

Classroom Quality, Classroom Composition, and Age at Entry: Experiences in Early Childhood Education and Care and Single and Dual Language Learners' German Vocabulary

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We examined independent and interactive links among three central characteristics of children's experiences in early childhood education and care and the German receptive vocabulary of single language learners and dual language learners (DLLs). We allowed for possible differential effects depending on children's language background. Our sample included 2,231 children (n = 1,555 single language learners, n = 371 DLLs from families in which German was frequently spoken, n = 305 DLLs from families in which German was less frequently spoken). Children attended 177 classrooms in 95 early childhood education and care centers and were 30 to 80 months old. We found that classroom process quality predicted German vocabulary only for DLLs with low exposure to German in the family. An earlier age at entry was linked to a larger German vocabulary for all children, but the link was stronger for DLLs from families with low exposure to German. Classroom composition did not predict German vocabulary.

Keywords: *child care, immigrant children, Peabody Picture Vocabulary Test (PPVT), Classroom Assessment Scoring System (CLASS), bilingual, monolingual*

BEING able to speak and understand one or more languages is part of the human experience. Language skills are not only essential for everyday communication but also crucial for literacy development and academic achievement (Bleses, Makransky, Dale, Højen, & Ari, 2016; Lee, 2011; Prevo, Malda, Mesman, & van Ijzendoorn, 2016). However, children differ enormously in their language skills and therefore start school with different preconditions for future educational success. While the home and the family are undoubtedly key contexts for language development, in many countries a majority of children also attend out-of-home child care before being enrolled into elementary school (Organisation for Economic Cooperation and Development, 2016). Thus, one major present-day question is whether and how experiences in early childhood education and care (ECEC) can support children in their language development—an important part of which is building a broad vocabulary. The present study examined how three central characteristics of children's ECEC experience are connected to children's German receptive vocabulary: ECEC process quality, classroom composition, and the age

at which children enter into ECEC. We are interested not only in overall associations but also in how the effect of one characteristic may depend on another.

Moreover, certain ECEC experiences may be more consequential for some children than others. In North America and Europe, an increasing number of children are from immigrant families (United Nations, 2015). Many of these children grow up being exposed to another language at home, in addition to or instead of the societal language. Growing up as a dual language learner (DLL) is a valuable resource, and maintaining the heritage language is vital for the relationship between children and their parents (De Houwer, 2013; Fillmore, 2000; Oh & Fuligni, 2010). However, DLLs also potentially face challenges, especially in countries such as the United States and Germany, where high skill levels in the societal language are essential for everyday interactions as well as educational success (Baumert & Schümer, 2001; Hoff, 2013; Kempert et al., 2016; Prevo et al., 2016). On one hand, DLLs may have a total vocabulary (i.e., combined vocabularies across their two languages) that is comparable or even larger than the



vocabularies of nonimmigrant single language learners (SLLs; e.g., Hoff, 2017). On the other, DLLs tend to score lower on vocabulary tests of the societal language (Dubowy, Ebert, von Maurice, & Weinert, 2008; Hoff et al., 2012; Linberg & Wenz, 2017), setting them at a disadvantage when they enter elementary school (Hoff, 2013). As DLLs on average may have fewer opportunities to hear and use the societal language at home, ECEC is potentially an especially important context for societal language development. Thus, we examined whether ECEC experiences are differentially related to the German receptive vocabulary of a large sample of nonimmigrant SLLs and linguistically diverse immigrant DLLs in German ECEC centers. We focused on vocabulary in the societal language, German, because of its links to children's educational achievement (Kempert et al., 2016). Furthermore, children's receptive vocabulary was shown to be a good indicator of overall proficiency in the same language in general (Berendes, Weinert, Zimmermann, & Artelt, 2013). Accordingly, when little evidence is available for vocabulary, we draw on literature using measures of other language domains.

ECEC Process Quality and Children's Language Skills

Research and policy makers are increasingly targeting ECEC process quality as a means of promoting children's development. Process quality includes positive, rich, and frequent interactions between children and their teachers (Howes et al., 2008) as well as developmentally appropriate and warm teacher behavior and a stimulating and safe environment (Harms, Cryer, & Clifford, 2005). Studies differ in how they measure ECEC quality. Some studies examine global quality, using broad measures (e.g., Early Childhood Environment Rating Scale, original and revised; Harms & Clifford, 1980; Harms, Clifford, & Cryer, 1998) that not only include process quality but capture aspects of structural quality as well. Other studies use more specific measures that focus on the quality of interactions in the classroom—for example, the Classroom Assessment Scoring System (CLASS; Pianta, La Paro, & Hamre, 2008). There is some agreement that high-quality ECEC is related to children's societal language skills (often assessed through receptive vocabulary; Burchinal, Kainz, & Cai, 2011). Nonetheless, two recent meta-analyses found only few and weak or modest effects of ECEC quality for both a broad measure (Early Childhood Environment Rating Scale: Brunsek et al., 2017) and a specific measure (CLASS: Perlman et al., 2016). One reason for small effects and mixed findings may be that the effect of ECEC process quality depends on other features of children's ECEC experiences. For example, high quality may be especially important for children in classrooms composed of many DLLs or for children who spend several years in ECEC and receive an especially large "dose" of ECEC. For this reason, we

examined such interactive associations in the present article. Another reason for small effects and mixed findings may be that the strength of the link between child care quality and language skills depends on child and family characteristics that are connected to lower vocabulary scores, such as poverty or low socioeconomic status (SES). Evidence on such differential effects is inconclusive, sometimes suggesting that ECEC quality can "buffer" against effects of such characteristics. Other times, evidence suggests the opposite—namely, that more advantaged children benefit most from high quality (e.g., Burchinal, Peisner-Feinberg, Bryant, & Clifford, 2000; Keys et al., 2013; McCartney, Dearing, Taylor, & Bub, 2007). This inconclusive evidence on differential effects may have to do with several large-scale U.S. studies excluding significant portions of at-risk children—specifically, DLLs from families with a lower SES—by requiring participating parents or children to be fluent in English (e.g., National Institute of Child Health and Human Development, 2002; Peisner-Feinberg et al., 2001). To our knowledge, there are three German studies focusing on differences between SLLs and DLLs: two studies based on broader measures of ECEC quality (Environmental Rating Scales) suggest that ECEC quality is connected to young DLLs' but not SLLs' German vocabulary skills (Ebert et al., 2013; Willard, Agache, & Leyendecker, 2019); a third study examined links between interaction quality as measured with the CLASS and children's morphological skills and yielded similar results. Quality was linked to German morphological skills for DLLs but not SLLs (Bihler, Agache, Schneller, Willard, & Leyendecker, 2018). In the present study, we examined whether ECEC classroom process quality, on the level of actual interactions, is differently connected to SLLs' and DLLs' German vocabulary. The study was based on a sample of target children randomly selected from a set of ECEC centers serving families with a range of social backgrounds.

Classroom Composition and Children's Language Skills

Classroom and center composition is highly salient in the media and in policy discussions. This is especially true for ethnic and linguistic composition—that is, the percentage of children with an immigrant background or the percentage of DLLs in a classroom. Such characteristics of children's peers in a classroom are likely to have an impact on children's development (e.g., Niklas & Tayler, 2018; Reid & Ready, 2013). Children attending ethnically diverse classrooms have the privilege of being exposed to other cultures and languages. They may learn to value and appreciate them and benefit in outcomes such as their attitudes toward children from other groups (Rutland, Cameron, Bennett, & Ferrell, 2005). For potential effects of linguistic classroom composition on children's societal language vocabulary, several hypotheses are conceivable. Based on the idea that

frequent rich exposure and interactions in a language promote vocabulary growth in that language (Unsworth, 2016), there is reason to hypothesize that having peers who can provide this kind of input is an advantage. In line with this, there is evidence that children benefit from having peers with more advanced language skills (Justice, Petscher, Schatschneider, & Mashburn, 2011; Mashburn, Justice, Downer, & Pianta, 2009). Moreover, two studies suggest that societal language exposure through peers promotes DLLs' societal language vocabulary skills (Palermo & Mikulski, 2014; Palermo et al., 2014). As immigrant DLLs in Germany tend to score lower on German vocabulary than SLLs (Dubowy et al., 2008; Linberg & Wenz, 2017), having many DLL peers may provide children with less German exposure and fewer growth-stimulating opportunities for complex interactions in German. Thus, a high percentage of DLLs from immigrant families in a classroom may be negatively connected to individual children's societal vocabulary skills. Alternatively, there may be positive effects of a high percentage of DLLs on societal language vocabulary, especially for DLLs themselves. For example, attending a classroom with many other DLLs may encourage individual DLLs to participate in verbal interactions in the societal language. Beginning learners may feel less embarrassment to actively use their emerging societal language skills. This example illustrates that classroom composition could also have very different effects on SLLs and DLLs. We are aware of two studies that examined the connection between composition in terms of the percentage of DLLs and children's societal language vocabulary. A U.S. study found a negative connection between the percentage of DLLs in a classroom and DLLs' English vocabulary (Garcia, 2018). In contrast, a study with German toddlers (Willard et al., 2019) found that the percentage of DLLs was not connected to SLLs' or DLLs' German vocabulary when controlling for children's individual language background (DLL vs. SLL). Thus, we examined whether composition in terms of the percentage of DLLs in a classroom is differentially related to SLLs' and DLLs' German vocabulary.

Age at Entry Into ECEC and Children's Language Skills

A major decision that parents have to make is at what age to enroll their child into ECEC. Especially for DLLs, such decisions may be closely connected to the accumulated opportunities for interactions in the societal language before starting elementary school. Few studies have specifically examined the effects of age at entry or the duration of ECEC attendance on receptive vocabulary. A handful of these indicated that a younger age at entry into ECEC and, closely connected, a longer duration of ECEC attendance are positively related to children's societal vocabulary skills (Domitrovich et al., 2013; Wen,

Leow, Hahs-Vaughn, Korfmacher, & Marcus, 2012; Yazejian, Bryant, Freel, & Burchinal, 2015). However, results may not be completely generalizable, as several of these studies focused on children from low-income families attending various forms of Head Start classrooms. There is also some evidence suggesting that an earlier entry or a longer duration of ECEC affects children's language and literacy skills differently, depending on the quality and composition of the classroom attended (Niklas, Schmiedeler, Pröstler, & Schneider, 2011; Sammons et al., 2004). Furthermore, several studies suggested that early entry and longer duration of ECEC have a greater positive impact on the societal language skills of DLLs than SLLs (Becker, 2010; Giesen, Agache, & Leyendecker, 2017; Klein & Sonntag, 2017; Sammons et al., 2002; Yazejian et al., 2015). Thus, we examined possible links between age at entry and children's German vocabulary and whether these links differ depending on classroom quality and composition as well as for DLLs and SLLs.

ECEC in Germany

In Germany, affordable publicly subsidized center-based ECEC is relatively widely available. However, because of extensive parental leave options and a shortage of openings for infants and toddlers, only 3% of children are enrolled before their first birthday, and only 28% are enrolled between the ages of 1 and 3 years. In contrast, almost all 3- to 6-year-olds (93%) attend center-based ECEC (Statistische Ämter des Bundes und der Länder, 2016; Statistisches Bundesamt, 2016). ECEC centers are strongly regulated at the state level, and most teachers complete vocational education with a focus in ECEC. The average process quality of ECEC centers can be described as moderate—according to the Infant/Toddler Environment Rating Scale—Revised and the CLASS—but varies considerably across centers and indicators of quality (Stuck, Kammermeyer, & Roux, 2016; Tietze et al., 2012; von Suchodoletz, Fäsche, Gunzenhauser, & Hamre, 2014). Centers also differ in their ethnic and linguistic composition, but there is a relatively high level of segregation, and DLLs are more likely to attend centers where the majority of children are also DLLs (Becker & Schober, 2017; Gambaro, 2017). Yet, in most ECEC centers, teachers speak solely German with the children (Bihler, Agache, Schneller, et al., 2018). Comparably low costs mean that income is likely to have little impact on the age at which a family enrolls their child and on the center they choose. As the quality of a center is hard to gauge for parents, they appear to base their choice on other criteria, such as proximity to the home or center composition (Becker & Schober, 2017; Cryer, Tietze, & Wessels, 2002; Stahl, Schober, & Spiess, 2017).

This Study

The aim of the present study was to examine associations between children's ECEC experiences and their German receptive vocabulary. It adds to the existing literature by including three central characteristics of children's ECEC experiences—ECEC process quality, classroom composition, and age at entry into ECEC—and by examining independent and interactive associations with German vocabulary. We include several facets of process quality but focus on observations of stimulating verbal interactions between teachers and children. Moreover, we analyze a large sample, including nonimmigrant SLLs and linguistically diverse immigrant DLLs. Finally, we differentiate between DLLs who are more and less frequently exposed to German at home.

Our research questions were as follows: (1) Is process quality related to children's German vocabulary in a similar degree, regardless of their language background, or only to that of DLLs? (2) Is process quality more strongly related to the German vocabulary of children who attend classrooms with a higher percentage of DLLs? (3) Is process quality more strongly related to the German vocabulary of children who are enrolled at a younger age? (4) Is the percentage of DLLs in a classroom differently related to SLLs' or DLLs' German vocabulary? (5) Is a younger age at entry into ECEC more strongly related to German vocabulary for children attending classrooms with a lower percentage of DLLs? (6) Is a younger age at entry related to all children's German vocabulary or more strongly to DLLs' German vocabulary?

Method

Sample

Data were drawn from a larger investigation on ECEC and language development that was conducted in the state of North-Rhine-Westphalia in Germany. The sample analyzed in this study consisted of 2,231 children who were enrolled in 177 classrooms in 95 ECEC centers. The children were between 30 and 80 months old ($M = 54$, $SD = 13$); about half were female (49%); and 70% were SLLs. Among the DLLs, 55% came from families in which German was frequently spoken in addition to another language (high exposure: DLL_{hiExp}), and 45% came from families in which German was less frequently spoken in favor of another language (low exposure: DLL_{loExp}). Overall, the classrooms in our sample included children from families in which over 60 languages were spoken. The most common heritage languages were Turkish, Russian, Arabic, and Polish.

Descriptive information was available for 87% of the 177 lead teachers, as not all center directors reported this information. The majority of the lead teachers for whom this information was available was female (94%). Of the lead teachers, 97% had completed the vocational training for

certified ECEC teachers. On average, they were 44 years old ($SD = 11$ years) and had 19 years of experience as an ECEC center teacher ($SD = 11$ years).

Sampling Procedure and Data Collection

ECEC centers received written information on the study by mail and were, shortly after that, contacted by phone and asked to participate. Teachers in participating centers handed out detailed written information on the study to all parents, and most centers also posted it on their notice boards and/or informed parents during parent-teacher conferences. To ensure that all parents were able to understand the information, it was available in multiple languages (Turkish, Russian, Polish, Arabic, Bulgarian, and English). Parents who did not want their children to participate in the study were asked to inform the teachers (around 2%). Only the basic information as described here was provided by the ECEC teachers. Data were collected anonymously and analyzed only in aggregated form. The protocol of the study was approved by the ethics committee of the Faculty of Psychology at the Ruhr-Universität Bochum. The study sample is representative for the German state of North-Rhine-Westphalia regarding center characteristics such as proportion of DLLs, average unemployment rate in the area, and geographical distribution of state-funded ECEC centers.

Data collection took place in the ECEC centers. German vocabulary testing with children was conducted individually in a separate room by trained research assistants. Every child received a certificate as a reward. Teachers provided basic information on the participating children and on classroom characteristics. Classroom observations began in the morning. Each classroom was observed four times (20 min each) within the same day by 1 of 11 trained and certified research assistants. For their participation, ECEC centers received a 100€ gift certificate, and classrooms received a children's book, a stuffed toy parrot, and balloons.

Measures

German receptive vocabulary. The German version of the Peabody Picture Vocabulary Test—Fourth Edition (PPVT-4) assesses children's German receptive vocabulary (Dunn & Dunn, 2007; Lenhard, Lenhard, Segerer, & Suggate, 2015). All children were administered the computer-based version, where they hear a prerecorded stimulus word and select the matching target image out of four color illustrations. We used standard scores (t values) with a mean of 50 and a standard deviation of 10 for the analyses. These t values were computed in relation to the appropriate age level in the norming sample for each child. For children <36 months old, no norm-based standard scores are available for the German PPVT-4 (the youngest children in the norming sample were 36 months old). We therefore converted the raw scores of

children in this young age group into t values by standardizing on respective age reference groups of children within our sample. Each reference group had an age range of 2 months (e.g., 30–31 months).

Process quality. Our process quality measure—the CLASS Pre-K (Pianta et al., 2008)—is an observational instrument designed to measure the quality of classroom interactions. It comprises 10 dimensions that can be combined into the three domains: emotional support, classroom organization, and instructional support. The applicability of the CLASS Pre-K in Germany and the three-domain structure were recently confirmed (Bihler, Agache, Kohl, Willard, & Leyendecker, 2018). In the present study, we focused on instructional support, which includes concept development, quality of feedback, and language modeling, as this domain most closely reflects frequent rich and complex verbal interactions between teachers and children. As emotional support and classroom organization may promote children’s readiness to learn, these two domains were included as well (Hamre et al., 2013). For each classroom, all four observations were combined into mean domain scores. Scores can range from 1 to 7 (1–2 = *low*, 3–5 = *moderate*, 6–7 = *high*). Cronbach’s alphas were as follows: $\alpha = .77$ for emotional support, $\alpha = .80$ for classroom organization, and $\alpha = .78$ for instructional support.

Classroom composition. Two compositional variables were calculated according to teacher reports on the children in the classroom. First, classroom composition in terms of DLLs was defined as the percentage of DLLs in each classroom and based on teacher reports of which children were exposed to a language other than German at home (solely or in addition to German). Second, to control for composition in terms of SES, we calculated the percentage of children from families who were exempted from ECEC fees due to low income.

Age at entry. Teachers reported on age of enrollment into the ECEC center. This information was used to compute age at entry in months.

Child:teacher ratio. For each classroom, the child:teacher ratio was generated as the number of children per teacher during the CLASS observation. This is an often-used indicator of structural quality and was included as a control variable in our analyses.

Teacher involvement. We also included a self-developed one-item measure capturing teachers’ overall involvement with children. This rating was made for every 20-min CLASS observation and then averaged. This measure reflects whether the research assistants observed the teachers actively engaging or participating in activities with children instead of, for example, attending to administrative

duties in the classroom. It was rated on a 7-point scale (1 = *low involvement*, 7 = *high involvement*). It was added as a control variable to test whether associations between ECEC characteristics and vocabulary were attributable to specific features of teacher-child interactions, as captured by the instructional support domain or to the general, overall involvement of teachers.

Child characteristics. Teachers reported on children’s family languages. Based on these reports, children were assigned to one of three groups: SLLs (German only); DLLs_{hiExp}, from families in which German was more frequently spoken (German and one or more other family languages); and DLLs_{loExp}, from families in which German was infrequently spoken (one or more other family languages but not German, according to teachers). Moreover, teachers provided information on children’s gender (0 = male, 1 = female) and age in months.

Analytic Strategy

Missing data. There were missing values on the following variables: age at entry (1%), composition in terms of SES (26%), child:teacher ratio (8%), and teacher involvement (8%). We imputed 50 data sets using two-level imputation in Mplus 8 (Muthén & Muthén, 2017). For our multilevel regression models, we report results that were pooled across all imputed data sets.

Multilevel regression models. As the children in our sample were nested in classrooms and ECEC centers, we applied multilevel regression modeling. We conducted two-level models, with classroom affiliation as the cluster variable. The average cluster size was 12.6. The third level, that of the ECEC centers, was not included in our analyses, as there were no Level 3 variables.

First, we estimated an intercept-only model to assess the baseline intraclass correlation. In the subsequent models, we added variables and interaction terms in several steps. Model 1 included all Level 1 and Level 2 predictor and control variables, with random slopes for language background and age at entry. Moreover, Model 1 included the Level 1 interaction terms between language background and age at entry. In the next models, we added cross-level and Level 2 interactions one at a time. Only significant interaction terms were retained for the subsequent models. Therefore, we added the following interaction terms: Instructional Support \times Language Background in Model 2, Instructional Support \times Composition in Terms of DLLs in Model 3, Instructional Support \times Age at Entry in Model 4, Composition in Terms of DLLs \times Language Background in Model 5, and Age at Entry \times Composition in Terms of DLLs in Model 6. In all models, language background was dummy coded, with SLLs serving as the reference group. As the two dummies represent language background, interaction terms for both were retained

TABLE 1

Descriptive Results for the Total Sample and the Three Subsamples: SLLs, DLLs_{hiExp}, and DLLs_{loExp}

Variable	Total sample		SLLs		DLLs _{hiExp}		DLLs _{loExp}		<i>F</i>	<i>p</i>
	<i>M</i> (<i>SD</i>)	<i>n</i>								
PPVT-4										
Raw score	78.01 (36.06)	2,231	85.27 (34.40)	1,555	67.73 (33.83)	371	53.52 (33.09)	305	130.50	<.001
<i>t</i> score	46.27 (10.27)	2,231	49.34 (9.21)	1,555	42.05 (8.98)	371	35.74 (7.82)	305	340.20	<.001
Instructional support	2.34 (0.67)	2,231	2.36 (0.66)	1,555	2.41 (0.69)	371	2.18 (0.69)	305	11.14	<.001
Emotional support	5.80 (0.53)	2,231	5.82 (0.53)	1,555	5.78 (0.53)	371	5.72 (0.52)	305	5.46	.004
Classroom organization	4.72 (0.77)	2,231	4.73 (0.77)	1,555	4.67 (0.72)	371	4.69 (0.84)	305	1.25	.286
Composition										
DLL	31.57 (19.10)	2,231	26.45 (16.33)	1,555	41.50 (19.08)	371	45.63 (20.40)	305	227	<.001
Low SES	21.07 (15.2)	1,643	19.76 (14.90)	1,140	23.36 (16.61)	279	24.86 (13.93)	224	14.62	<.001
Age at entry	31.00 (9.83)	2,201	30.21 (9.32)	1,539	31.11 (10.05)	365	34.96 (11.12)	297	29.81	<.001
Child:teacher ratio	6.64 (2.64)	2,053	6.53 (2.56)	1,433	6.54 (1.98)	344	7.34 (3.56)	276	11.26	<.001
Teacher involvement	4.61 (1.08)	2,057	4.64 (1.08)	1,442	4.57 (1.05)	341	4.53 (1.11)	274	1.57	.209

Note. Test statistics refer to the comparisons among subsamples. DLL = dual language learner; DLL_{hiExp} = dual language learner–high exposure to German; DLL_{loExp} = dual language learner–low exposure to German; PPVT-4 = Peabody Picture Vocabulary Test–Fourth Edition; SES = socioeconomic status; SLL = single language learner.

TABLE 2

Post Hoc Tukey Honestly Significant Difference Pairwise Comparisons for SLLs, DLLs_{hiExp}, and DLLs_{loExp}

Variable	SLLs vs. DLLs _{hiExp}		SLLs vs. DLLs _{loExp}		DLLs _{hiExp} vs. DLLs _{loExp}	
	<i>d</i>	<i>p</i>	<i>d</i>	<i>p</i>	<i>d</i>	<i>p</i>
PPVT-4						
Raw score	0.51	<.001	0.93	<.001	0.42	<.001
<i>t</i> score	0.79	<.001	1.51	<.001	0.75	<.001
Instructional support			0.26	<.001	0.33	<.001
Emotional support			0.20	.004		
Composition						
DLL	−0.89	<.001	−1.12	<.001	−0.21	.006
Low SES	−0.24	.001	−0.35	<.001		
Age at entry			−0.49	<.001	−0.37	<.001
Child:teacher ratio			−0.29	<.001	−0.29	<.001

Note. Empty cells represent nonsignificant differences. DLL = dual language learner; DLL_{hiExp} = dual language learner–high exposure to German; DLL_{loExp} = dual language learner–low exposure to German; PPVT-4 = Peabody Picture Vocabulary Test–Fourth Edition; SES = socioeconomic status; SLL = single language learner.

in subsequent models when at least one of two was significant. Level 1 variables were entered as group mean centered and Level 2 variables as grand mean centered.

Results

Descriptive Results

Children's average PPVT-4 raw scores were $M = 78.01$ ($SD = 36.06$), and their average standard scores (t values) were $M = 46.27$ ($SD = 10.27$). On average, children had

started attending an ECEC center at the age of 31 months ($SD = 9.8$); the youngest age at entry was 4 months, the oldest 74 months. As evident in Tables 1 and 2, there were several differences between the SLLs, DLLs_{hiExp}, and DLLs_{loExp}. Both DLL groups had smaller German vocabularies than SLLs, and DLLs_{loExp} had a smaller vocabulary than DLLs_{hiExp}. DLLs_{loExp} also had somewhat different ECEC experiences than SLLs and DLLs_{hiExp}. DLLs_{loExp} were enrolled in ECEC centers later and attended classrooms with lower instructional and emotional support and a higher

child:teacher ratio. Both DLL groups attended classrooms with higher proportions of DLLs and children from low-income families than SLLs.

Regarding process quality, classroom average scores on instructional support were low ($M = 2.38$, $SD = 0.69$). There were no classrooms in our sample that scored high (score 6–7) on this domain; the majority (59%) was rated as having low instructional support (score 1–2). In contrast, average scores on emotional support ($M = 5.82$, $SD = 0.56$) and classroom organization ($M = 4.79$, $SD = 0.79$) were moderate to high, with 71% of the classrooms having high ratings on emotional support and 16% on classroom organization. There were no classrooms with low ratings on emotional support or classroom organization. The proportion of DLLs in the classroom ranged from 0% to 97% ($M = 31.38$, $SD = 19.33$); the proportion of children from low-income families ranged from 0% to 88% ($M = 21.28$, $SD = 16.04$). On average, the mean number of children per teacher was 6.30 ($SD = 2.64$), and teachers' involvement was moderate ($M = 4.68$, $SD = 1.09$).

Multilevel Regression Analyses

The intercept-only model yielded an intraclass correlation of .119 and thus indicated the need for multilevel modeling. In Model 1, the intraclass correlation decreased to .065 and remained stable in subsequent models (.061–.065). Moreover, model fit remained relatively stable from Model 2 to Model 6 (Models 1–6 are presented in Table 3).

Our first research question concerned whether process quality was related to SLLs' and DLLs' German vocabulary to a similar degree. Our focal measure of process quality, instructional support, did not significantly predict children's German vocabulary (Model 2). However, there was a significant interaction between instructional support and language background for DLLs_{loExp} (Model 2: $b = 1.66$, $p = .039$). Inspection of conditional effects (Preacher, Curran, & Bauer, 2006), which are illustrated in Figure 1, showed that instructional support was positively linked to German vocabulary only for DLLs from families in which German was not spoken frequently (DLLs_{loExp}; simple slope = 1.91, $p = .010$). Instructional support did not predict the German vocabulary of SLLs or DLLs_{hiExp}, who both had comparatively higher exposure to German in the family. Accordingly, the difference in German vocabulary between SLLs and DLLs_{loExp} was considerably larger for children in classrooms with very low instructional support (2 *SDs* below *M*; difference: 11.63, $p < .001$) than in classrooms with higher instructional support (2 *SDs* above *M*; difference: 7.02, $p < .001$).

Our second research question concerned whether process quality was more strongly related to German vocabulary for children from classrooms with a higher percentage of DLLs. The interaction between instructional support and

composition in terms of the percentage of DLLs was not significant (Model 3). Our third research question concerned whether process quality was more strongly related to the German vocabulary of children who entered ECEC at a younger age. The interaction between instructional support and age at entry was not significant (Model 4). In sum, these nonsignificant interactions indicated that the association between instructional support and German vocabulary did not depend on other features of children's ECEC experiences.

Our fourth research question concerned whether the percentage of DLLs in a classroom was differently related to SLLs' and DLLs' German vocabulary. Preliminary analyses revealed that classroom composition in terms of DLLs was a significant predictor of German vocabulary when not accounting for individual language background. Higher percentages of DLLs in the classroom were related to lower German vocabulary scores (the bivariate correlation was $r = -.22$, $p < .01$; see Figure 2A). However, this link disappeared when language background was accounted for. As depicted in Figure 2B, there was no association between composition and German vocabulary in any of the three language groups. This finding was confirmed in our hierarchical models in which we controlled for language background: We found neither a significant main effect (Models 1–6) nor a significant interaction effect between classroom composition and language background (Model 5). Thus, the bivariate association between composition and German vocabulary for the total sample was a case of the so-called Simpson's paradox (Hox, 2010). The association in the total group was "caused" by SLLs, DLLs_{hiExp}, and DLLs_{loExp} attending classrooms composed of different average percentages of DLLs. Thus, despite the nonassociation of composition and German vocabulary in every subgroup, combining the groups led to the appearance of a significant association. In sum, there was no indication that the percentage of DLLs in a classroom was related to either SLLs' or DLLs' German vocabulary.

Our fifth research question concerned whether a younger age at entry into ECEC was more strongly related to German vocabulary for children attending classrooms with a lower percentage of DLLs. Age at entry significantly predicted German vocabulary (Model 2: $b = -0.06$, $p = .015$). However, the interaction between age at entry and the percentage of DLLs in a classroom was not significant (Model 6). Thus, we found no indication that a younger age at entry was more strongly related to German vocabulary for children attending classrooms with lower (or higher) percentage of DLLs.

Our sixth and final research question concerned whether a younger age at entry was related more strongly to DLLs' than to SLLs' German vocabulary. There was a significant main effect of age at entry ($b = -0.06$, $p = .015$) and a significant interaction with language background for DLLs_{loExp} (Model 2: $b = -0.09$, $p = .026$). As portrayed in

TABLE 3

Unstandardized Estimates and Standard Errors From Multilevel Regression Analyses Predicting German Receptive Vocabulary (PPVT-4 t Values)

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Intercept	50.68 (1.02)**	50.56 (1.02)**	50.54 (1.02)**	50.57 (1.02)**	50.17 (0.89)**	50.64 (1.06)**
Level 1						
Gender	-0.41 (0.38)	-0.41 (0.38)	-0.41 (0.38)	-0.41 (0.38)	-0.41 (0.38)	-0.42 (0.38)
Age at entry	-0.07 (0.03)*	-0.06 (0.03)*	-0.06 (0.03)*	-0.06 (0.03)*	-0.03 (0.03)	-0.06 (0.03)*
DLL _{hiExp}	-5.84 (1.58)**	-5.85 (1.58)**	-5.85 (1.58)**	-5.85 (1.58)**	-5.16 (1.92)**	-6.11 (1.67)**
DLL _{loExp}	-9.67 (1.38)**	-9.33 (1.38)**	-9.30 (1.39)**	-9.33 (1.39)**	-4.82 (1.78)**	-9.54 (1.44)**
Level 2						
IS	0.70 (0.44)	0.24 (0.48)	0.24 (0.47)	0.68 (1.05)	0.19 (0.47)	0.22 (0.47)
Emotional support	0.75 (0.71)	0.82 (0.71)	0.85 (0.73)	0.82 (0.71)	0.68 (0.69)	0.78 (0.71)
Classroom organization	0.74 (0.40)+	0.74 (0.39)+	0.74 (0.39)+	0.74 (0.39)+	0.84 (0.37)*	0.78 (0.38)*
Composition DLL	-0.03 (0.02)	-0.03 (0.02)	-0.03 (0.02)	-0.03 (0.02)	-0.01 (0.02)	0.01 (0.05)
Composition low SES	-0.03 (0.02)+	-0.04 (0.02)+	-0.04 (0.02)+	-0.03 (0.02) +	-0.03 (0.02)+	-0.04 (0.02)+
Child:teacher ratio	0.09 (0.12)	0.10 (0.12)	0.10 (0.12)	0.09 (0.12)	0.11 (0.12)	0.10 (0.12)
Teacher involvement	-0.40 (0.39)	-0.41 (0.38)	-0.41 (0.38)	-0.41 (0.38)	-0.46 (0.37)	-0.40 (0.38)
Interaction terms						
Age at Entry × DLL _{hiExp}	-0.04 (0.05)	-0.04 (0.05)	-0.04 (0.05)	-0.04 (0.05)	-0.06 (0.06)	-0.03 (0.06)
Age at Entry × DLL _{loExp}	-0.09 (0.04)*	-0.09 (0.04)*	-0.09 (0.04)*	-0.09 (0.04)*	-0.22 (0.05)**	-0.08 (0.04) +
IS × DLL _{hiExp}		1.00 (0.86)	0.97 (0.88)	1.01 (0.87)	0.99 (0.86)	0.99 (0.86)
IS × DLL _{loExp}		1.66 (0.80)*	1.62 (0.80)*	1.72 (0.81)*	1.44 (0.81)+	1.68 (0.81)*
IS × Composition DLL			0.00 (0.02)			
IS × Age at Entry				-0.01 (0.03)		
Composition DLL × DLL _{hiExp}					0.01 (0.04)	
Composition DLL × DLL _{loExp}					-0.01 (0.03)	
Age at Entry × Composition DLL						-0.00 (0.00)
σ^2						
Within	71.84 (2.33)**	71.78 (2.33)**	71.79 (2.33)**	71.80 (2.34)**	71.79 (2.35)**	71.79 (2.34)**
Between	9.78 (7.76)	10.10 (7.79)	10.03 (7.84)	9.91 (7.94)	12.58 (8.52)	9.34 (8.12)
DLL _{hiExp}	9.24 (5.05)+	8.64 (4.65)+	8.66 (4.67)+	8.70 (4.67)+	8.83 (4.71)+	8.61 (4.67)+
DLL _{loExp}	0.55 (6.63)	0.65 (6.93)	0.66 (6.95)	0.62 (6.89)	1.70 (7.39)	0.74 (7.20)
Age at entry	0.00 (0.01)	0.00 (0.01)	0.00 (0.01)	0.00 (0.01)	0.00 (0.01)	0.00 (0.01)
AIC	16,063	16,063	16,065	16,065	16,066	16,064
BIC _{adjusted}	16,119	16,124	16,129	16,128	16,132	16,127

Note. Random slopes were estimated for language background and age at entry. SLLs served as the reference group for DLLs_{hiExp} and DLLs_{loExp}. Gender: 0 = boys, 1 = girls. AIC = Akaike information criterion; BIC = Bayesian information criterion; DLL = dual language learner; DLL_{hiExp} = dual language learner—high exposure to German; DLL_{loExp} = dual language learner—low exposure to German; IS = instructional support; PPVT-4 = Peabody Picture Vocabulary Test—Fourth Edition; SES = socioeconomic status; SLL = single language learner.
+ $p < .10$. * $p < .05$. ** $p < .01$.

Figure 3, a younger age at entry was linked to more German vocabulary for all children (SLLs: simple slope = -0.06 , $p = .014$; DLLs_{hiExp}: simple slope = -0.10 , $p = .047$) but even more so for DLLs_{loExp} (simple slope = -0.151 , $p < .001$).

Out of the control variables, only classroom organization was linked to German vocabulary and only in Model 3 ($b = 0.84$, $p = .024$) and Model 4 ($b = 0.78$, $p = .041$) so that the effect cannot be regarded as robust. All other control variables—that is, children’s gender, emotional support in the classroom, classroom composition in terms of low SES, the child:teacher ratio of the classroom, and teachers’ overall

involvement with the children—did not significantly predict children’s German vocabulary.

Discussion

We examined how variations in children’s ECEC experiences are related to their German receptive vocabulary skills. In doing so, we accounted for the possibility of multiple features of children’s ECEC experience being interactively related to German vocabulary. Moreover, we studied differential relationships in a large sample including SLLs and DLLs, which reflected the increasing linguistic diversity in

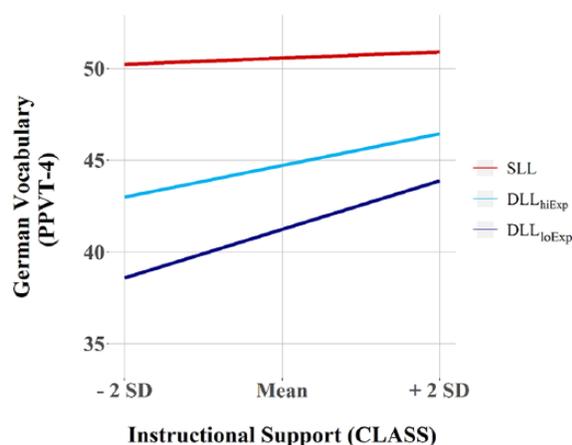


FIGURE 1. Simple slopes for the regression of German receptive vocabulary (t values) on instructional support for the three language groups: SLL (single language learner), DLL_{hiExp} (dual language learner–high exposure to German), and DLL_{loExp} (dual language learner–low exposure to German). PPVT-4 = Peabody Picture Vocabulary Test–Fourth Edition.

Germany and other Western countries. We found that process quality was related to the German vocabulary of DLLs who received relatively little exposure to German in the family. However, process quality was unrelated to the German vocabulary of SLLs and the other group of DLLs—both of which ostensibly had relatively frequent exposure to German in the family. Furthermore, a younger age at entry into ECEC was related to a larger German vocabulary, especially for DLLs with little exposure to German. In contrast, classroom composition in terms of DLLs was unrelated to children’s German vocabulary, regardless of their language background or other ECEC experiences.

Process Quality Related to Some—but Not All—Children’s German Vocabulary

Research, practice, and policy hold high hopes concerning the potential of process quality. Interestingly, our investigation showed that the “naturally occurring variations” in process quality in Germany are not connected to *all* children’s German vocabulary. Neither for SLLs nor for DLLs with relatively frequent exposure to German in the family was process quality related to German vocabulary. Only for DLLs with relatively little exposure to German in the family was there a connection between process quality in the classroom and children’s German vocabulary. If such DLLs were in higher-quality classrooms, they reached German vocabulary scores that were, on average, within the normal band (less than -1 SD from the norming samples’ mean). However, if these DLLs attended lower-quality classrooms, they

reached German vocabulary scores that were markedly lower (about -1.5 SD). This suggests that children who receive the least German exposure at home are very sensitive to the variations in process quality in German classrooms. This is in accord with studies showing that ECEC quality may provide support for lower-performing groups of children by boosting their vocabulary in the societal language (e.g., Burchinal et al., 2000; Ebert et al., 2013; Willard et al., 2019). Together, these studies make a strong case that it is important to examine the differential relevance of ECEC quality for children from various backgrounds.

Ours was the third German study that failed to uncover an association between process quality and SLLs’ German vocabulary (Ebert et al., 2013; Willard et al., 2019). We extended this by showing that there may be subgroups of DLLs for whom there is also no such association. This raises a fundamental question: Why might process quality not be connected to all children’s German vocabulary? Our focal measure of process quality, instructional support, taps specific forms of stimulating verbal interactions between children and their teachers. We observed these stimulating verbal interactions quite infrequently, as evidenced by the low average scores on the domain instructional support. While there was some variation, it was on a low to moderate level. Perhaps a connection with the German vocabulary might become evident for all groups of children if the variation extended to higher levels of quality. For beginning German learners, even a slight increase in stimulating verbal interactions in German might make a difference. Perhaps children who receive more ample input in the societal language at home would require very intensive verbal stimulation in the classroom to create a noticeable boost in their vocabulary skills. There is indeed evidence for such nonlinear or threshold effects of ECEC quality (Burchinal et al., 2011). Further investigation of high process quality may thus be especially important to support SLLs and DLLs with relatively frequent exposure to the societal language. Even though the latter scored within the normal range, it is important to identify under which conditions they score even closer to SLLs. Several other studies reported low to moderate levels of instructional support for German (Stuck et al., 2016; von Suchodoletz et al., 2014) and international (e.g., Hamre, Hatfield, Pianta, & Jamil, 2014; Hu, Fan, Gu, & Yang, 2016; Leyva et al., 2015) ECEC classrooms. Thus, future studies may struggle to identify large-enough samples of classrooms with higher levels of instructional support. However, such samples, either naturally occurring or created through interventions, may aid in uncovering how ECEC can support the societal language development of all children.

Higher levels of process quality may indeed cause all children’s societal language vocabulary to flourish. There is, however, the possibility that merely higher *levels* of process quality, as assessed through the CLASS, would not

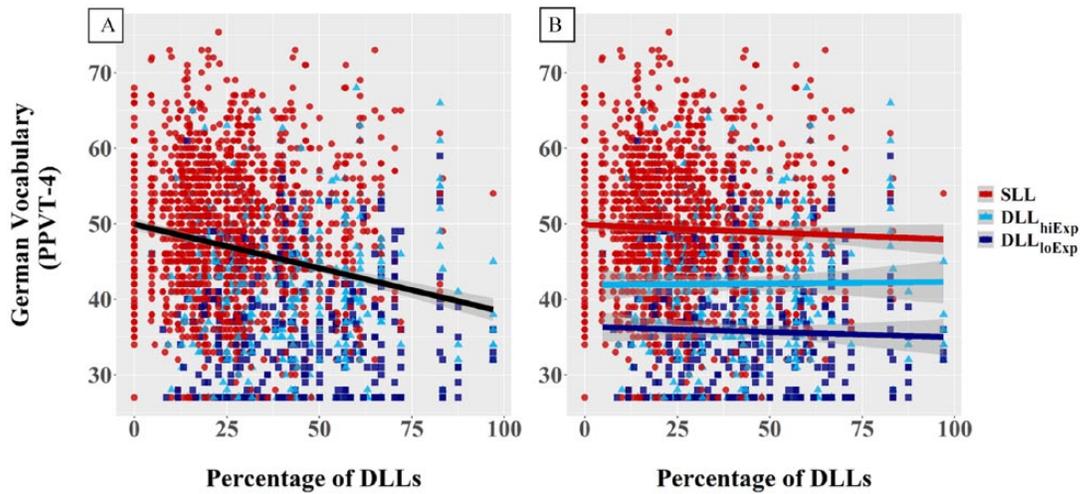


FIGURE 2. Bivariate correlations of classroom composition in terms of DLLs and German receptive vocabulary (t values) for (A) the total sample and (B) the 3 language groups separately: SLL (single language learner), DLL_{hiExp} (dual language learner–high exposure to German), and DLL_{loExp} (dual language learner–low exposure to German). PPVT-4 = Peabody Picture Vocabulary Test–Fourth Edition.

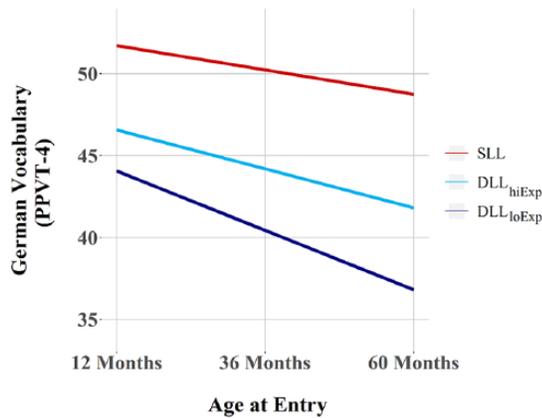


FIGURE 3. Simple slopes for the regression of German receptive vocabulary (t values) on age at entry for the three language groups: SLL (single language learner), DLL_{hiExp} (dual language learner–high exposure to German), and DLL_{loExp} (dual language learner–low exposure to German). PPVT-4 = Peabody Picture Vocabulary Test–Fourth Edition.

suffice for children who receive considerable exposure to the societal language in the family. Perhaps what constitutes high quality varies among different groups of children according to their needs. Thus, the very definition of process quality may differ between, for example, beginning and more advanced learners. As a recent meta-analysis reviewed numerous studies in which various measures derived from the CLASS were not consistently connected to

children’s language development (Perlman et al., 2016), it may be necessary to continue exploring what different groups of children need from their ECEC centers in terms of language stimulation. For example, some DLLs may strongly benefit from teachers who are able to incorporate their heritage language into the classroom (Castro, Espinosa, & Páez, 2011). Further exploring high quality may also require integrating various levels of analysis. The CLASS focuses on certain types of observed interactions in the classroom. It appears promising to extend this by also collecting data on, for example, microfeatures of teachers’ speech, such as the linguistic complexity or the occurrence of activities such as storybook reading, singing, or role-play (Bowers & Vasilyeva, 2011; Wasik, Hindman, & Snell, 2016).

Classroom Composition Not Related to German Vocabulary

Classroom composition in terms of the percentage of DLLs was remarkably unrelated to SLLs’ and DLLs’ German vocabulary. At first glance, there was a relationship when the entire sample was examined without controlling for individual language background (SLLs vs. DLL_{hiExp} vs. DLL_{loExp}). Higher percentages of DLLs seemed to be linked to lower individual German vocabulary scores. However, this constituted a methodological artifact referred to as a Simpson’s paradox. It arose due to the, on average, highest-scoring SLLs generally attending classrooms with few DLL peers, the lower-scoring DLLs with frequent German exposure attending classrooms with more DLL

peers, and the lowest-scoring DLLs with little German exposure attending classrooms with many DLL peers. When the entire sample was examined, this “mimicked” a negative relationship. When accounting for individual language background, composition and German vocabulary were completely unrelated. This was the case regardless of process quality or the age at which an individual entered ECEC. This nonevidence for effects of composition in terms of DLLs is in accordance with another German study (Willard et al., 2019). However, it is in contrast to a U.S. study suggesting that DLLs’ vocabulary development in the societal language may be slowed by attending a classroom with many other DLLs (Garcia, 2018).

Our results indicate that classroom composition in terms of the percentage of DLLs might not be linked to children’s receptive vocabulary in the societal language. Possibly the role of peers is not as consequential as assumed—at least for the age groups examined in the present study. ECEC teachers might have a stronger influence on children’s societal language development as they provide adult expert input (Hoff, 2006). Preschool-aged peers might not be able to provide enough high-quality input to influence children’s language skills. Alternatively, quantity and quality of input could be sufficient in all regular classrooms, regardless of composition.

However, there may be several other possible reasons why we did not find evidence for a connection between classroom composition and children’s German vocabulary. First, there may be negative and positive effects of being in a classroom with many DLL peers that may cancel each other out. On one hand, interacting with mostly DLL peers could limit the exposure to new and complex words in the societal language. On the other, as speculated earlier, DLLs may feel more encouraged to participate in classrooms with many other DLL peers, and teachers may be more experienced in adjusting their interactions to various individual skill levels, leading to positive effects. Second, composition in terms of the roughly assessed language background may not be the most suitable measure. One hypothetical pathway of composition effects is through peers’ actual language skills. Thus, composition effects may be better understood by employing a more precise analysis of peers’ actual language skills. Furthermore, the overall composition of a classroom may be less relevant than individual children’s interactions with respective playmates. Who does a child play with? What languages do they use? How well does the playmate speak those languages? Such analyses are especially interesting, as preschoolers may choose playmates with language skills that are similar to their own (DeLay, Hanish, Martin, & Fabes, 2016; Lin, Justice, Paul, & Mashburn, 2016). Third, even though our sample included several classrooms with high percentages of DLLs (>75%), the majority of classrooms had much lower percentages of DLLs. If there are

threshold effects, it may be necessary to oversample classrooms with very high percentages of DLLs.

Age at Entry Into ECEC Related to German Vocabulary

The age at which children entered into ECEC proved to be a crucial feature of their experience. A younger age at entry was related to a larger German vocabulary for all children, regardless of their language background. This link was especially pronounced for the DLLs with little exposure to German in the family. This is in line with several other studies suggesting stronger effects for DLLs than for SLLs (Becker, 2010; Giesen et al., 2017; Klein & Sonntag, 2017; Sammons et al., 2002; Yazejian et al., 2015). It extends these results by suggesting that an early entry into ECEC may be especially important for a subgroup of DLLs who have fewer opportunities to interact in the societal language outside of ECEC.

The relationship between the age at entry and German vocabulary was not dependent on the process quality or composition of a classroom. This suggests that children’s mere attendance of any ordinary German ECEC center promotes their German vocabulary—regardless of the specifics of teacher-child interactions in the classroom. One possible explanation for this is that merely attending ECEC from a younger age on and thus for a longer duration may provide children with manifold additional experiences, interaction partners, and situations from which they can learn new words in the societal language. It also suggests that potential effects of process quality and a younger age at entry into ECEC operate independently from one another in an additive manner. Future studies may disentangle potential effects of the age at entry and the duration of attendance in months or other aspects of the “dose” of ECEC, such as weekly hours of attendance. Moreover, oversampling children who are enrolled before their first birthday would allow conclusions on whether entering ECEC at a very young age is beneficial for their vocabulary in the societal language.

Limitations and Future Directions

The main limitation of our study is that the data set included only a bare minimum of child and family characteristics. For example, we had no information on individual families’ SES. One consequence is that we cannot rule out that the effects that we attribute to children’s language background are instead “caused” by their families’ SES. Moreover, effects that we attributed to variations in process quality and the age at entry may be spurious when examined in conjunction with a larger set of child and family background variables. This is perhaps especially pertinent to our finding on age at entry. Families’ SES may be confounded with the age at which they enroll their children into ECEC,

with children from more affluent and educated backgrounds attending from an earlier age on (Tietze et al., 2013). The low number of child and family covariates may be less pertinent to our finding on process quality. In Germany, ECEC center rates are regulated, and parents have difficulties judging quality (Cryer et al., 2002). Thus, it is unlikely that there are strong self-selection effects into centers of varying quality.

Aside from SES, family language is another important family characteristic. In the present study, information on this variable was collected from teachers. While parents are, undoubtedly, better informants on the languages they use, the measure was broad and basic so that teachers can be assumed to have knowledge on it. Information like that is usually acquired in teachers' everyday interactions with parents as well as by observing interactions between parents and children during drop-off and pickup times. Teachers' reports of family language use were predictive of children's receptive vocabulary, with more frequent use of German being associated with higher German vocabulary. This is in accord with previous findings showing that input frequency is connected to DLLs' language outcomes (Hammer et al., 2014). As a side note, such associations should not be taken as a reason to simply recommend more frequent German use to parents. Maintaining the heritage language can be important for family relationships (Fillmore, 2000; Oh & Fuligni, 2010), and children are unlikely to learn the heritage language if not from parents. Moreover, starting to use more of the societal language (and less of the heritage language) may not always have the desired effect on children's societal language skills, perhaps because not all parents are highly proficient speakers of it (Hammer, Davison, Lawrence, & Miccio, 2009; Place & Hoff, 2011). Even though our results suggest that the teacher reports tapped parents' actual language use, parent reports and a more nuanced measure, such as families' self-reported language use patterns (Hammer et al., 2014) would have been preferable. Unfortunately, collecting data on extensive child and family covariates is extremely time and cost intensive in large-scale investigations such as the present study and often hinders participation of families from lower social strata. Alternatives for probing the causal connections suggested here are longitudinal fixed effects models, which allow adjusting for time-invariant unmeasured confounders (Gunasekara, Richardson, Carter, & Blakely, 2014). Longitudinal models would also better enable an explicit examination of how ECEC experiences affect children of varying skill levels. For example, do SLLs with smaller vocabularies benefit from variations in process quality?

Many heritage languages were represented in the classrooms in our sample. This is a strength, as it mirrors the situation in typical German classrooms. Yet, it makes it unfeasible to assess children in their heritage language.

From Germany, there is a paucity of research on how ECEC experiences are related to children's heritage language skills. For example, will enrolling DLLs into ECEC at an early age influence their heritage language skills? Ultimately, the goal should be to identify how to support DLLs in their development of both languages.

Practical Implications

Given that the results are correlational, they do evoke certain implications for practice. Overall, they point to early entry into ECEC and process quality as key features of children's ECEC experiences, especially for DLLs. These are thus variables to which parents, ECEC professionals, and policy makers can direct their focus. In contrast, composition in terms of the share of DLLs, which parents can easily judge, may not be a very useful indicator.

In conjunction with other studies (Ebert et al., 2013; Willard et al., 2019), it is emerging that picking one German "garden variety" ECEC center over the other will not have much of an impact on the societal language vocabulary of most children. Conversely, parents of DLLs who use little German would be well advised to seek an ECEC center of the highest possible quality. As parents have great difficulty identifying high quality, it is up to policy makers to invest in raising quality levels. Especially regarding the stimulation of language and cognitive development, there is much room for improvement in German ECEC centers. It is important to ensure that new initiatives to raise quality put a special focus on centers with many DLLs.

Our results suggest that an early enrollment into ECEC might be beneficial for children's societal language development. However, because of the following reasons, we are cautious to make strong statements and recommendations: First, our sample contained few children who entered ECEC before their first birthday (2%). Therefore, our findings do not necessarily apply to very early enrollment (which is also rather uncommon in Germany). Second, there are many other developmental areas to consider beyond societal language vocabulary (e.g., socioemotional development or, for DLLs, the heritage language). Third, parents will consider multiple other aspects, including finances and life plans, when deciding when to enroll their child. Nevertheless, our results do suggest that policy makers need to improve early access to ECEC centers, especially for families of DLLs. As reviewed here, on average, DLLs enter ECEC considerably later than SLLs (Tietze et al., 2013). This may in part be due to parents' preferences. Yet, in Germany, obtaining a highly sought-after opening for a toddler often entails visiting numerous centers, filling out paperwork, and following up by calling center directors. These are serious obstacles, especially for parents who are less experienced with the German language. It is up to policy, the administration in municipalities, and ECEC centers to act.

Finally, our results suggest that in practice there may be no “one size fits all” solution to promoting children’s language through ECEC. Diverse groups of children may benefit from different ECEC experiences.

Conclusion

ECEC has become a major part of the lives of many children, who may spend a substantial portion of their waking hours in ECEC. While there is some agreement that ECEC can be beneficial, the particulars of its potential to support and promote diverse children’s language development are just beginning to be explored. Our study indicates that an early entry into a high-quality ECEC center can promote societal vocabulary skills, especially those of children who have little contact with the societal language outside of ECEC. But our study also makes obvious that much remains to be explored: How can ECEC quality stimulate the societal language skills of a diverse range of children learning one or several languages?

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References

- Baumert, J., & Schümer, G. (2001). Familiäre Lebensverhältnisse, Bildungsbeteiligung und Kompetenzerwerb [Family characteristics, educational participation, and competencies]. In J. Baumert, et al. (Eds.), *PISA 2000. Basiskompetenzen von Schülerinnen und Schülern im internationalen Vergleich* (pp. 323–407). Opladen, Germany: Leske + Budrich.
- Becker, B. (2010). Wer profitiert mehr vom Kindergarten? *KZfSS Kölner Zeitschrift für Soziologie und Sozialpsychologie*, *62*, 139–163. doi:10.1007/s11577-010-0090-5
- Becker, B., & Schober, P. S. (2017). Not just any child care center? Social and ethnic disparities in the use of early education institutions with a beneficial learning environment. *Early Education and Development*, *28*, 1011–1034. doi:10.1080/10409289.2017.1320900
- Berendes, K., Weinert, S., Zimmermann, S., & Artelt, C. (2013). Assessing language indicators across the lifespan within the German National Educational Panel Study (NEPS). *Journal for Educational Research Online / Journal für Bildungsforschung Online*, *5*(2), 15–49.
- Bihler, L.-M., Agache, A., Kohl, K., Willard, J. A., & Leyendecker, B. (2018). Factor analysis of the classroom assessment scoring system replicates the three domain structure and reveals no support for the bifactor model in German preschools. *Frontiers in Psychology*, *9*, 1–13. doi:10.3389/fpsyg.2018.01232
- Bihler, L.-M., Agache, A., Schneller, K., Willard, J. A., & Leyendecker, B. (2018). Expressive morphological skills of dual language learning and monolingual German children: Exploring links to duration of preschool attendance, classroom quality, and classroom composition. *Frontiers in Psychology*, *9*, 1–12. doi:10.3389/fpsyg.2018.00888
- Bleses, D., Makransky, G., Dale, P. S., Højen, A., & Ari, B. A. (2016). Early productive vocabulary predicts academic achievement 10 years later. *Applied Psycholinguistics*, *37*, 1461–1476. doi:10.1017/S0142716416000060
- Bowers, E. P., & Vasilyeva, M. (2011). The relation between teacher input and lexical growth of preschoolers. *Applied Psycholinguistics*, *32*, 221–241. doi:10.1017/S0142716410000354
- Brunsek, A., Perlman, M., Falenchuk, O., McMullen, E., Fletcher, B., & Shah, P. S. (2017). The relationship between the Early Childhood Environment Rating Scale and its revised form and child outcomes: A systematic review and meta-analysis. *PLOS One*, *12*, 1–29. doi:10.1371/journal.pone.0178512
- Burchinal, M., Kainz, K., & Cai, Y. (2011). How well do our measures of quality predict child outcomes? A meta-analysis and coordinated analysis of data from large-scale studies of early childhood settings. In M. Zaslow, I. Martinez-Beck, K. Tout, & T. Halle (Eds.), *Quality measurement in early childhood settings* (pp. 11–31). Baltimore, MD: Brookes.
- Burchinal, M., Peisner-Feinberg, E., Bryant, D. M., & Clifford, R. (2000). Children’s social and cognitive development and child-care quality: Testing for differential associations related to poverty, gender, or ethnicity. *Applied Developmental Science*, *4*, 149–165. doi:10.1207/S1532480XADS0403_4
- Castro, D. C., Espinosa, L. M., & Páez, M. M. (2011). Defining and measuring quality in early childhood practices that promote dual language learners’ development and learning. In M. Zaslow, I. Martinez-Beck, K. Tout, & T. Halle (Eds.), *Quality measurement in early childhood settings* (pp. 257–280). Baltimore, MD: Brookes.
- Cryer, D., Tietze, W., & Wessels, H. (2002). Parents’ perceptions of their children’s child care: A cross-national comparison. *Early Childhood Research Quarterly*, *17*, 259–277. doi:10.1016/S0885-2006(02)00148-5
- De Houwer, A. (2013). Harmonious bilingual development: Young families’ well-being in language contact situations. *International Journal of Bilingualism*, *19*, 169–184. doi:10.1177/1367006913489202
- DeLay, D., Hanish, L. D., Martin, C. L., & Fabes, R. A. (2016). Peer effects on Head Start children’s preschool competency. *Developmental Psychology*, *52*, 58–70. doi:10.1037/dev0000066
- Domitrovich, C. E., Morgan, N. R., Moore, J. E., Cooper, B. R., Shah, H. K., Jacobson, L., & Greenberg, M. T. (2013). One versus two years: Does length of exposure to an enhanced preschool program impact the academic functioning of disadvantaged

- children in kindergarten? *Early Childhood Research Quarterly*, 28, 704–713. doi:10.1016/j.ecresq.2013.04.004
- Dubowy, M., Ebert, S., von Maurice, J., & Weinert, S. (2008). Sprachlich-kognitive Kompetenzen beim Eintritt in den Kindergarten: Ein Vergleich von Kindern mit und ohne Migrationshintergrund [Verbal and cognitive competencies of young preschool-children: A comparison between children with and without background of migration]. *Zeitschrift für Entwicklungspsychologie und Pädagogische Psychologie*, 40, 124–134. doi:10.1026/0049-8637.40.3.124
- Dunn, L. M., & Dunn, D. M. (2007). *Peabody Picture Vocabulary Test* (4th ed.). Minneapolis, MN: NCS Pearson.
- Ebert, S., Lockl, K., Weinert, S., Anders, Y., Kluczniok, K., & Rossbach, H.-G. (2013). Internal and external influences on vocabulary development in preschool children. *School Effectiveness and School Improvement*, 24, 138–154. doi:10.1080/09243453.2012.749791
- Fillmore, L. W. (2000). Loss of family languages: Should educators be concerned? *Theory Into Practice*, 39, 203–210. doi:10.1207/s15430421tip3904_3
- Gambaro, L. F. (2017). Children from migrant backgrounds: Who are their Kita peers? *DIW Economic Bulletin*, 7(51/52), 559–566. Retrieved from http://www.diw.de/documents/publikationen/73/diw_01.c.574011.de/diw_econ_bull_2017-51-1.pdf
- Garcia, E. B. (2018). The classroom language context and English and Spanish vocabulary development among dual language learners attending Head Start. *Early Childhood Research Quarterly*, 42, 148–157. doi:10.1016/j.ecresq.2017.09.005
- Giesen, U., Agache, A., & Leyendecker, B. (2017). Positive Effekte eines frühen Starts in einer Kindertageseinrichtung auf die Entwicklung sprachlicher Kompetenzen im Deutschen bei Vorschulkindern aus türkischsprachigen Familien. Ergebnisse einer Latent-Change-Analyse. *Psychologie in Erziehung und Unterricht*. Advance online publication. doi:10.2378/PEU2017.art19d
- Gunasekara, F. I., Richardson, K., Carter, K., & Blakely, T. (2014). Fixed effects analysis of repeated measures data. *International Journal of Epidemiology*, 43, 264–269. doi:10.1093/ije/dyt221
- Hammer, C. S., Davison, M. D., Lawrence, F. R., & Miccio, A. W. (2009). The effect of maternal language on bilingual children's vocabulary and emergent literacy development during Head Start and kindergarten. *Scientific Studies of Reading*, 13(2), 99–121. doi:10.1080/10888430902769541
- Hammer, C. S., Hoff, E., Uchikoshi, Y., Gillanders, C., Castro, D. C., & Sandilos, L. E. (2014). The language and literacy development of young dual language learners: A critical review. *Early Childhood Research Quarterly*, 29, 715–733. doi:10.1016/j.ecresq.2014.05.008
- Hamre, B. K., Hatfield, B., Pianta, R., & Jamil, F. (2014). Evidence for general and domain-specific elements of teacher-child interactions: Associations with preschool children's development. *Child Development*, 85, 1257–1274. doi:10.1111/cdev.12184
- Hamre, B. K., Pianta, R. C., Downer, J. T., DeCoster, J., Mashburn, A. J., Jones, S. M., . . . Hamagami, A. (2013). Teaching through interactions: Testing a developmental framework of teacher effectiveness in over 4,000 classrooms. *The Elementary School Journal*, 113, 461–487. doi:10.1086/669616
- Harms, T., & Clifford, R. M. (1980). *Early Childhood Environment Rating Scale (ECERS)*. New York, NY: Teachers College Press.
- Harms, T., Clifford, R. M., & Cryer, D. (1998). *Early Childhood Environment Rating Scale-Revised Edition (ECERS-R)*. New York, NY: Teachers College Press.
- Harms, T., Cryer, D., & Clifford, R. M. (2005). *Infant/Toddler Environment Rating Scale-Revised Edition (ITERS-R)*. New York, NY: Teachers College Press.
- Hoff, E. (2006). How social contexts support and shape language development. *Developmental Review*, 26, 55–88. doi:10.1016/j.dr.2005.11.002
- Hoff, E. (2013). Interpreting the early language trajectories of children from low-SES and language minority homes: Implications for closing achievement gaps. *Developmental Psychology*, 49, 4–14. doi:10.1037/a0027238
- Hoff, E. (2017). Bilingual development in children of immigrant families. *Child Development Perspectives*, 12, 80–86. doi:10.1111/cdep.12262
- Hoff, E., Core, C., Place, S., Rumiche, R., Señor, M., & Parra, M. (2012). Dual language exposure and early bilingual development. *Journal of Child Language*, 39, 1–27. doi:10.1017/S0305000910000759
- Howes, C., Burchinal, M., Pianta, R., Bryant, D., Early, D., Clifford, R., & Barbarin, O. (2008). Ready to learn? Children's pre-academic achievement in pre-kindergarten programs. *Early Childhood Research Quarterly*, 23, 27–50. doi:10.1016/j.ecresq.2007.05.002
- Hox, J. J. (2010). *Multilevel analysis: Techniques and applications* (2nd ed.). New York, NY: Routledge.
- Hu, B. Y., Fan, X., Gu, C., & Yang, N. (2016). Applicability of the Classroom Assessment Scoring System in Chinese preschools based on psychometric evidence. *Early Education and Development*, 27, 714–734. doi:10.1080/10409289.2016.1113069
- Justice, L. M., Petscher, Y., Schatschneider, C., & Mashburn, A. (2011). Peer effects in preschool classrooms: Is children's language growth associated with their classmates' skills? *Child Development*, 82, 1768–1777. doi:10.1111/j.1467-8624.2011.01665.x
- Kempert, S., Edele, A., Rauch, D., Paetsch, J., Darsow, A., Wolf, K., . . . Stanat, P. (2016). Die Rolle der Sprache für zuwanderungsbezogene Ungleichheiten im Bildungserfolg [Language and immigration related disparities in educational success]. In C. Diehl, C. Hunkler, & C. Kristen (Eds.), *Ethnische Ungleichheiten im Bildungsverlauf. Mechanismen, Befunde, Debatten* (pp. 157–241). Wiesbaden, Germany: Springer VS.
- Keys, T. D., Farkas, G., Burchinal, M. R., Duncan, G. J., Vandell, D. L., Li, W., . . . Howes, C. (2013). Preschool center quality and school readiness: Quality effects and variation by demographic and child characteristics. *Child Development*, 84, 1171–1190. doi:10.1111/cdev.12048
- Klein, O., & Sonntag, N. (2017). Ethnische Unterschiede der Wirkung institutioneller U3-Kinderbetreuung. *Zeitschrift für Erziehungswissenschaft*, 20, 41–60. doi:10.1007/s11618-016-0683-5
- Lee, J. (2011). Size matters: Early vocabulary as a predictor of language and literacy competence. *Applied Psycholinguistics*, 32, 69–92. doi:10.1017/S0142716410000299

- Lenhard, A., Lenhard, W., Segerer, R., & Suggate, S. (2015). *Peabody Picture Vocabulary Test (4. Ausgabe)*. Frankfurt, Germany: NCS Pearson.
- Leyva, D., Weiland, C., Barata, M., Yoshikawa, H., Snow, C., Treviño, E., & Rolla, A. (2015). Teacher-child interactions in Chile and their associations with prekindergarten outcomes. *Child Development, 86*, 781–799. doi:10.1111/cdev.12342
- Lin, T.-J., Justice, L. M., Paul, N., & Mashburn, A. J. (2016). Peer interaction in rural preschool classrooms: Contributions of children's learning-related behaviors, language and literacy skills, and problem behaviors. *Early Childhood Research Quarterly, 37*, 106–117. doi:10.1016/j.ecresq.2016.04.001
- Linberg, T., & Wenz, S. E. (2017). Ausmaß und Verteilung sozioökonomischer und migrationspezifischer Ungleichheiten im Sprachstand fünfjähriger Kindergartenkinder [Extent and distribution of socio-economic and immigration-related inequalities in the language abilities of 5-year-old preschool children]. *Journal for Educational Research Online / Journal für Bildungsforschung Online, 9*(1), 77–98.
- Mashburn, A. J., Justice, L. M., Downer, J. T., & Pianta, R. C. (2009). Peer effects on children's language achievement during pre-kindergarten. *Child Development, 80*, 686–702. doi:10.1111/j.1467-8624.2009.01291.x
- McCartney, K., Dearing, E., Taylor, B. A., & Bub, K. L. (2007). Quality child care supports the achievement of low-income children: Direct and indirect pathways through caregiving and the home environment. *Journal of Applied Developmental Psychology, 28*, 411–426. doi:10.1016/j.appdev.2007.06.010
- Muthén, L. K., & Muthén, B. O. (2017). *Mplus user's guide* (8th ed.). Los Angeles, CA: Muthén & Muthén.
- National Institute of Child Health and Human Development. (2002). Early child care and children's development prior to school entry: Results from the NICHD Study of Early Child Care. *American Educational Research Journal, 39*, 133–164. doi:10.3102/00028312039001133
- Niklas, F., Schmiedeler, S., Pröstler, N., & Schneider. (2011). Die Bedeutung des Migrationshintergrunds, des Kindergartenbesuchs sowie der Zusammensetzung der Kindergartengruppe für sprachliche Leistungen von Vorschulkindern. *Zeitschrift für Pädagogische Psychologie, 25*, 115–130. doi:10.1024/1010-0652/a000032
- Niklas, F., & Tayler, C. (2018). Room quality and composition matters: Children's verbal and numeracy abilities in Australian early childhood settings. *Learning and Instruction, 54*, 114–124. doi:10.1016/j.learninstruc.2017.08.006
- Oh, J. S., & Fuligni, A. J. (2010). The role of heritage language development in the ethnic identity and family relationships of adolescents from immigrant backgrounds. *Social Development, 19*, 202–220. doi:10.1111/j.1467-9507.2008.00530.x
- Organisation for Economic Cooperation and Development. (2016). *PF3.2: Enrolment in child care and pre-school*. Retrieved from <http://www.oecd.org/els/family/database.htm>
- Palermo, F., & Mikulski, A. M. (2014). The role of positive peer interactions and English exposure in Spanish-speaking preschoolers' English vocabulary and letter-word skills. *Early Childhood Research Quarterly, 29*, 625–635. doi:10.1016/j.ecresq.2014.07.006
- Palermo, F., Mikulski, A. M., Fabes, R. A., Hanish, L. D., Martin, C. L., & Stargel, L. E. (2014). English exposure in the home and classroom: Predictions to Spanish-speaking preschoolers' English vocabulary skills. *Applied Psycholinguistics, 35*(6), 1163–1187. doi:10.1017/s0142716412000732
- Peisner-Feinberg, E. S., Burchinal, M. R., Clifford, R. M., Culkin, M. L., Howes, C., Kagan, S. L., & Yazejian, N. (2001). The relation of preschool child-care quality to children's cognitive and social developmental trajectories through second grade. *Child Development, 72*, 1534–1553. doi:10.1111/1467-8624.00364
- Perlman, M., Falenchuk, O., Fletcher, B., McMullen, E., Beyene, J., & Shah, P. S. (2016). A systematic review and meta-analysis of a measure of staff/child interaction quality (the Classroom Assessment Scoring System) in early childhood education and care settings and child outcomes. *PLOS One, 11*, 1–33. doi:10.1371/journal.pone.0167660
- Pianta, R. C., La Paro, K. M., & Hamre, B. K. (2008). *Classroom Assessment Scoring System: Manual, Pre-K*. Baltimore, MD: Brookes.
- Place, S., & Hoff, E. (2011). Properties of dual language exposure that influence 2-year-olds' bilingual proficiency. *Child Development, 82*(6), 1834–1849. doi:10.1111/j.1467-8624.2011.01660.x
- Preacher, K. J., Curran, P. J., & Bauer, D. J. (2006). Computational tools for probing interaction effects in multiple linear regression, multilevel modeling, and latent curve analysis. *Journal of Educational and Behavioral Statistics, 31*, 437–448. doi:10.3102/10769986031004437
- Prevo, M. J. L., Malda, M., Mesman, J., & van Ijzendoorn, M. H. (2016). Within- and cross-language relations between oral language proficiency and school outcomes in bilingual children with an immigrant background: A meta-analytical study. *Review of Educational Research, 86*, 237–276. doi:10.3102/0034654315584685
- Reid, J. L., & Ready, D. D. (2013). High-quality preschool: The socioeconomic composition of preschool classrooms and children's learning. *Early Education and Development, 24*, 1082–1111. doi:10.1080/10409289.2012.757519
- Rutland, A., Cameron, L., Bennett, L., & Ferrell, J. (2005). Interracial contact and racial constancy: A multi-site study of racial intergroup bias in 3–5 year old Anglo-British children. *Journal of Applied Developmental Psychology, 26*, 699–713. doi:10.1016/j.appdev.2005.08.005
- Sammons, P., Sylva, K., Melhuish, E. C., Siraj, I., Taggart, B., & Elliot, K. (2002). *The Effective Provision of Pre-School Education (EPPE) Project: Technical Paper 8a—Measuring the impact of pre-school on children's cognitive progress over the pre-school period*. London, England: University of London.
- Sammons, P., Sylva, K., Melhuish, E. C., Siraj-Blatchford, I., Taggart, B., Elliot, K., & Marsh, A. (2004). *The Effective Provision of Pre-School Education (EPPE) Project: Technical Paper 9—Report on age 6 assessments*. London, England: University of London.
- Stahl, J. F., Schober, P. S., & Spiess, C. K. (2017). Parental socioeconomic status and childcare quality: Early inequalities in educational opportunity? *Early Childhood Research Quarterly, 44*, 304–317. doi:10.1016/j.ecresq.2017.10.011
- Statistische Ämter des Bundes und der Länder. (2016). *Kindertagesbetreuung regional 2016*. Retrieved from https://www.destatis.de/DE/Publikationen/Thematisch/Soziales/KinderJugendhilfe/KindertagesbetreuungRegional5225405167004.pdf?__blob=publicationFile

- Statistisches Bundesamt. (2016). *Statistiken der Kinder- und Jugendhilfe. Kinder und tätige Personen in Tageseinrichtungen und in öffentlich geförderter Kindertagespflege am 01.03.2016*. Retrieved from https://www.destatis.de/DE/Publikationen/Thematisch/Soziales/KinderJugendhilfe/Tageseinrichtungen/Kindertagespflege5225402167004.pdf?__blob=publicationFile
- Stuck, A., Kammermeyer, G., & Roux, S. (2016). The reliability and structure of the Classroom Assessment Scoring System in German pre-schools. *European Early Childhood Education Research Journal*, 24, 873–894. doi:10.1080/1350293X.2016.1239324
- Tietze, W., Becker-Stoll, F., Bensel, J., Eckhardt, A. G., Haug-Schnabel, G., Kalicki, B., . . . Leyendecker, B. (2012). *NUBBEK. Nationale Untersuchung zur Bildung, Betreuung und Erziehung in der frühen Kindheit. Fragestellungen und Ergebnisse im Überblick* [NUBBEK. National Study of Child Care and Early Childhood. Overview of research questions and findings]. Retrieved from <http://www.nubbek.de/media/pdf/NUBBEK%20Broschuere.pdf>
- Tietze, W., Becker-Stoll, F., Bensel, J., Eckhardt, A. G., Haug-Schnabel, G., Kalicki, B., . . . Leyendecker, B. (2013). *NUBBEK. Nationale Untersuchung zur Bildung, Betreuung und Erziehung in der frühen Kindheit* [NUBBEK. National Study of Child Care and Early Childhood]. Weimar, Germany: Verlag das Netz.
- United Nations. (2015). *Trends in international migrant stock: The 2015 revision*. Retrieved from http://www.un.org/en/development/desa/population/migration/data/estimates2/data/UN_MigrantStockByAge_2015.xlsx
- Unsworth, S. (2016). Quantity and quality of language input in bilingual language development. In E. Nicoladis, & S. Montanari (Eds.), *Bilingualism across the lifespan: Factors moderating language proficiency* (pp. 103–121). Washington, DC: de Gruyter.
- von Suchodoletz, A., Fäsche, A., Gunzenhauser, C., & Hamre, B. K. (2014). A typical morning in preschool: Observations of teacher-child interactions in German preschools. *Early Childhood Research Quarterly*, 29, 509–519. doi:10.1016/j.ecresq.2014.05.010
- Wasik, B. A., Hindman, A. H., & Snell, E. K. (2016). Book reading and vocabulary development: A systematic review. *Early Childhood Research Quarterly*, 37, 39–57. doi:10.1016/j.ecresq.2016.04.003
- Wen, X., Leow, C., Hahs-Vaughn, D. L., Korfmacher, J., & Marcus, S. M. (2012). Are two years better than one year? A propensity score analysis of the impact of Head Start program duration on children's school performance in kindergarten. *Early Childhood Research Quarterly*, 27, 684–694. doi:10.1016/j.ecresq.2011.07.006
- Willard, J. A., Agache, A., & Leyendecker, B. (2019). *Classroom composition, classroom quality and language skills of immigrant dual language learners and non-immigrant children in Germany*. Manuscript submitted for publication.
- Yazejian, N., Bryant, D., Freel, K., & Burchinal, M. (2015). High-quality early education: Age of entry and time in care differences in student outcomes for English-only and dual language learners. *Early Childhood Research Quarterly*, 32, 23–39. doi:10.1016/j.ecresq.2015.02.002

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