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Internal and external influences on vocabulary development in preschool children

Susanne Ebert^{a*}, Kathrin Lockl^a, Sabine Weinert^a, Yvonne Anders^b,
Katharina Kluczniok^a and Hans-Günther Rossbach^a

^a*University of Bamberg, Bamberg, Germany;* ^b*Free University of Berlin, Berlin, Germany*

Competency in society's lingua franca plays a major role in the emergence of social disparities within education. Therefore, the present longitudinal study investigates vocabulary development and its predictors in preschool years. We focus on whether internal (phonological working memory) and external variables (preschool and home learning environment) have different impacts depending on parental native language. The study considers 547 children from 97 German preschools. Children's vocabulary was assessed at the ages of 3, 4, and 5 years. Latent growth curve models show that non-native German language children are characterized by reduced vocabulary at first assessment and lower progress compared to monolingual peers. Phonological working memory has a strong impact on all children's initial vocabulary but also on vocabulary growth in those whose parents speak German as an additional language. The effects of preschool and home learning environment are comparatively smaller.

Keywords: language development; preschool quality; home learning environment; longitudinal studies; migration

Theoretical background

Being competent in the lingua franca used by the majority of society is indisputably one of the central educationally relevant cognitive competencies with lasting influence on cognitive, sociocognitive, and social development. Language forms an important coding and communication system supporting children's acquisition of knowledge in various domains (see Weinert, 2006). Thus, social disparities in school achievement and academic careers have – at least in part – been attributed to differences in (German) language competencies (e.g., Stanat, 2006). In order to understand the emergence of these disparities, analysing the courses and influential factors of language development seems to be important. In this context, the present paper focuses on internal and external factors of vocabulary development as a key component of language acquisition.

*Corresponding author. Email: susanne.ebert@uni-bamberg.de

With respect to *internal factors*, phonological working memory has proved to be a powerful predictor of individual differences in vocabulary status and growth. The functional impact of phonological working memory on lexical learning has been demonstrated in experimental, quasi-experimental, and longitudinal studies and in first-language acquisition as well as in foreign-language learning (e.g., Gathercole & Baddeley, 1993; Service & Kohonen, 1995). However, there is empirical evidence showing that the impact of phonological working memory on vocabulary growth changes with language status and/or age suggesting that differences in phonological working memory capacity become less important when vocabulary size increases (Gathercole, Willis, Emslie, & Baddeley, 1992). Moreover, the (relative) importance of individual differences in working memory in natural first- and second-language acquisition is by no means clear because external factors are not considered simultaneously. Likewise, studies addressing *external factors* of language acquisition often disregard internal child characteristics by exclusively focussing on learning environment at home and/or in (pre)school.

Studies concerning the impact of *home learning environment* show that children of less educated mothers or children from lower socioeconomic status (SES) families build their vocabularies at comparatively slower rates (e.g., Hart & Risley, 1995; Roberts, Jurgens, & Burchinal, 2005). Moreover, the Home Observation for Measurement of the Environment (HOME; Caldwell & Bradley, 1984), a more proximal measure of quality and quantity of stimulation and support at home, has been found to be associated to children's later language skills (e.g., Roberts et al., 2005). In addition, more specific indicators of the language-learning environment like quantity (number of words) and quality (e.g., richness) of parental speech (Hart & Risley, 1995), frequency of shared-book-reading (Scarborough & Dobrich, 1994) as well as maternal book-reading strategies and sensitivity during reading (Roberts et al., 2005) were shown to be positively correlated with child language competencies.

Concerning *preschool education*, similar variables as the ones considered above have been shown to contribute to children's language competencies. For example, there is evidence that the quality of instructional support available for children in their interactions with teachers (Mashburn et al., 2008), the amount of time spent for meaning-focused activities such as book reading (Connor, Morrison, & Slominski, 2006), or specific features of teachers' language input within the preschool classroom (e.g., Girolametto & Weitzman, 2002; Huttenlocher, Vasilyeva, Cymerman, & Levine, 2002) are related to children's language development. Besides process quality, structural characteristics such as qualification of the teacher or number of children in class are thought to indirectly influence child development mediated by the emotional and instructional quality of teacher-child interactions (Mashburn et al., 2008; National Institute of Child Health and Human Development Early Child Care Research Network [NICHD ECCRN], 2002). However, the effects of these variables are relatively small, and some researchers do not find an effect of structural program characteristics on children's language skills (Mashburn, Justice, Downer, & Pianta, 2009). Therefore, it is not evident whether structural characteristics of preschool do account for differences in language development, especially when procedural preschool characteristics are considered simultaneously.

When taking into account both home *and* preschool characteristics, one would not expect the effects of preschool education to be as strong as those of home environment (NICHD ECCRN, 2002). Nevertheless, especially when children lack

high quantitative and/or qualitative language input and a stimulating learning environment at home, preschool attendance may turn out to be of particular importance.

In sum, there is plenty of evidence that language development in general and vocabulary acquisition in particular is influenced by child characteristics as well as by various variables at home and in preschool. However, the relative weight of these variables in promoting language learning is by no means clear as most studies consider either child variables or environmental factors. From a theoretical as well as from an empirical point of view, child variables, measures of home learning environment, and measures of preschool quality are likely to covary. Thus, when internal and external predictors, that is, child characteristics, institutional, and home learning environment, are considered separately, the effect of each factor may be overestimated and could possibly be traced back to the respective other variable not included in the model. Therefore, it is important to take child, preschool, and family factors conjointly into account. Further on, the impact of the various predictors might change according to the child's native language background.

The present study

The present study has two major goals: Firstly, the study aims to investigate how internal and external factors discussed in the literature *conjointly* influence vocabulary acquisition in preschool children considering (a) child characteristics, (b) measures of the preschool setting, as well as (c) of home learning environment. From a methodological point of view, the assessment and inclusion of home environment allows for controlling selection biases in preschool attendance and thus for an unbiased test of the effects of preschool quality.

The second major goal of the study is to examine whether the relative weight of predictors differs depending on the child's language background at home (German vs. non-German). Since vocabulary development itself influences the interrelation between phonological working memory and vocabulary growth (Gathercole et al., 1992), we expect this relation to be more pronounced in children with a non-German language background. Further on, we hypothesize that for children with a non-German language background preschool characteristics will turn out to be especially important for vocabulary acquisition.

To test for the relative impact of child characteristics, preschool quality and home learning environment, the effects of the various variables are modelled within latent linear growth curve models allowing for a separate estimate of influences on (a) individual differences in vocabulary status at the beginning of the study when children were about 3 years of age (intercept) and (b) vocabulary growth over a 2-year period of preschool attendance (slope).

Method

Procedure and sample

The present study is part of the interdisciplinary longitudinal project BiKS (Educational Processes, Competence Development and Selection Decisions in Pre- and Primary School Age). All data were drawn from the substudy BiKS-3-10.¹ The sample consists of 547 children (48.3% girls) attending 97 preschools in two German federal states (Hesse and Bavaria).² The first time point of measurement was in

autumn 2005, when the vast majority of children had just entered preschool and the children were about 3 years old. Various measures of children's cognitive and verbal competencies were assessed longitudinally with half- or 1-year intervals between measurement points. In addition, indicators of preschool setting as well as variables concerning the child's home environment were assessed using questionnaires, interviews, and observations.

The present study focuses on children's vocabulary development during preschool period. Receptive vocabulary was considered at three measurement points, separated by one year. The predictors of vocabulary development were assessed within this time interval at two or three measurement points (see below). At the first time point, children were on average 3;9 years old ($M = 44.57$ months, $SD = 4.99$ months).

Measures

Developmental variable

For the assessment of children's receptive vocabulary, a German research version of the Peabody Picture Vocabulary Test (PPVT; Dunn & Dunn, 1981) was implemented. In this test, the child is presented with one lexical item at a time, and his or her task is to select the picture out of four pictures that the word refers to. Items were presented in order of increasing difficulty, and testing was stopped when the child's response to 6 or more items within a set of 12 items was incorrect. Each correct response was scored as one point (max. 175).

Child characteristics

Besides children's age in months and gender, indicators of phonological working memory were considered as child variables potentially influencing children's vocabulary development. To assess children's phonological working memory, a digit span task and a nonword repetition task were deployed.

Nonword repetition task. The nonword repetition task was taken from a German test battery for the assessment of language development in preschool children (SETK 3-5; Grimm, 2001) and administered at the first measurement point. It assesses the ability to represent new phonological patterns in phonological working memory. Children were instructed to repeat 13 nonwords (e.g., "Billop") which differed in length (two to five syllables). Performance was rated by the number of correctly recalled nonwords (max. 13).

Digit span. The digit span task was administered at all three measurement points. It is taken from the German version of the Kaufmann-Assessment Battery for Children (K-ABC; Melchers & Preuss, 2003). Children were asked to reproduce sequences of digits presented at a rate of one digit per second. The test included three trials at each item length and was discontinued when none of the items of a given length was reproduced correctly. The sum score of items recalled was assessed at each measurement point.

To obtain a relatively stable measure for analyses, a mean score for phonological working memory was used. Raw scores of both tests were z standardized and averaged, the correlations between tests ranging between $r = .40$ and $r = .71$.

Structural characteristics and measures of process quality in preschool setting

Structural characteristics. Class size, child–staff ratio, and the number of children with migration background in the class were considered as structural preschool measures.

Process quality. The measure of process quality in preschool is based on life observations of each preschool setting by trained observers using a German version of the Early Childhood Environment Rating Scale-Extension (ECERS-E; Sylva, Siraj-Blatchford, & Taggart, 2003). Since the present study focuses on children’s vocabulary development, the subscale “literacy” was used in the analyses. This subscale includes six items which refer, for example, to the amount of different kinds of books (e.g., picture books, reference books) or the observation of adults reading to the child. The scores range from 1 to 7 with 1 indicating *inadequate* quality, 3 *minimal* quality, 5 *good* quality, and 7 *excellent* quality of preschool. The internal consistency (Cronbach’s alpha) of the literacy scale is 0.59 and 0.64 at the two considered measurement points, respectively.

Promotion of language in preschool. This measure is based on information given by the preschool teachers concerning the questions (a) whether the preschool has a focus on promoting language skills and (b) whether children with a background of migration receive special language training in this preschool. The answers on these two items were summarized, and the resulting sum score was standardized to range from 0 to 1.

All preschool measures were average scores of two or three annual assessments. In addition, age of entry into preschool was accounted for. As age of the children at each measurement point was also considered in the analyses, age of entry into preschool can be interpreted as an indicator of the total time of preschool attendance influencing child development.

Family background and home learning environment

Family background. With regard to their parent’s mother tongue, 21.8% show another parental language status than German. A total of 12.1% of the children have parents who both comprise a different first language than German, whereas 9.7% live in families where one parent does not speak German as his/her mother tongue.

Socioeconomic status of the family was measured as a distal social background variable using the International Socioeconomic Index of Occupational Status (ISEI; see Ganzeboom, de Graaf, & Treiman, 1992). In the analyses, the highest value (HISEI) in each family was considered. Further, maternal education level was assessed (differentiating between no degree or degree at vocational level, general certificate of secondary education, and qualifications for university entrance).

Home learning environment (HLE) – literacy. To measure the domain-specific quality of home learning environment, three different data sources were used. We considered (a) self-constructed questionnaires and interviews, (b) an adapted version of the HOME (Caldwell & Bradley, 1984), and (c) a semistandardized book-reading task between primary caregiver and child. The resulting “literacy” scale consisted of 10 items, such as the frequency of shared book reading, number of children’s books,

or encouragement to learn the alphabet. The internal consistency (Cronbach's alpha) at the three considered measurement points is 0.60, 0.67, 0.63, respectively. For the following analyses, the scale was standardized to a range from 0 to 1, and an average score of the annual assessments was computed.

Statistical analyses

To examine the impact of the potential predictors on children's vocabulary development, latent linear growth curve models with three repeated measurement points were computed. Age at assessment was treated as a time-varying predictor in all analyses.

First, a separate latent linear growth curve model was conducted to test for differences in (a) starting level (intercept) and (b) vocabulary growth (slope) depending on parental native language status.

Next, a model was specified for all children with a stepwise procedure in order to evaluate the relative weight of the various internal and external predictors. According to our research questions, child variables (age, sex, phonological working memory) were considered first. Then procedural and structural preschool measures were included. In a last step, family background variables and literacy stimulation at home were included to test whether potential effects of preschool may already be accounted for by relevant aspects of the home learning environment, thus controlling for potential selectivity in preschool attendance.

In addition, a multiple-group analysis differentiating between children with a German and a non-German parental native language status was conducted to compare the effects of the various predictors for children with different family language backgrounds. Again, the stepwise procedure described above was used in these analyses.

All analyses were carried out using MPlus version 6.0 (Muthén & Muthén, 2010). Model fit was evaluated by root mean square error of approximation (RMSEA) and comparative fit index (CFI), recommended by Hu and Bentler (1999). As the data have a nested structure with children being nested in preschool classes, the standard errors adjusted for the multilevel structure of the data were estimated in all analyses. Full-information-maximum likelihood (FIML) approach (e.g., Arbuckle, 1996) that includes valid information of all observations for model estimation was used to deal with missing data.

Results

Descriptives

A summary of the descriptive statistics for the child measures as well as for the family and the preschool characteristics is given in Table 1.³ Since a main goal of the present study is to compare vocabulary development as a function of family language background, the descriptive statistics are separated for children according to their parental native language status (German vs. at least one parent non-German).

The means presented in Table 1 show that vocabulary size grows significantly and steadily over the preschool years. Furthermore, *t* tests demonstrate significant differences between children with German and non-German parental native language status on all variables except for age of child at Time 1 and age of child when entering preschool.

Table 1. Means of the key measures for children in accordance to their parental native language status (standard deviations in parentheses).

Child level (<i>N</i> = 547)	total	Parental Native Language Status		
		German	Non-German	<i>t</i> Test
Age at entry (in months)	37.5 (5.2)	37.6 (4.8)	37.4 (6.4)	ns
Age at time 1 (in months)	44.6 (5.0)	44.5 (5.0)	44.7 (5.1)	ns
<i>Outcome measures</i>				
Vocabulary score time 1	34.2 (19.0)	37.4 (18.5)	22.3 (15.8)	<i>p</i> < .01
Vocabulary score time 2	56.1 (21.7)	60.1 (20.0)	41.7 (21.8)	<i>p</i> < .01
Vocabulary score time 3	77.6 (21.8)	82.4 (19.3)	60.1 (21.9)	<i>p</i> < .01
Digit span time 1	3.74 (2.74)	3.92 (2.79)	3.10 (2.43)	<i>p</i> < .01
Digit span time 2	5.76 (2.29)	6.00 (2.26)	4.91 (2.26)	<i>p</i> < .01
Digit span time 3	7.37 (2.24)	7.55 (2.26)	6.67 (2.02)	<i>p</i> < .01
Pseudoword time 1	5.54 (3.28)	5.81 (3.29)	4.59 (3.06)	<i>p</i> < .01
<i>Family characteristics</i>				
Home learning environment - literacy	0.52 (0.12)	0.54 (0.11)	0.44 (0.15)	<i>p</i> < .01
HISEI	52.4 (16.3)	54.3 (15.7)	45.9 (16.6)	<i>p</i> < .01
Preschool level (<i>N</i> = 97)				
<i>Structural characteristics</i>				
Class size	23.6 (3.4)	23.9 (3.1)	22.5 (4.3)	<i>p</i> < .01
Child-staff ratio	11.2 (3.1)	11.7 (2.9)	9.6 (3.1)	<i>p</i> < .01
Children with migration background-to-class size ratio	23.0 (23.6)	16.6 (16.7)	46.2 (29.4)	<i>p</i> < .01
<i>Indicators of process quality</i>				
ECERS-literacy	3.23 (0.75)	3.30 (0.75)	2.97 (0.67)	<i>p</i> < .01
Promotion of language in preschool	0.32 (0.31)	0.28 (0.28)	0.49 (0.33)	<i>p</i> < .01

Disparities in vocabulary growth depending on family language background

According to the procedure described above, growth curve models were specified to explore the differential impact of the predictors on children's vocabulary development.

When parental native language status (German versus non-German) as a predictor was entered, a significant effect of parental native language status on initial vocabulary status and vocabulary growth showed up. Children whose parents do not speak German as their mother tongue demonstrate lower performance at first assessment ($b = -1.42, p < .01$) than monolingual German children, and the performance gap even widens over the following 2 years ($b = -0.83, p < .01$). Children with only one parent with non-German mother tongue show lower vocabulary achievement at first assessment ($b = -0.47, p < .01$) than children with monolingual German language background, but there is no effect on growth ($b = -0.04, ns$). The model shows a good fit of data with CFI = 1.00 and RMSEA = 0.02.

What impact do internal and external variables have on children's vocabulary development?

Model 1 (see Table 2) considers various child characteristics as predictors. The analysis reveals that phonological working memory has a significant impact on children's initial vocabulary status ($b = 0.54, p < .01$) and on later growth

($b = 0.17, p < .05$), whereas gender does not significantly explain variance of initial achievement nor growth.

In the following model (Model 2, see Table 2), the indicators of domain-specific process quality in preschool were added. The results indicate that domain-specific quality tends to be positively associated with the initial level of receptive vocabulary ($b = 0.12, p < .10$) but not with the slope. Promotion of language is negatively related to children's initial vocabulary ($b = -0.16, p < .01$) but, again, not to the slope. Children's age at entry to the preschool setting as an indicator for the total duration of preschool experience tends to be negatively associated with the slope ($b = -0.13, p < .10$).

Model 3 (see Table 2), which additionally includes structural characteristics of the preschool settings shows that class size ($b = -.14, p < .05$) and the ratio of children with a migration background in the class ($b = -.20, p < .01$) are negatively related to children's initial vocabulary status. In contrast, child-staff ratio tends to be positively associated with the initial achievement level ($b = .10, p < .10$). Regarding vocabulary growth, the ratio of children with migration background just failed to reach significance ($b = -.20, p < .10$), suggesting that children's vocabulary in classes with a lower ratio of children with migration background tends to grow faster than in classes with more children with migration background.

In addition to the variables mentioned before, Model 4 also includes indicators of family background. As shown in Table 3, parental native language status as well as mother's education proved to have a significant impact on children's initial vocabulary, but not on the slope. Children with non-German language background – and especially children whose both parents have a non-German language status – show a lower achievement level at first assessment ($b = -0.31, p < .01$). Further on, there is a tendency for children from families with higher socioeconomic status to have a richer vocabulary at first assessment ($b = 0.09, p < .10$). However, none of the tested family background variables has a significant impact on vocabulary growth, at least after controlling for child and preschool characteristics.

Comparing Model 4 to Models 1–3, it can be seen that the influence of children's phonological working memory on vocabulary growth is reduced when family background characteristics are included. Furthermore, the analyses show that Model 4, which accounts for family characteristics, explains substantially more variance of the intercept (48%) than Model 3, but the amount of explained variance of the slope (15%) is again rather low.

Finally, Model 5 (see Table 3) additionally considers home learning environment in terms of promoting literacy as a predictor. The results indicate that the quality of the home learning environment is positively associated to the initial level of children's vocabulary ($b = 0.28, p < .01$), but not to the slope. The influence of family background variables is reduced when adding home learning environment as a predictor.

Table 3 also shows the amount of explained variance of intercept and slope for each model as well as model fit, which is good or very good for all models.

Do internal and external variables have differential effects on vocabulary development for children with German and non-German language background?

To examine the question whether the impact of the various internal and external variables differs depending on parents' native language status, we computed a

Table 2. Results of latent growth curve analyses to predict the development of receptive vocabulary between the first (age 3) and third (age 5) assessment (Model 1 – Model 3).

Predictors	Model 1			Model 2			Model 3					
	Intercept		Slope	Intercept		Slope	Intercept		Slope			
	B	SE (B)	B	SE (B)	B	SE (B)	B	SE (B)	B	SE (B)		
<i>Child characteristics</i>												
Working memory	.54**	.04	.17*	.09	.52**	.04	.16+	.09	.52**	.04	.17+	.09
Gender (0 = female, 1 = male)	.04	.04	.06	.08	.03	.04	.05	.08	.02	.04	.05	.08
<i>Process quality</i>												
ECERS-Literacy					.12+	.07	.03	.09	.08	.06	.00	.10
Promotion of language in preschool					-.16**	.05	-.10	.09	-.06	.06	.08	.10
Age of child at entry to the preschool setting					.03	.06	-.13+	.07	.04	.06	-.16*	.07
<i>Structural preschool characteristics</i>												
Class size									-.14*	.06	.13	.08
Child-staff ratio									.10+	.06	.13	.09
Children with migration background-to-class size ratio									-.20**	.07	-.20+	.11
Slope with Intercept	B = -.09	SE = .16	B = -.07	SE = .18	B = -.12	SE = .12	B = -.12	SE = -.27	.29**	.38**	.16+	
R ²		.03		.06		.33**		.06				
Model fit (CFI/RMSEA)	1.00/0.01		1.00/0.01		1.00/0.00		1.00/0.00		1.00/0.00			

Notes: In all models, age of assessment was included as time-varying predictor, although not shown in the table. Coefficients are standardized using the variances of continuous variables.

+p < .10, *p < .05, **p < .01.

Table 3. Results of latent growth curve analyses to predict the development of receptive vocabulary between the first (age 3) and third (age 5) assessment (Model 4 & Model 5).

Predictors	Model 4				Model 5			
	Intercept		Slope		Intercept		Slope	
	B	SE (B)	B	SE (B)	B	SE (B)	B	SE (B)
<i>Child characteristics</i>								
Working memory	.42**	.05	.10	.08	.39**	.05	.10	.08
Gender (0 = female, 1 = male)	.03	.04	.04	.08	.04	.04	.04	.08
<i>Process quality</i>								
ECERS-Literacy	.06	.05	-.01	.10	.05	.05	-.01	.10
Promotion of language in preschool	-.05	.06	.09	.09	-.06	.06	.09	.09
Age of child at entry to the preschool setting	.04	.05	-.14*	.05	.04	.05	-.14+	.07
<i>Structural preschool characteristics</i>								
Class size	-.11*	.05	.12	.08	-.10*	.05	.13	.08
Child-staff ratio	.07	.06	.12	.08	.08	.05	.12	.08
Children with migration background-to-class size ratio	-.03	.07	-.13	.12	-.01	.06	-.13	.12
<i>Family background</i>								
Parental native language status (Reference category: native German)								
one parent not German mother tongue	-.10**	.04	.04	.06	-.08*	.04	.04	.06
both parent not German mother tongue	-.31**	.05	-.10	.09	-.23**	.05	-.08	.10
<i>Mother's education (Reference category: qualification for university entrance)</i>								
general certificate of secondary education	-.05	.05	.03	.09	-.01	.05	.02	.09
no degree or a degree at vocational level	-.16**	.05	-.02	.08	-.07	.05	-.02	.08
Highest socioeconomic status of the family	.09+	.05	.11	.10	.04	.05	.11	.11
<i>Home learning environment: literacy</i>								
Slope with Intercept	B = -.25+	SE = .15	B = -.26+	SE = .15	B = -.26+	SE = .15	B = -.26+	SE = .15
R ²	.48**		.15*		.54**		.15*	
Model fit (CFI/RMSEA)	1.00/0.00		1.00/0.00		1.00/0.00		1.00/0.00	

Notes: In all models, age of assessment was included as time-varying predictor, although not shown in the table. Coefficients are standardized using the variances of continuous variables. + $p < .10$, * $p < .05$, ** $p < .01$.

multiple-group growth curve analysis comparing children with a German and a non-German language background.⁴ The analyses followed the same stepwise procedure as described above.

Figure 1 depicts a diagram of the model and its results separated for children with a German and a non-German language background. For reasons of clarity and simplicity, paths are only shown when a significant effect on intercept or slope is demonstrated in at least one of the conducted steps. Furthermore, the range of the observed coefficients found across the different steps is indicated.

Some effects turned out to be even more pronounced in children with a non-German language background than for the whole group and did not show up in the monolingual German subsample.

First, with respect to child characteristics, phonological working memory on the one hand proved to be highly associated to vocabulary status in both groups ($b = 0.39$, $p < .01$ for non-German language background; $b = 0.57$, $p < .01$ for monolingual Germans), and these effects of working memory are maintained when other predictors are included into the models. On the other hand – as hypothesized – the impact of phonological working memory on vocabulary growth is restricted to the children with non-German language background ($b = 0.40$, $p < .01$; for monolingual Germans: $b = 0.04$, ns).

Second, concerning process quality and promotion of language in preschool, there is an association with vocabulary status at first assessment in children with non-German language background ($b = 0.16$, $p < .10$; $b = -0.28$, $p < .01$), but not in the native German language sample ($b = 0.04$, $b = 0.02$; both, ns). As in the total sample, we do not find a significant association of preschool characteristics with vocabulary growth in either of the subsamples.

Third, with regard to structural preschool measures, the ratio of children with migration background is negatively associated with vocabulary status at the beginning of the study ($b = -0.23$, $p < .05$) and – tentatively but nonsignificantly – with vocabulary growth in children whose parents have a different mother tongue than German. This effect vanishes when family background variables are controlled. In the monolingual German subsample, the only significant effect that shows up is class size ($b = -0.18$, $p < .05$).

Finally, literacy-specific home learning environment plays an important role for children's initial vocabulary in both subsamples ($b = 0.41$, $p < .01$ for non-German language status; $b = 0.27$, $p < .01$ for monolingual Germans) but not for its growth. This model which considers all predictors explains 44%/45% of the variance of the intercept and 9%/31% of the variance of the slope for children with non-German and monolingual German language background, respectively. Model fit is good (CFI = 0.99, RMSEA = .03).

Thus, the main difference between the two groups of children regarding the relative weight of the predictors concerns the effect of phonological working memory on vocabulary growth. In addition, the two groups differ with respect to the association between preschool characteristics (process quality, promotion of language, ratio of children with migration background in class, class size) and initial language status.

Discussion

The main goal of the study was to examine the relative impact of internal and external variables on vocabulary development when conjointly considering

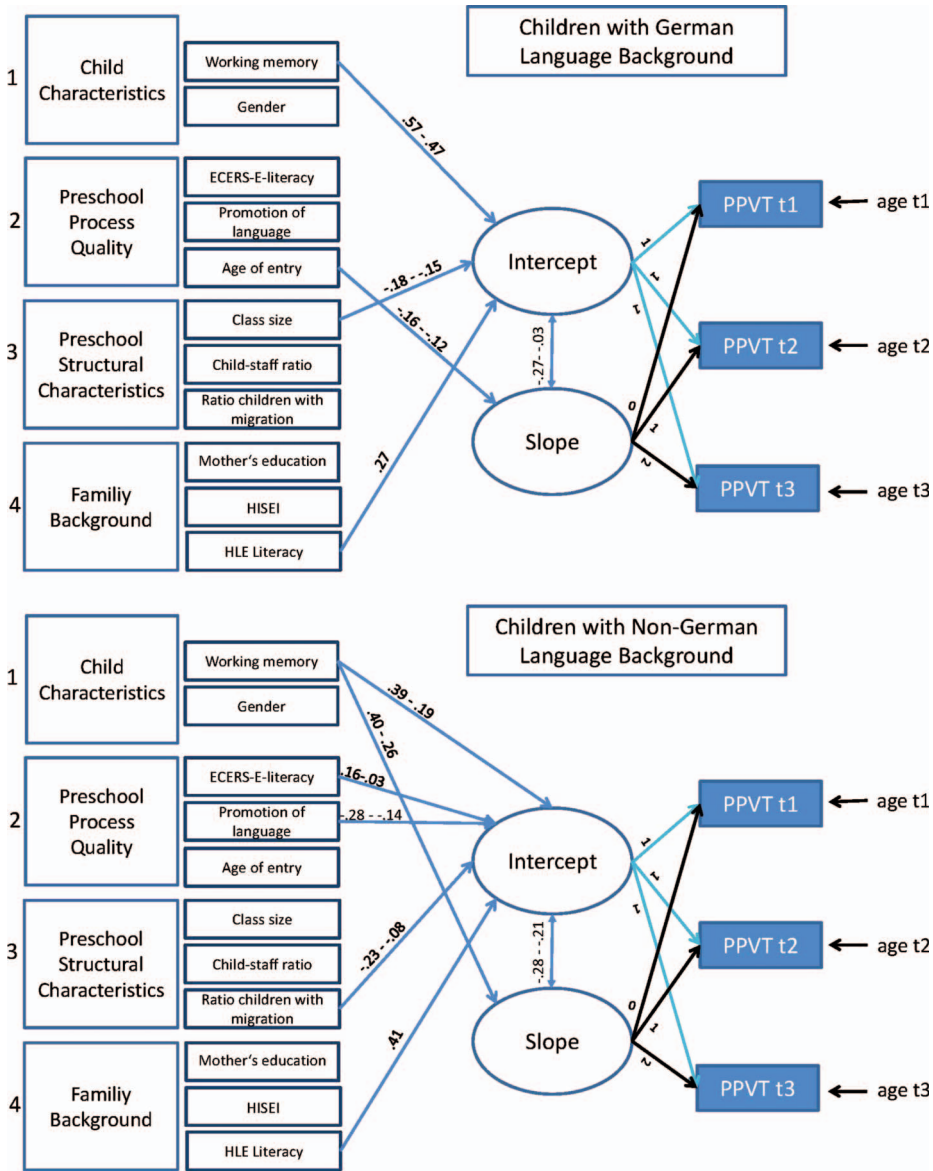


Figure 1. Results of multiple-group analysis to predict the development of receptive vocabulary between the first (t1) and third (t3) assessment for children with German vs. non-German language background.

Notes: Paths not significant ($p < .10$) in any of the four steps (1–4) have been deleted (all possible predictive paths were assessed). Range of path coefficients across the different steps is shown as soon as a coefficient was significant at least in one step. ECERS-E-literacy = literacy scale of the Early Childhood Environment Rating Scale-Extension; HISEI = Highest International Socioeconomic Index of Occupational Status; HLE = Home Learning Environment; PPVT = Peabody Picture Vocabulary Test.

child characteristics, measures of the preschool setting, and of home learning environment. Furthermore, the study aimed to investigate whether the relative weight of predictors differs depending on the child's language

background at home (children with German vs. non-German language background).

First of all, our results demonstrate significant disparities between monolingual German children and children whose parents do not speak the lingua franca of the majority of society as their mother tongue (see also Dubowy, Ebert, von Maurice, & Weinert, 2008). Children with a foreign-language background were not only characterized by their reduced lexical knowledge in the German language but also showed a significantly lower performance on phonological working memory tasks, attended preschools with less process quality but comparatively better structural conditions (child–staff ratio, class size), and their families were characterized by comparatively lower socioeconomic status (SES) and a less literacy-stimulating home learning environment compared to the monolingual Germans.

Second, the analyses of latent growth curve models demonstrated that children with a non-German language background did not only exhibit reduced lexical knowledge at preschool entry but also showed lower progress across preschool years.

These results highlight that it is important to consider internal and external variables simultaneously and to differentiate between groups with different language backgrounds when analysing language development.

Concerning internal predictors of children's (German) language competencies, as hypothesized, phonological working memory proved to be a significant predictor of children's vocabulary status at preschool entrance and vocabulary growth over the preschool years. This result holds true especially for children with a non-native German language background and therefore low language skills at the beginning of the study. It replicates and extends data obtained by Gathercole and colleagues (e.g., Gathercole & Baddeley, 1993; Gathercole et al., 1992). Within cross-lagged analyses, Gathercole and colleagues demonstrated an impact of phonological working memory on vocabulary growth in younger children; whereas in older preschool children, this relationship turned around. In the present study, the multiple-group analysis underpins that it depends on initial vocabulary status whether differences in phonological working memory predict the magnitude of further vocabulary growth. The findings suggest that phonological working memory is especially important in the early stages in first- as well as in second-language learning.

When home learning environment is included into the model, the effect of working memory is reduced suggesting a covariation of child and family characteristics as proposed by ecological and interactionistic theories of development (e.g., Bronfenbrenner & Ceci, 1994; Marjoribanks, 2002). Please note that phonological working memory has been proposed to be highly determined by genetic factors (Kovas et al., 2005) and rather independent of family background (e.g., Alloway, Gathercole, Willis, & Adams, 2004). Further, analyses demonstrate that it is literacy stimulation and not just SES or mother's education level that predicts child vocabulary when these three variables were considered conjointly.

Contrary to other studies and against our expectations, we do not find a strong effect of structural or procedural measures of preschool quality on vocabulary growth. When all children are considered, the only variable with a significant impact on vocabulary growth is the proportion of children with migration background in the preschool class, which is negatively associated. This effect vanishes when parental native language status and family background is included into the model; within subgroup analyses, it still shows up within the subsample of children with a

non-German language background – although reduced – but not in the German subsample. These findings are in line with results by Mashburn et al. (2009) and suggest that language input provided by peers may make a relatively small but significant contribution to children's vocabulary development.

With respect to other preschool characteristics, neither literacy stimulation as measured by the ECERS-E nor a special focus on language promotion, smaller class sizes, or reduced child–staff ratio had a significant impact on vocabulary growth. Interestingly, compared to monolingual German children, children whose parents have a different mother tongue than German attended preschools that are characterized by significantly lower process quality, whereas with respect to structural variables, these preschools show a comparatively higher ratio of children with migration background, while class size and child–staff ratio is comparatively lower.⁵ At the same time, these preschools more often provide additional language support for the children.

The fact that the domain-specific quality in promoting literacy is even lower for children with non-German language background might either reflect (a) a selection bias in preschool attendance depending, for example, on a covariation between preschool quality and residential area or/and (b) may result from the fact that measures of preschool quality are not just depending on preschool teachers but also on child variables that are relevant to the quality of teacher–child interactions, for example, child language competencies. In fact, children with a non-German language background attended preschools with a higher ratio of children with migration background and thus possibly restricted German language skills. The need for additional language support is recognized by these preschools as indicated by an enhanced provision of language support.

Nevertheless, differences in these preschool characteristics do not have a significant impact on vocabulary growth. Concerning language promotion programs, it has to be acknowledged that the variable we used in the analyses is only a rough estimate of the promotion that occurred in preschool. However, the result converges with evaluations of programs for language promotion that also showed nonsignificant effects and thus lagged far behind theoretically based expectations (Roos, Polotzek, & Schöler, 2010). With respect to literacy promotion measured by the ECERS-E literacy scale, a mean of 3.23 and a rather low standard deviation were obtained. From a practical point of view, this suggests that literacy promotion could be enhanced significantly. Regarding the statistical analysis, the differences between preschools and thus the existing variance in this measure and/or sample size may have been too small to reveal differential effects on vocabulary growth. In addition, it should be noted that our study controlled for children's initial performance level and that an effect of preschool quality on children's vocabulary development would have shown up if we had not systematically differentiated between initial achievement and growth.

In sum, the findings demonstrate that phonological working memory and – to a lesser extent – home learning environment are predictive for children's vocabulary scores when various internal and external variables are considered. On the other hand, preschool characteristics have not been found to significantly contribute to vocabulary development – at least when internal child characteristics are controlled for. This does not mean that preschool process quality as measured by the ECERS is not relevant for children's cognitive development. Thus, data from the same sample (BiKS-3-10) show that domain-specific preschool process quality is important for

growth of children's early numeracy skills (Anders et al., 2012). Within the language domain, subdomain-specific aspects of preschool quality and stimulation may be relevant to promote different aspects of language learning. This conclusion converges with the results of Sylva et al. (2006), who showed that the ECERS-E literacy scale predicted children's pre-reading skills but not their language abilities. Concerning the promotion of vocabulary development, specific characteristics of linguistic input may be essential (e.g., Huttenlocher et al., 2002). Thus, future work addressing the relative impact of preschool quality on children's language development should also include more specific measures of language input provided by preschool teachers and peers.

Taken together, the present study shows that there is much to do in order to improve preschool quality and to promote lexical learning and compensate for individual or home-based differences in language learning.

Notes

1. Data collection was carried out within two subprojects of the larger interdisciplinary research group BiKS, funded by the German Research Foundation. We would like to thank all participating children, their parents, and their preschool teachers, as well as all students engaged in data collection for their most active cooperation.
2. Note that these are all children included in the BiKS-3-10 study. In the other BiKS paper in this issue (Anders, Grosse, Rossbach, Ebert, & Weinert, this issue), fewer children were included (99.4% of the original study) due to missing data in relevant variables.
3. Note that the descriptives for preschool measures are slightly different from those reported in the other BiKS paper (Anders et al., this issue). This is due to the fact that for the present analyses only preschool measures of the first two measurement points are considered, because only these were assessed before the last assessment of the developmental variable.
4. Since the number of children whose parents have another mother tongue than German is relatively small, the analyses refer to all children with another language background than German (one or two parents) and contrast them against monolingual German children.
5. Lower class sizes and higher child-staff ratio in preschools with comparatively more children with migration background are due to German law.

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