Working memory, phonological awareness and developing language skills
Evidence from a latent variable longitudinal study

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**Introduction**

Links between working memory and phonological awareness with vocabulary acquisition, language comprehension and reading have been widely reported (e.g., Jong & van der Leij, 1999; Gathercole & Allington, 2006; Gupta, 2003). The central executive and the phonological loop components of the working memory model have been found to make significant contributions to language learning. Despite extensive research in the area, the specific associations between working memory, phonological awareness and language are not fully understood and remain the subject of debate.

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**Method**

**Summary**

Central executive, phonological loop, phonological awareness, native and foreign vocabulary knowledge, language comprehension, and reading were investigated longitudinally in a population of children growing up in Luxembourg - a country in which Luxembourgish is mainly used in social interactions, and German and French are instructed in schools.

**Participants**

119 Luxembourgish speakers with both parents speaking Luxembourgish. Children were assessed in Kindergarten and in 1st Grade of 15 Luxembourgish schools.

- 6 years old
- Emphasis on Luxembourgish
- Pre foreign language learners
- Pre readers and writers

- 7 years old
- Luxembourgish: 1 hour / week
- German: 8 hours / week
- Reading and writing in German

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**Analyses**

Structural Equation Modeling

Model relationships between latent constructs that are not directly observed but relate to observed variables

Reduce measurement error by having multiple indicators per latent variable

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**Discussion**

The findings lend strong support to the position that the phonological loop is one of the main contributors to new word learning in both native and non-native languages by supporting the formation of stable phonological representations of new words in long-term memory.

The phonological loop also seems to play a significant role in the syntactic comprehension of sentences. The heard material might be kept active in the phonological loop while the child is listening to the sentence and processing it for comprehension. Finally the central executive appears to make significant contributions to reading development.

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**References**


Hillsdale: Erlbaum.

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**AIM**

Assess working memory and phonological awareness in young children exposed to multiple languages in order to explore their relationship with developing language skills in the areas of vocabulary, comprehension and reading.

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**Result 1**

Kindergarten First Grade

- Phonological loop
- Digit recall
- Backwards digit recall
- Counting recall
- Rhyme detection A
- Rhyme detection B

Factor 1 (Phonological loop) .99
Factor 2 (Central executive) .83
Factor 3 (Phonological awareness) .53

Phonological loop, central executive, and phonological awareness - separate but correlated latent constructs in children from 6 to 7 years

Continuity/ stability between the constructs over time

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**Result 2**

Kindergarten First Grade

- Phonological loop
- Vocabulary
- Comprehension
- Central executive
- Phonic awareness

Factor 1 (Phonological loop) .83
Factor 2 (Comprehension) .51
Factor 3 (Central executive) .32
Factor 4 (Phonological awareness) .48

Knowledge of native and foreign vocabulary and language comprehension abilities - strongly associated with the phonological loop

Reduction of this association over the year: previous language knowledge might become increasingly important (Gathercole et al., 1992)

Phonological awareness and reading: strong link in 1st Grade but not in Kindergarten

Cause or consequence of developing reading skills?

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**Result 3**

Kindergarten First Grade

- Phonological loop
- Vocabulary
- Comprehension
- Reading

Factor 1 (Phonological loop) .38
Factor 2 (Vocabulary) .62
Factor 3 (Comprehension) .46
Factor 4 (Reading) .33

Phonological loop assessments in Kindergarten significantly predicted vocabulary knowledge and comprehension in native and foreign languages one year later.

Central executive and phonological loop measures in Kindergarten - significantly associated with reading in 1st Grade

Phonological awareness, indexed by rhyme detection, did not predict any of the language constructs one year later.

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**Result 4**

Kindergarten First Grade

- Phonological loop
- Vocabulary
- Comprehension
- Reading

Factor 1 (Phonological loop) .38
Factor 2 (Vocabulary) .62
Factor 3 (Comprehension) .46
Factor 4 (Reading) .33

Phonological loop assessments in Kindergarten significantly predicted vocabulary knowledge and comprehension in native and foreign languages one year later.

Central executive and phonological loop measures in Kindergarten - significantly associated with reading in 1st Grade

Phonological awareness, indexed by rhyme detection, did not predict any of the language constructs one year later.

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**Result 5**

Kindergarten First Grade

- Phonological loop
- Vocabulary
- Comprehension
- Reading

Factor 1 (Phonological loop) .38
Factor 2 (Vocabulary) .62
Factor 3 (Comprehension) .46
Factor 4 (Reading) .33

Phonological loop assessments in Kindergarten significantly predicted vocabulary knowledge and comprehension in native and foreign languages one year later.

Central executive and phonological loop measures in Kindergarten - significantly associated with reading in 1st Grade

Phonological awareness, indexed by rhyme detection, did not predict any of the language constructs one year later.

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**Result 6**

Kindergarten First Grade

- Phonological loop
- Vocabulary
- Comprehension
- Reading

Factor 1 (Phonological loop) .38
Factor 2 (Vocabulary) .62
Factor 3 (Comprehension) .46
Factor 4 (Reading) .33

Phonological loop assessments in Kindergarten significantly predicted vocabulary knowledge and comprehension in native and foreign languages one year later.

Central executive and phonological loop measures in Kindergarten - significantly associated with reading in 1st Grade

Phonological awareness, indexed by rhyme detection, did not predict any of the language constructs one year later.

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**Result 7**

Kindergarten First Grade

- Phonological loop
- Vocabulary
- Comprehension
- Reading

Factor 1 (Phonological loop) .38
Factor 2 (Vocabulary) .62
Factor 3 (Comprehension) .46
Factor 4 (Reading) .33

Phonological loop assessments in Kindergarten significantly predicted vocabulary knowledge and comprehension in native and foreign languages one year later.

Central executive and phonological loop measures in Kindergarten - significantly associated with reading in 1st Grade

Phonological awareness, indexed by rhyme detection, did not predict any of the language constructs one year later.