "phonological awareness is a domain-general precursor variable of school achievement rather than a domain-specific precursor variable of only subsequent literacy development in school" (Krajewski & Schneider, 2009, p. 527). Thus, phonological awareness is also associated with, for example, mathematical performance (e.g., De Smedt, Taylor, Archibald, & Ansari, 2010; Krajewski & Schneider, 2009). Because "the capacity to store and process material over short periods of time, referred to as working memory, and also the awareness of phonological structure, may play a crucial role in key learning areas for children at the beginning of formal learning" (Alloway et al., 2005, p. 417), within the NEPS, indicators of phonological processing (phonological working memory, phonological awareness) have been assessed in children in their last year of preschool at the ages of 5 to 6.[8]

*6.2.2.5 Early literacy (letter knowledge)*. Early letter knowledge has been shown to be an important predictor of reading development in the first grade (Muter, Hulme, Snowling, & Taylor, 1998). Moreover, preschool letter knowledge is a precursor of later phoneme awareness. Carroll (2004) even assumes that "the learning of letters must play a crucial role in the development of phoneme awareness" (p. 213). In accordance with this assumption, some studies have demonstrated that young children require a certain amount of letter knowledge before they can master some types of phonological awareness tasks, especially ones at the level of phonemes (e.g., Johnston, Anderson, & Holligan, 1996). Thus, early letter knowledge

8 A more technical reason for assessing phonological working memory in preschool is that most measures (digit span, pseudoword repetition) require that a single person be tested at a time; in the NEPS for school-aged children, tests are administered in group testing situations.

is being assessed once in the last year of kindergarten when the children are about 5 to 6 years of age.

## 6.3 Assessing reading competence and listening comprehension across the lifespan within the NEPS

In the following sections, a brief description of the measurement instruments will be presented. All instruments were newly developed because there were no existing instruments that allowed for the assessment of reading competence and listening comprehension coherently across a broad range of ages and educational stages.

### 6.3.1 Reading competence

Because the framework for the assessment of reading competence across the lifespan is detailed in the article by Gehrer, Zimmermann, Artelt, and Weinert (2013, this issue), we will only very briefly sketch some important points and will not go into detail.

The assessment of reading competence is based on a literacy conception using quasiauthentic texts. These texts vary systematically according to text functions and cover a variety of themes. By using various tasks, different comprehension requirements can be assessed. Thus, reading competence is operationalized as a rather general functional ability applicable to a broad range of educational and everyday contexts.

Specifically, to coherently assess reading competence across the lifespan, several characteristic features that are to be met by all reading assessments were specified in the general framework of the NEPS reading competence tests. These characteristics were then implemented in an age-appropriate manner. In all assessments, (quasi)authentic texts were chosen to cover a wide range of topics as well as different text functions that are considered to be relevant across the lifespan, specifically: (a) informational texts, (b) texts presenting commentaries or arguments, (c) literary texts, (d) instructional texts, and (e) advertising texts. For each age cohort, the texts are being selected to suit the thematic orientation and the lexical, semantic, and grammatical skills of the respective age group. By increasing text complexity (e.g., extended vocabulary, longer words, increasing complexity of the sentence structures) as well as the basic length of texts, the test design took into account increases in reading competence from childhood to adulthood. To cover different comprehension requirements that arise for the reader in various reading situations, three types of information processing are being considered in the NEPS reading assessments. The assessments will distinguish between information retrieval, information integration and interpretation, and the judgment and evaluation of the information given in the texts. For school-age children, reading comprehension will

be assessed every second year from Grade 2 onwards. In addition to reading competence, reading speed was assessed once in starting cohorts 2 to 6.

Obviously, reading competence is not measured in infants and kindergarten children. However, when the kindergarten cohort attends the second grade in elementary school, reading skills will be measured for the first time. In all other cohorts, reading assessment is being implemented in the first wave of competence assessment of the respective cohort (i.e., of fifth-grade students, ninth-grade students, college students, and adults) and are being assessed every second year in the school cohorts (in the adult cohort, measurement frequency is generally lower; i.e., approximately every sixth year).

### 6.3.2 Listening comprehension

Similar to the measurement of reading competence, the assessment of listening comprehension will use quasiauthentic material from realistic settings and will parallel the framework for reading competence in many aspects. However, there will also be some major differences. For instance, sequences may include factual reports from the radio, but also dialogues between two or more conversational partners. In addition, natural language will be presented online in comparison to reading, which is self-paced. Major challenges for the development of suitable instruments to assess listening comprehension are: (a) to select authentic listening situations that can be understood without too much contextual information, (b) the development of task formats that do not put too much pressure on memory load, and (c) the usage of task formats that do not require much reading. The exact framework and instruments for assessing listening comprehension are still in the making. As already mentioned, while tests for listening comprehension are still being developed, vocabulary tests are being implemented as a proxy to enable additional research questions and national and international comparative research. In principle, listening comprehension (on the text/discourse or word levels) should be measured about every second year in the school cohorts of the NEPS and the time point of measurement will alternate with the measurement of reading literacy, thus beginning in general at the second competence measurement. Again, in the adult cohort, measurements will occur less often (about every sixth year).

## 6.4 Measurement of language components within the NEPS and indicators assessed at specific educational stages or measurement points

The measurement of language components draws heavily on existing test instruments. In the following sections, a brief outline of the measures will be given.

### 6.4.1 Receptive vocabulary

Receptive vocabulary comprises all words a person recognizes and comprehends when heard. With regard to the assessment, as already mentioned, a common receptive vocabulary test is the PPVT (Dunn & Dunn, 1981, 2004). Based on the straightforward test administration of the PPVT and its psychometric properties, many international large-scale panel studies apply the PPVT (British Cohort Study; Bynner, 2004; the European Child Care and Education Study; ECCE Group, 1997). In the testing situation, the child is presented with a target word that is read aloud to him or her. Then, the child has to decide which picture out of a set of four fits the target word. This approach can be used in individual testing situations as well as in group settings for participants of different ages.

Due to the fact that vocabulary will be applied as a proxy for listening comprehension, receptive vocabulary is being assessed at least once in each starting cohort. Whereas there is a published German version of the PPVT for age groups from 13 years onwards comprising 89 items (Dunn & Dunn, 2004), a PPVT-like research version had to be developed for each of the younger age groups (4 to 5 years of age, first graders, sixth graders). To do so, PPVT data from the BiKS-3–10[9] study (see Weinert et al., 2012) were analyzed using item response theory to shorten the research version implemented in the BiKS-3–10 study from 175 items to roughly 80 items. This BiKS research version (Roßbach, Tietze, & Weinert, 2005) had been established based on data from the ECCE study and the research version that had been administered in that study. The version for the 4- to 5-year-old children comprised 77 items and had a Cronbach's alpha of $\alpha = .81$. The test was administered with stop criteria. The item selection for the test version for the first graders was based on a pilot study with approximately 600 first graders who were tested with twice as many items. Again, item response theory was applied to select a total of 66 items to be used on the final test. The version for the sixth graders was tested in a pilot study with 369 students; data analyses showed an internal consistency (Cronbach's alpha) of $\alpha = .88$ for this test version. Assessments of vocabulary can be linked across age groups because an anchor item design underlies the various test versions. In addition, a linking study allows the different modes of administration to be linked (individual testing in preschool, testing in group settings in school).

### 6.4.2 Receptive grammar

Receptive grammar can be measured using a picture selection method. The child hears a sentence and has to choose the picture that fits the sentence. This is an economical and suitable approach for assessing listening comprehension of gram-

9 BIKS = Bildungsprozesse, Kompetenzentwicklung und Selektionsentscheidungen im Vor- und Grundschulalter/Educational Processes, Competence Development and Selection Decisions in Preschool and Primary School Age.

matical structures in large-scale studies. One grammar test using the picture selection task is the Test for Reception of Grammar (TROG; Bishop, 1989; German version: TROG-D; Fox, 2006). In the NEPS, a shortened version of the TROG-D is being administered. All or nearly all syntactic category groups of the original test were maintained, but only approximately half of the items were used. Sentences with negation, prepositions, passive constructions, subordinate clauses, and relative clauses are examples that were included. Thus, it will be possible to analyze whether difficulties with grammar are a major obstacle to language comprehension.

The shortened kindergarten version comprises 48 items, and the first grade version comprises 40 items with some easy items left out and difficult items to be added.

### 6.4.3 Orthographic skills[10]

For the NEPS, a testing tool that draws on the assessment procedures used in other studies like PIRLS 2006 (Progress in International Reading Literacy Study) and HeLp 2007/8 (Hamburg Reading Promotion Project) is being developed.[11] Orthographic skills are being assessed every 2nd year in secondary school. The first assessment took place in the fifth grade. Approximately 75% of the test words used for the NEPS spelling test in the fifth grade originated from the test material of the orthography test applied in the HeLp 2007/08 study and has thus already been checked for test-quality criteria. About one fourth of the test words were newly developed and piloted. The NEPS test differentiates between two levels of analyses, that is the whole-word level and the level of subskills suggested by theoretical approaches (e.g., understanding of the syllabic structure of words, of inflectional and derivational morphemes; Frahm et al., 2011, p. 226).

Those subskills are tapped and measured by focusing on structural units of words. In order to survey the competence on both levels, the NEPS test combines a cloze text where students are asked to fill in single words with complete sentences that have to be written down in total. This test format proved to be particularly time-efficient and provides all necessary information. The whole test is presented via CD.

In the fifth grade, the testing focused on regular spellings, the core competence of spelling. In the seventh grade, the test comprises – according to curricular guidelines – a higher proportion of words with a complex structure as well as words from the peripheral area (e.g., exceptions in spelling, spelling of foreign words). Moreover, we included the capitalization of nominalized words and punctuation in Grade 7. This leads to a higher number of sentences. The content of both

10 The test instruments are being developed at the University of Hamburg under the direction of Prof. Dr. Inge Blatt. The NEPS research group includes the researchers Dr. Sarah Frahm (University of Hamburg) and Stephan Jarsinski (TU Dortmund University).

11 This basic research was conducted by Prof. Dr. Inge Blatt and Prof. Dr. Andreas Voss (Voss, Blatt, & Kowalski, 2007; Blatt, Voss, Kowalski, & Jarsinski, 2011).

tests did not refer to specific knowledge but to everyday life topics such as music and sports. Moreover, all subskills were considered equally.

### 6.4.4 Early letter knowledge

Early letter knowledge is being measured by showing a child a board with 24 letters and asking him or her to name the letters (e.g., "Münsteraner Screening", Mannhaupt, 2006).

### 6.4.5 Phonological processing

With respect to phonological processing, indicators of phonological awareness and phonological working memory are being assessed. Phonological working memory is often measured by memory span tasks. In these tasks, the child is presented with an increasing number of digits that have to be immediately recalled in the same order.[12] We are applying the *digit span* subscale of the German version of the Kaufman Assessment Battery for Children (Melchers & Preuß, 2009) and the *Zahlennachsprechen* subscale of the Hamburg-Wechsler-Intelligenztest für Kinder III (Tewes, Rossmann, & Schallberger, 2002), a backwards digit span task. This latter kind of task requires the involvement of the central executive, the component of working memory that allows information to be manipulated (see Baddeley, 1986).

Whereas the coherently assessed competence domains (functional measures) afford the development of new test instruments (or, in the case of vocabulary, the adaptation of existing test instruments), for measures that are being assessed only once or twice in one specific cohort and age group, existing tests or subtests of well-established assessment instruments had to be selected. In the following sections, we present and discuss the procedure for how we selected adequate measures for phonological awareness for the NEPS.

## 6.5 Selection of appropriate phonological indicators: A preliminary study

As already detailed, phonological awareness should be assessed in the NEPS because it is an important precursor of literacy development across languages and or-

12 Another measure of phonological working memory is nonword repetition (e.g., *phonologisches Arbeitsgedächtnis für Nichtwörter* subscale of the *Sprachentwicklungstest für drei- bis fünfjährige Kinder* (SETK 3–5); Grimm, 2001). Within large-scale studies, the scoring of this measure is probably less reliable. Because nonwords reflect the phonotactic-prosodic structure of a certain language, the outcomes of nonword repetition are also influenced by language-specific previous knowledge.

thographies (e.g., Ziegler & Goswami, 2005). Actually, "the discovery of a strong relationship between children's phonological awareness and their progress in learning to read is one of the great successes of modern psychology" (Bryant & Goswami, 1987, p. 439).

However, whereas in some competence domains, the task/item selection for the NEPS is obvious from the very beginning (e.g., because of a limited task/item pool; early letter knowledge: 24 letters), in some domains, the choice of tests is more challenging because many tasks exist or because it is unclear whether tasks fit the required criteria (e.g., concerning item difficulty for a specific age group); accordingly, a theoretically and empirically driven selection must be made. This is often done based on data from preliminary studies. In the following paragraphs one of these preliminary studies is briefly described to exemplify the process of task selection for the NEPS.

From a theoretical point of view, it has been widely acknowledged that phonological awareness is a complex two-dimensional construct (e.g., Schnitzler, 2008). The first dimension is the linguistic unit on which a person is able to reflect. Three unit sizes can be distinguished: syllables, onset-rimes, and phonemes. Awareness on the largest sublexical unit, the syllable, is developed relatively early, followed by the awareness of onset-rime units, and finally the awareness of phoneme units. These three phonological units have different predictive power concerning reading and spelling acquisition.[13] For instance, whereas phoneme awareness helps the reader to grasp the alphabetic principle that underlies our system of written language (e.g., Muter, Hulme, Snowling, & Taylor, 1998), onset-rime awareness helps a person to use analogical reading and spelling strategies and to build their mental representations of written words (Wimmer, Landerl, & Schneider, 1994).[14]

The second dimension is the level of the explicitness of the operation. Hereby, four levels can be distinguished: identification, segmentation, blending, and manipulation (Stackhouse & Wells, 1997). These levels refer to the depth of metalinguistic reflection that is needed to complete a phonological awareness task. Whereas

13 Based on the fact that languages vary in their phonological structure and their phoneme-grapheme consistency (shallow vs. transparent orthography), this connection is also language-specific (see e.g., "Grain Size Theory" in Ziegler & Goswami, 2005; Goswami, 2006).

14 Wimmer, Landerl, and Schneider (1994) tested a total of 183 German-speaking children (Study 1: $n$ = 45; Study 2: $n$ = 138) before they learned to read and later on at the end of their first year of schooling as well as 2 and 3 years later. They discovered that preschool rhyme awareness (e.g., Pf**and** – S**and**) was only marginally associated to reading (speed and accuracy) and writing at the end of Grade 1 but gained substantial predictive power for reading and spelling achievement at the end of elementary school. No such improvement was observed for onset awareness (e.g., **S**aft – **S**alz). They concluded that, compared to English, "rhyme awareness was found to be of similar relevance for learning to read German as it was found for learning to read English. The difference is that for learning to read English rhyme awareness was found to be important from the very beginning, while for learning to read German rhyme awareness became important considerably later" (Wimmer et al., 1994, p. 480). However, it must be noted that the relevance of awareness at the level of onset-rime for reading skills in late elementary school is relatively small compared to linguistic competencies like vocabulary (which is also included in the NEPS preschool assessment).

implicit phonological awareness tasks (e.g., identification) require less awareness, explicit phonological awareness tasks (e.g., manipulation) require higher levels of awareness. In general, the cognitive complexity of a task increases with the explicitness of the operation.

Concerning the assessment of phonological awareness, a broad range of tests and subscales exist. However, not all of them are suitable for assessment in the framework of an educational study like the NEPS. It must be considered that most well-established measures for assessing phonological awareness in preschool-age children are used as screenings and/or in therapeutic settings. Consequently, they are good at differentiating between below-average performance and average performance to identify training or therapy needs. For example, the most difficult task in the well-known Bielefelder Screening zur Früherkennung von Lese-Rechtschreibschwierigkeiten (BISC; Jansen, Mannhaupt, Marx, & Skowronek, 2002) has an average task difficulty of 0.78/0.80 (10 and 4 months before school entry, respectively). That means that between 78 and 80% of the children solved this task correctly. Thus, the most difficult BISC task is still an easy one.

To identify the tasks that would be appropriate for the NEPS, we conducted a small study to select phonological indicators for the second main study in kindergarten (for details concerning all tests and instruments in kindergarten, see Berendes et al., 2011). The aim of this study was to identify tasks that would allow performances to be differentiated by all phonological-awareness skill levels, including average and above-average performances. Thus, based on the two-dimensional construct of phonological awareness, we included tasks that varied by the size of the linguistic unit (syllable → phoneme) and dimension of operation (identification → manipulation) from easy to difficult. Thus, we expected that tasks requiring the manipulation of phonemes would be particularly difficult.

One hundred sixty-four children with different linguistic backgrounds and a mean age of 5.9 years took part in this study. All children were recruited from 15 preschools in four federal states of Germany. In the following paragraphs, the different kinds of phonological awareness tasks will be described.[15]

### 6.5.1 Identification of syllables

The ability to identify syllables was measured according to the *Silben identifizieren* (SI) subscale of the QUIL-D (German version of the *Queensland Inventory of Literacy*; Dodd, Holm, & Oerlemans, 1996). Two two-syllable words were presented, and the child was invited to decide whether the two words had a similar beginning (same initial syllable), a similar ending (same final syllable), or no similarities.

15 Diverse (control) variables (e.g., phonological working memory with and without involvement of the central executive and sentence repetition as a proxy for the child's language competencies) were used in the study. Because analyses that included these variables will not be presented in this paper, the concrete measures are not described here.

### 6.5.2 Manipulation of syllables

The ability to manipulate syllables was assessed based on a modification of the *Silben zusammensetzen* subscale of the *Rundgang durch Hörhausen* (Martschinke, Kirschhock, & Frank, 2001). Two bisyllabic words were presented to the child. These words are animal names, and cards with pictures of these animals were placed in front of the child. Each animal card was cut into two parts so that the parts could be put together in different ways to become fantasy animals. The child was asked to combine the first syllable of the one word with the second syllable of the other word and vice versa to name a fantasy animal presented by the respective parts of the picture cards (e.g., <Zie|ge – Ka|mel> → <Zie|mel – Ka|ge>).

### 6.5.3 Blending of onsets and rimes

The child heard monosyllabic words with a gap between the onset and the rime and was asked to blend these two parts (*Onset-Reim-Synthetisieren–output* subscale of the *Test für Phonologische Bewusstheitsfähigkeiten* (TPB), Fricke & Schäfer, 2008).

### 6.5.4 Identification of phonemes

The ability to identify phonemes was measured with a set of picture-based multiple-choice tasks (*Laut-Wort-Zuordnung* subscale of the *Münsteraner Screening zur Früherkennung von Lese-Rechtschreibschwierigkeiten* (MÜSC), Mannhaupt, 2006). The child heard a phoneme, then he or she heard three words and was instructed to point to the picture that illustrated the word with the previously heard phoneme.

### 6.5.5 Manipulation of phonemes

In order to assess the child's ability to manipulate phonemes, mono- or bisyllabic words were presented to the child, and the child was asked to repeat the word without the initial phoneme (*Anlaute-Manipulieren–output* subscale of the TPB, Fricke & Schäfer, 2008).

The main results of the study according to classical test theory are presented in Table 5. Classical test theory was used because the aim was to compare and select

appropriate well-established subtests rather than to construct a new test and select appropriate items.[16]

The results concerning item difficulty showed that one type of task, *identification of phonemes*, was very easy to master ($p_i$ = .81). One type of task, *identification of syllables*, showed a medium item difficulty ($p_i$ = .51). Two types of tasks, *manipulation of syllables* and *blending of onsets and rimes* showed high item difficulties ($p_i$ = .21; $p_i$ = .23), and the items of one type of task, *manipulation of phonemes*, were hardly answered correctly at all ($p_i$ = .06). The average item selectivity was high for all types of tasks ($r_{it}$ = .53 to $r_{it}$ = .76) except for the *identification of syllables* task ($r_{it}$ = .23). This last task was the only one with a low internal consistency (α = .56), whereas the other tasks showed medium (α = .83) to high (α = .93/.94) internal consistencies.

Table 5: Means, standard deviations, item difficulties, item selectivities (including range) and Cronbach's alphas according to classical test theory for the five phonological awareness tasks

| Type of task | Number of items | *M* | *SD* | Average item difficulty ($p_i$) | Average item selectivity ($r_{it}$) | Cronbach's alpha (α) |
|---|---|---|---|---|---|---|
| Identification of syllables | 12 | 6.17 (0–11) | 2.12 | .51 (.20–.78) | .23 (-.02–.46) | .56 |
| Manipulation of syllables | 8 | 1.68 (0–8) | 1.97 | .21 (.18–.26) | .76 (.67–.82) | .93 |
| Blending of onsets and rimes | 12 | 2.70 (0–12) | 3.93 | .23 (.14–.31) | .74 (.62–.85) | .94 |
| Identification of phonemes | 10 | 8.00 (0–10) | 2.45 | .81 (.65–.88) | .53 (.41–.66) | .83 |
| Manipulation of phonemes | 12 | 0.75 (0–12) | 2.27 | .06 (.04–.11) | .74 (.51–.86) | .94 |

To identify phonological tasks appropriate for inclusion in the second NEPS main study in kindergarten, the selection was based on the average item difficulty, the average item selectivity, and the internal consistency of the tasks.[17]

First, with regard to task difficulty, four of the five tasks could be considered: identification of syllables, manipulation of syllables, blending of onsets and rimes, and identification of phonemes. The task requiring the manipulation of phonemes was – in line with our theoretical expectations – too difficult for our sample ($p_i$ = .06) and was therefore not considered further. Surprisingly, the identification of phonemes task was easier than the identification of syllables task. This forces the question of why this task was so much easier than the other one. A closer look at the single items that were included on the subtest requiring the identifica-

16 Test construction and item selection for the new test instruments that were developed in-house – the tests for coherent assessment across the lifespan – drew from probabilistic test theory (item response theory; IRT).

17 Critical limits for interpretation (according to Weise, 1975) were: item difficulty: $p_i$ > .80/ $p_i$ = .80 - .20/$p_i$ < .20 → low/moderate/high item difficulty; item selectivity: $r_{it}$ < .30/ $r_{it}$ = .30 - .50/$r_{it}$ > .50 → low/moderate/high item selectivity.

tion of phonemes showed that many of the initial sounds were vowels (70%) and/or had syllable qualities (40%, e.g., Ameise → A-mei-se). This facilitated the identification of the initial phoneme. Thus, it could be assumed that we would have obtained a notably higher item difficulty if, for example, the tasks would have instead contained more (unvoiced) consonants in a complex onset as the initial phoneme. Moreover, the identification of phonemes task was administered in a picture-based format. Furthermore, the identification of syllables task required attention to the initial and final syllables of words whereas the identification of phonemes task focused solely on the identification of initial phonemes of words. Thus, the results show that additional factors have to be considered to predict the difficulty of phonological awareness tasks than the two-dimensional account suggests.

Second, the data concerning psychometric quality showed that four of the tasks: manipulation of syllables, blending of onset and rimes, identification of phonemes, and manipulation of phonemes met the criteria of good item selectivity. The task requiring the identification of syllables had a low item selectivity ($r_{it}$ = .23) and low internal consistency (α = .56). Therefore, this task was no longer considered, although it was the one with a medium task difficulty ($p_i$ = .51).

Third, two types of tasks, blending of onset and rimes and manipulation of syllables, showed no particular differences in terms of item difficulty, item selectivity, and internal consistency. Because the administration of the blending of onsets and rimes task took only half as much time as the manipulation of syllables task, there was some preference for this task in terms of time economy. Besides, theoretical considerations – as discussed later – speak in favor of the blending of onsets and rimes task.

Overall, two tasks emerged as suitable for our study: the subscale *identification of phonemes* was chosen to differentiate children located at the lower performance levels, and the subscale *blending of onsets and rimes* was chosen as a more difficult task.

These two types of tasks not only meet the requirements of psychometric quality and cover different item difficulties but also serve different functions concerning the prediction of literacy acquisition. Whereas phonological awareness on the phoneme level is of special importance in the beginning of reading acquisition (i.e., in the so-called "alphabetic phase" of literacy; Frith, 1985) and serves children's understanding of the alphabetic principle (phoneme-grapheme and grapheme-phoneme conversion), phonological awareness at the onset-rime level is important for a later stage of reading acquisition (i.e., in the so-called "orthographic phase" of literacy; Frith, 1985). In this phase, the child often uses an analogical strategy on the level of onset-rime to improve his or her reading and spelling skills (e.g., the word <R-ind> can be spelled correctly in analogy to the word <K-ind>).

## 7. Concluding remarks

The present article has presented a brief rationale and outline of the assessment of language indicators within the German National Educational Panel Study. The research design allows for detailed analyses of the importance of language skills and their effect and dependence on educational processes and educational careers. The longitudinal observation of German language competencies is expected to lead to a better understanding concerning the development of these skills over the lifespan and their influence on educational outcomes.

Because the data of all main studies of the NEPS are provided to the scientific community,[18] research questions from different research fields (e.g., psychology, sociology, pedagogy, linguistics) can be expected.

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18 Access to NEPS research data via Internet: https://www.neps-data.de/

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