Bilingual Preschool Children's Second-Language Vocabulary Development: The Role of

First-language Vocabulary Skills and Second-language Talk Input

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Abstract

Aims: In this study, we aimed to examine whether five-year-old children with varying first-language (L1) vocabulary skills benefitted differently from second-language (L2) teacher-led group talk and peer-play talk when acquiring L2 vocabulary in preschool contexts.

Design: The participants were 26 bilingual children, speaking Turkish (L1) and Norwegian (L2), who participated in a longitudinal study. At age five, they experienced variability in the amount and diversity of the L2 talk they were exposed to in interactions with teachers and peers.

Data and analysis: Preschool L2 talk exposure was assessed by calculating the density of word tokens and word types in video-taped teacher-led group talk and in peer-play talk. The children's vocabulary skills were assessed in L1 at age five and in L2 at ages four, five, six, seven and 10, using translated versions of the Peabody Picture Vocabulary Test-III. To obtain a more reliable estimate of the children's L2 vocabulary skills we used data from all time points to fit a longitudinal growth model.

Findings: Children with more developed L1 vocabulary skills who were exposed to teacher-led talk and peer-play talk with a high density of tokens had more developed L2 vocabulary skills at age five. This interaction effect remained after controlling for maternal education.

Originality: Few previous studies, if any, have analyzed whether interaction effects between L1 vocabulary skills and L2 exposure may impact L2 vocabulary skills; that is, whether children with more developed L1 vocabulary skills are more prepared to make use of the L2 environment.

Implications: Interdependency among languages may be mediated by classroom talk quality. Rather than limiting the discussion of L1-L2 relations to issues of direct transfer, future research should include children's experiences with using socio-pragmatic skills when interpreting word meaning.

Introduction

For an increasing number of children around the world, the language of instruction in school is not the language spoken in the family. Previous research on the relationships between first language (L1) and second language (L2) vocabulary has resulted in divergent findings (Goldenberg, Rueda, & August, 2006; Melby-Lervåg & Lervåg, 2011). A variety of factors, including linguistic features such as shared phonological forms or cognate vocabulary among languages (Genesee & Geva , 2006; Marinova-Todd & Uchikoshi, 2011), the specific vocabulary dimensions targeted (Ordóñez, Carlo, Snow, & McLaughlin, 2002), and the language acquisition support children receive at home and at school (Goldenberg, Reese, & Rezaei, 2011; Hammer, Scarpino, & Davison, 2011; Quiroz, Snow, & Zhao, 2010; Uchikoshi, 2006) impact L1–L2 vocabulary relationships. Recent evidence suggests that there is no simple or linear relationship between vocabulary skills in bilingual children's two languages (Cha & Goldenberg, 2015).

In the present study, we examined whether L1 vocabulary skills support L2 vocabulary acquisition in young bilingual children who were developing sequential bilingualism with Turkish as their first language and Norwegian as their second. It has been well documented that for young monolingual children, vocabulary development is supported by language-learning environments that expose them to rich talk (Hurtado, Markman, & Fernald, 2008; Pan, Rowe, Singer, & Snow, 2005; Rowe, 2012). Compared to young monolingual children, children who learn an L2 bring additional skills, acquired in their L1, to the process of using input to learn the new language. Thus, in this study, we investigated how children with varying L1 vocabulary skills used the resources of the L2 vocabulary environment when acquiring their L2.

Theoretical Positions on the Relationships between Talk Exposure and L1 and L2 Vocabulary Proficiency

Previous studies on the relationships between children's L1 and L2 vocabulary have mostly drawn on two theoretical positions: the time-on-task hypothesis and the interdependence hypothesis. In this study, we will also draw on a third theoretical stance; a socio-pragmatic approach to L2 vocabulary learning.

The time-on-task, or competition hypothesis, suggests that the amount of exposure children have to a particular language determines their vocabulary size in that language (for discussion of this hypothesis, see Cha & Goldenberg, 2015; Quiroz et al., 2010). The time-on-task hypothesis predicts a lack of association, or even a negative association, between bilingual children's two vocabularies. In other words, exposure to one language and concomitant vocabulary skills is inversely related with exposure to, and vocabulary skills in, the other language. The time-on-task hypothesis focuses on the relationships between exposure and vocabulary, but unlike the interdependence hypothesis, it does not address whether vocabulary proficiency in the L1 supports L2 learning.

The interdependence hypothesis, on the other hand, suggests that competency development in an L2 is partially a function of the type of competency developed in the L1 (Cummins, 1979). Cummins proposed that certain linguistic skills such as metalinguistic and academic language skills transfer across languages. Contemporary versions of the interdependence hypothesis suggest that transfer from the L1 can facilitate L2 learning when the two languages share features. The interdependence hypothesis addresses intrapersonal transfer but does not consider whether L1 vocabulary skills interact with L2 talk exposure to impact L2 vocabulary skills, that is, whether children with more developed L1 vocabularies are more able to use L2 exposure more efficiently in their L2 learning.

Effects of potential interactions between L1 and L2 exposure on L2 vocabulary skills are not well understood however; there are few studies that consider whether children with more developed L1 vocabulary skills are more adept at using L2 exposure to support their L2

learning. According to the socio-pragmatic perspective on word learning (Akhtar & Tomasello, 2000; Tomasello, 1992), children approach word learning as a social puzzle, looking for interpretation support in the social and linguistic contexts. For children in the process of acquiring their first words, the meaning of words is typically reduced by the possible intentions the speaker may have. The children's task is thus to use the social and/or linguistic context to infer the meaning of a speech segment. Indeed, Akhtar and Menjivar (2012) have suggested that living in bilingual environments, having to choose a language of communication based on a judgement of the information needs of others, may enhance young children's development of the ability to understand the intentions of others. As opposed to monolingual language learners, sequentially bilingual children already know words in their L1 when exposed to their L2. Thus, they bring to the language learning process a wider set of skills, such as a conceptual structure developed in L1 that may serve to support L2 vocabulary acquisition by facilitating the use of social and linguistic cues for word interpretation. We propose that the socio-pragmatic stance extends the interdependence hypothesis by suggesting that relations between L1 and L2 vocabulary may result from children with more developed L1-skills being able to use the potential resources of L2 exposure more efficiently.

Mixed Support for Cross-Language Vocabulary Relationships

Studies examining cross-language vocabulary relationships have had mixed findings (Quiroz et al., 2010). In their recent metanalysis, Melby-Lervåg, and Lervåg (2011) found a small meta-correlation between L1 and L2 vocabulary, with large variations in the strength of the correlations among the studies they reviewed. Studying preschool children, Uchikoshi (2006) found that children with higher initial Spanish receptive vocabulary tended to start kindergarten with higher English receptive vocabulary. Although this suggested a relationship between L1 and L2 lexical knowledge, Spanish vocabulary scores were not related to growth

rates in English vocabulary scores. Other studies have found no (Uccelli & Paez, 2007) or limited support (Farver, Lonigan, & Eppe, 2009; Kohnert, Kan, & Conboy, 2010; Scheele, Leseman, & Mayo, 2010) for claims that developing skills in the L1 result in more developed L2 skills. On the other hand, Karlsen, Lervåg, and Lyster (2016) did find an effect of L1 vocabulary on L2 vocabulary growth in a sample of kindergarten children speaking Urdu as their L1 and Norwegian as their L2. In sum, L1–L2 relationships are complex, suggesting the need to consider mediating relationships.

The Amount and Diversity of Talk Exposure Predicts Vocabulary Learning

The amount and variability in how much talk young children hear is enormous. While the time-on-task hypothesis is concerned with the proportion of input in each of the languages the bilingual child is exposed to, studies examining the effects of tokens and types exposure on vocabulary learning apply a different perspective and pay attention to within-language input variation. A large body of research with monolingual samples has demonstrated that young children who experience rich caregiver talk are more likely to develop strong language capacities and that the overall number of words (tokens) and/or diversity of words (types) adults use when interacting with children, both at home (Hart & Risley, 1995; Hurtado et al., 2008; Huttenlocher et al., 2010; Pan et al. 2005; Rowe, 2012) and in educational settings (Dickinson & Porche, 201I; Han, Roskos, Christie, Mandzuk, & Vukelich, 2005), predict children's vocabulary growth during the preschool period. In studies on monolingual children, density of types rather than tokens, is a better predictor of vocabulary learning (Dickinson & Porche, 2011; Pan et al. 2005; Rowe, 2012). In studies using samples of bilingual learners, the number of words (tokens) heard in L2 teacher talk appears to be the better predictor of L2 vocabulary development. Bowers and Vasilyeva (2011), studying a sample of monolingual and bilingual preschoolers, reported that the amount of teacher talk was the only predictor of L2 vocabulary growth in the bilingual children, while teacher talk diversity predicted the

monolingual children's vocabulary growth. They suggested that the overall amount of talk was the more relevant input for L2 learners who are in the early stages of building their vocabulary with high-frequency words. This interpretation was partly supported by another study (Rydland, Grøver, & Lawrence, 2014), which concluded that the amount (tokens) of teacher-led talk is a stronger predictor of L2 vocabulary than diversity (types).

Many bilingual children learning an L2 in preschool spend a substantial amount of time in interaction with peers. Mashborn, Justice, Downer, and Pianta (2009) found that preschoolers' expressive and receptive language development was positively associated with their peers' expressive language skills. Another study (Schechter & Bye, 2007) reported that children attending a preschool program with advantaged peers improved their receptive vocabulary scores compared to children attending a preschool program for low-income children, suggesting that the language skills of the more advantaged peers had a positive impact. Blum-Kulka & Gorbatt (2014) who studied the interactions of bilingual children in preschools, documented the many ways in which peers provided crucial forms of L2 exposure and opportunities for language practice. Similarly, Grøver Aukrust (2004) found that participating in play and related discursive genres such as peer explanatory talk in preschool enhanced non-native speakers' receptive vocabulary. Finally, Rydland et al. (2014) reported that peer talk that exposed young L2 learners' to a variety of words (tokens as well as types) predicted their L2 vocabulary skills.

Most studies examining the impact of tokens and types on vocabulary learning have examined maternal input in mother-child dyads (Hart & Risley, 1995; Rowe, 2012; Weizman & Snow, 2001). In complex, multiparty settings, such as in teacher-led group time or when children play in groups, it is common that one participant starts off an utterance that one or more other participants complete or that children repeat each other in ways that make it hard to identify some as producers and others as receivers of input. We will thus argue that in

preschool multiparty interaction involving several children, the tokens and types produced by the group may be relevant to consider as an index of talk amount and diversity, while keeping in mind that the measure includes target child talk contributions.

Socio-economic Factors Predict Home Talk Exposure

Studies have robustly documented that socio-economic factors (SES) influence monolingual language acquisition and that children from higher SES families are more likely to have access to the type of talk that effectively propels vocabulary acquisition (Farkas & Beron, 2004; Hart & Risley, 1995; Hoff, 2013; Huttenlocker, Waterfall, Vasilyeva, Vevea, & Hedges, 2010). For bilingual children, however, SES seems to be less consistently related to vocabulary growth. Golberg, Paradis, and Crago (2008) and Rydland et al. (2014) found effects of SES (as measured by maternal education) on children's L2 vocabulary acquisition longitudinally. Similarly, Quiroz et al. (2010) found that maternal education predicts L2 (but not L1) vocabulary in bilingual preschool children. Scheele et al. (2010), on the other hand, found no relationship between SES and L2 vocabulary among three-year-olds.

The Present Study

We examined the extent to which L1 vocabulary supported the development of L2 vocabulary in a sample of five-year-old bilingual children who spoke Turkish (L1) at home and Norwegian (L2) in preschool. The children participated in a longitudinal study from preschool to fifth grade. They attended a variety of preschool classrooms and experienced variability in the richness of the L2 talk they were exposed to. We investigated how children with varying L1 vocabulary skills at age five benefitted from L2 teacher-led group talk and peer-play talk when acquiring L2 vocabulary in the preschool context.

In line with the social-pragmatic stance, we hypothesized that children who knew more words in their L1 would benefit more from a word-rich L2 environment, while children

with less developed L1 vocabulary skills would be less able to use the potential resources of the L2 environment to gain L2 vocabulary. We assumed that children with more developed L1 vocabulary skills had more experiences with talk embedded in contexts that supported them in making inferences about speaker intentions based on social and linguistic cues. Extending this assumption, we proposed that children's previous experiences with using such cues to extract word meaning might support the equivalent meaning-seeking processes in L2 vocabulary acquisition.

This study therefore addressed limitations of previous research by focusing on how preschoolers with high or low L1 vocabulary skills benefitted from L2 talk exposure varying in amount and diversity in two typical preschool settings: teacher-led group talk and peer-play talk. The following questions were posed:

1.   How do preschool L2 learners with varying L1 vocabulary skills benefit from teacher-led talk in their L2 vocabulary development?

2.   How do preschool L2 learners with varying L1 vocabulary skills benefit from peer-play talk in their L2 vocabulary development?

Moreover, as parental education in some studies has been found to be predictive of L2 vocabulary learning, we wanted to explore whether potential interaction effects of L1 and exposure on L2 remained after controlling for parental education.

3.   After controlling for parental education, how do preschool L2 learners with varying L1 vocabulary skills benefit from teacher-led and peer-play talk in their L2 vocabulary development?

Method

Participants

Twenty-six children (15 boys and 11 girls) living in multi-ethnic neighborhoods in the greater Oslo area in Norway participated in the present study. We followed the target children from preschool to fifth grade. All visits were conducted at the end of the spring semester.

The target children were all born in Norway while their parents were born in Turkey. At the onset of the study, the children had attended preschool for a minimum of two years. They were all normally-developing children. The parental education level ranged from five years of schooling to the completion of high school, and most of the parents held jobs with relatively low educational demands. To recruit the children, we contacted public preschools located in multi-ethnic neighborhoods in the larger Oslo area and asked them to distribute the study information and consent forms (in Turkish and Norwegian) to parents of Turkish origin. We lost two children in the fifth grade follow-up for reasons unrelated to this study.

In the late 1960s, many Turkish immigrants came to Norway to seek work. Later, marriage and family reunification have been the main reasons for immigration. An emphasis on Turkish language maintenance among the Turkish immigrant population in Norway has been documented (Blom & Henriksen, 2008). In the present study, demographic information and information about language use were collected from telephone interviews with the parents when the children were five years old (conducted by a native Turkish speaker), confirming that the participating families maintained use of the Turkish language at home.

The Preschool and School Contexts

The sample of children was distributed across 20 public preschool classrooms. Many of the target children's peers spoke a language different form Norwegian at home, but in school, the common language was Norwegian.

Norwegian preschools can be characterized by their child-centered approach that emphasizes opportunities for informal learning through free play and social activities. The preschool classrooms observed were similar in terms of their structural features, organization

and resources. All classrooms were age-heterogeneous, serving children aged three to five. The children would normally play with their peers in the morning hours before circle time and lunch. A typical afternoon would also include at least a couple of hours allocated to free play.

The instruction policy for language-minority children in Norway is to provide support for their development of the Norwegian language (Norwegian Ministry of Education and Research, 2007). Measures to support bilingual children's development of their mother tongue language have received little attention. In the present study, the lead teachers were mainly ethnic Norwegians, although many classrooms also had teacher assistants or mother-tongue teachers with non-ethnic Norwegian backgrounds.

The target children lived in multiethnic neighborhoods in two larger cities in Norway and attended their local neighborhood preschools. In spite of the similarities in structural features and resources across the observed preschool classrooms, the amount and diversity of the words the children were exposed to in everyday interaction with teachers and peers varied considerably.

Procedure

Norwegian vocabulary skills. The target children's receptive vocabulary skills in Norwegian were assessed individually at four different time points, from preschool to fifth grade, with a translated version of the Peabody Picture Vocabulary Test – III (PPVT-III, Dunn & Dunn, 1997). In the PPVT-III, the child was shown successive panels of four pictures and asked to point to the picture that matched the word said by the assessor. The PPVT-III consists of 144 items. We omitted five items from the original test, either because of their cultural inappropriateness or because of dialectical variation. The translated version of the PPVT-III into Norwegian has been shown to correlate highly with other measures of oral

language skills (Grøver Aukrust, 2009). Cronbach's alpha of the PPVT-III in this sample was .81 at age five, .83 at age six, and .94 at age 10.

During the first round of data collection, the sample comprised sixteen children who were attending the penultimate year of preschool (age four) and 10 children who were attending the last year of preschool (age five). The children who were recruited during their penultimate year of preschool were visited again during their final year of preschool, in first grade, and in fifth grade. The children who were recruited during their final year of preschool, were visited again in first grade, second grade, and fifth grade. Thus, all 26 children were visited at age five, six, and 10 (except for the two children who left the study in the fifth grade follow-up). The mean raw score for PPVT-III at age five was 43.62 (SD = 7.64).

Turkish vocabulary skills at age five. The target children's Turkish vocabulary skills were measured with PPVT-III, which was translated from the English and Norwegian versions. The Turkish assessment was administered by a native Turkish speaker and separated from the Norwegian assessment by at least one day. Cronbach's alpha of the Turkish PPVT-III with this sample was .90. The mean raw score for this predictor was 52.85 (SD = 5.77).

Talk exposure in preschool at age five. When the target children attended the last year of preschool (age five), they were videotaped in teacher-led circle time and peer play. As some children attended the same preschool classrooms, we chose to sample the same circle time for these children. Twenty different circle times were sampled with a mean length of 18.5 minutes. The whole class (approximately 15–18 children) participated in the observed teacher-led circle times. Circle time was a daily event in the observed preschools, and the only instructional activity prepared by the teacher that included all children in the classroom. Children would typically be seated in a circle on small chairs or on pillows on the floor. Circle times were conversation-based and focused on stories that the children wanted to share with the group or a topic chosen by the teacher (e.g., what is it to go on a safari or what is a

family) or they addressed a shared event in the close past or future such as a school trip or a celebration they were preparing for. Most teachers took care to offer each child an opportunity to speak during the circle time. A couple of the observed circle times started with the teacher reading a book before introducing conversation time. Even though book reading is an important context for language learning (Kucirkova, Snow, Grøver, & McBride, *in press*), to make the observed circle times comparable across the classrooms we did not transcribe book reading *per se* while any conversational activity related to the book was included in the transcript. We also limited the transcripts to talk and excluded singing.

In the Scandinavian countries children's play time occupies the major part of an ordinary preschool day. During this time children are free to engage in play activities of their choice. Peer play was videotaped when the target children interacted with their friends in the playroom. All classrooms had a room that was well equipped with toys to encourage play. The observed playgroups comprised between two and six children, with an average group size of 3.5 (SD = 1.2). Each group was videotaped for 30 to 60 minutes. To attain comparable situations across the target children, we selected the consecutive 20 minutes during which each target child was most engaged in joint play with his or her peers. We sampled 25 peer-play episodes, because two target children appeared in the same recording.

The talk occurring in the circle times and the peer-play episodes was transcribed following the transcription conventions of the Child Language Data Exchange System (MacWhinney, 1995). Only utterances in Norwegian were transcribed. The transcripts were analyzed with the Computerized Child Language Analysis (MacWhinney, 1995) to identify four different talk variables: the tokens and types in teacher-led talk during circle time and the tokens and types in peer talk during play. Given the multiparty quality of the talk we observed we decided to include all utterances produced in circle time and peer play (including target child's) when computing tokens and types.

Consequently, we first identified the number of tokens produced during talk in circle time and peer play, respectively, and computed the density of tokens per minute. During circle time, the mean number of tokens per minute was 89.51 (SD = 33.37), and the teachers contributed 74.18% of these tokens. In peer-play talk, the mean number of tokens per minute was 72.69 (SD = 28.21), and the target children contributed 38.07% of these tokens. Note that we selected for transcription the play segments in which the child was most engaged, which explains the relatively high degree of target child talk.

Then, to establish a measure of talk diversity, we computed the number of types, excluding the most common words by screening the transcripts against an exclusion list. Previous studies have suggested that being exposed to low-frequent or rare words predicts monolingual children's long-term vocabulary learning (Beals, 1997; Weizman & Snow, 2001). These studies typically excluded a large number of words (e.g. the 3000 most frequent words). We intended to develop a talk index that was clearly distinguished from the index based on tokens. Yet, as the children were young L2 speakers we did not want to exclude a large number of types when assessing talk diversity. We hence arrived on a decision to exclude the 150 most frequent words in Norwegian. We also excluded numbers used in counting and the use of personal names. Morphological variants of the same root were counted as one word. Finally, we calculated the density of types per minute, which was 9.18 (SD = 3.30) in circle time and 6.74 (SD = 2.75) in peer play. Thus, the circle time talk contained more tokens and types than peer-play talk. Although the correlations between tokens and types were high for circle time (r = 0.88, p < .001) and play (r = 0.90, p < .001), there was considerable variation across the classrooms with respect to the talk the target children were exposed to.

The control for maternal education. Maternal education was divided in three main categories: 1) 13 mothers had attended school for about five years, 2) seven mothers had completed middle school, and 3) six mothers had completed high school. Preliminary

analyses revealed that paternal-education level, gender, and length of preschool attendance (measured in months) were not related to the children's Norwegian vocabulary skills, while maternal education appeared to be a significant predictor and thus an important control variable.

Data Analysis

We used data from children at ages four, five, six, seven and 10 to fit a longitudinal growth model describing the children's L2 vocabulary scores (Singer & Willett, 2009). The estimates of change in the children's L2 vocabulary skills between ages four and five obtained in this way are more reliable than those obtained by ordinary least squares regression, because "as you add waves of data… the reliability with which change can be measured will improve" (Singer & Willett, 2003, p. 44). Fitting a trajectory across three or more data points reduces the impact of measurement error that perforce, inflates or reduces measured scores at each occurrence. The more waves of data, the better the fit between the model and the true growth we are trying to estimate. In our analysis, the recentered time variable specifies whether the data was collected when the children were age four (TIME = -1), five (TIME = 0), six (Time = 1), seven (TIME = 2), or 10 (TIME = 5). This means that difference in intercept represents the difference in Norwegian vocabulary scores at age five. Because we had a relatively small sample, we used the linear specification of time and restricted maximum likelihood estimation with the *xtmixed* command in Stata (StataCorp, 2015) for all models (see Bryk & Raudenbush, 1992, p. 53). We answered our research questions with models fit to the Norwegian vocabulary scores of all students across all waves of data (see Appendix I for details on the statistical treatment). In this way, we obtained estimates of the children's wave-to-wave vocabulary growth and also an estimate of how differences in Turkish PPVT-III scores predicted differences in Norwegian vocabulary. We then tested for interaction between Turkish vocabulary knowledge and talk exposure from teacher and peers in our model of

Norwegian vocabulary knowledge at age five. We examine the overall fit of the model with reference to its -2 log likelihood (the deviance statistic) and also examine the p value associated with each parameter in interpreting these results.

Results

We found a strong positive correlation between the children's receptive vocabulary in Turkish and Norwegian ($r = .47$, $p < .05$). Furthermore, while we found no relationships between our measures of teacher-led talk exposure and the children's L2 vocabulary at age five, there was a correlation between their age-5 vocabulary and talk exposure in peer play, as measured in tokens ($r = .47$, $p < 0.05$) and types ($r = .55$, $p < .01$). The correlations between maternal education and either of the language measures at age five were not significant.

Table 1 approximately here ----------------------
To answer our research questions, we fit a series of models to the Norwegian PPVT-III data. Table 1 presents the results related to talk exposure in teacher-led circle time (research question one), as analyzed by tokens (Models A–B) and types (Models D–E), while Table 2 presents the results related to talk exposure in peer-play (research question two), as analyzed by tokens (Model F–G) and types (Models I–J). The third research question asked whether potential relations detected in models A-B, D-E, F-G, and I-J would remain after control for parental education. The results are presented in model C (Table 1) and H (Table 2).

How do Preschool L2 Learners with Varying L1 Vocabulary Skills Benefit from Teacher-Led Talk in their L2 Vocabulary Development? (Models A, B, D, and E)

Model A predicts children's Norwegian vocabulary scores by age, Turkish vocabulary skills at age five, and the tokens in teacher-led talk. This model predicts that children at the age of five would have an average L2 PPVT-III score of 40.86 and improve roughly 10 points each year. This model also demonstrates that children with higher Turkish vocabulary skills had

higher Norwegian skills at age five (b = 2.957, p < 0.01) and that children exposed to more teacher-led talk during circle time (b = 3.681, p < 0.001) ended the year with higher vocabulary scores. Model B introduces the interaction between Turkish vocabulary and tokens in teacher-led talk. After controlling for Turkish vocabulary and the amount of teacher-led talk at age 5, children with higher Turkish scores still benefited more from teacher-led talk than children with lower Turkish vocabulary scores (b = 2.831, p < 0.01).

Interestingly, the models examining talk types during teacher-led talk (D and E) were different. In model D, the parameters associated with intercept, growth, Turkish vocabulary, and the diversity of talk exposure during play were significant. However, we found that the interaction between Turkish vocabulary and types of teacher-led talk was not significant in explaining the differences on the Norwegian PPVT-III at age five when controlling for Turkish skills and teacher-led talk exposure (Model E).

How do Preschool L2 Learners with Varying L1 Vocabulary Skills Benefit from Peer-Play Talk in their L2 Vocabulary Development? (Models F, G, I, and J)

Table 2 presents a series of models predicting Norwegian PPVT-III scores from talk exposure during peer play.

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Estimates of Norwegian vocabulary at age five and annual growth are similar to those in our previous models, as are the estimates of improvement in Norwegian vocabulary predicted from the Turkish PPVT-III (Model F). Model G introduces the interaction between Turkish vocabulary and peer-play tokens; the parameter estimate of this interaction term is significant in predicting Norwegian vocabulary (b=2.367, p < 0.05). Model I examines the predictive utility of Turkish vocabulary and peer-play type. In Model J, we introduce the interaction

between peer-play types and age-5 Turkish vocabulary skills. We find it is not a significant predictor of Norwegian PPVT-III.

After Controlling for SES, how do Preschool L2 Learners with Varying L1 Vocabulary Skills Benefit from Teacher-led and Peer-play Talk in their L2 Vocabulary Development? (Models C and H)

To see whether models B and G were significant after controlling for the growth associated with maternal education, we added a maternal-education-by-age term in each model. Model C shows that the interaction between tokens in teacher-led talk and age-5 Turkish vocabulary skills was a significant predictor of the children's Norwegian vocabulary ($b = 2.295$, $p = .05$), even after controlling for maternal education. Model H estimates the Turkish vocabulary by peer-play tokens interaction, controlling for growth associated with maternal education, which was significant even with controls ($b = 2.283$, $p < 0.05$).

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Discussion

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After examining relations between L1 vocabulary, L2 talk exposure, and L2 vocabulary, we found the following:

1. Preschool children with more developed L1 vocabulary skills who were exposed to teacher-led talk and peer-play talk that had a high density of tokens had higher L2 vocabulary skills. These relationships remained even after controlling for maternal education.

2. The equivalent interaction effects did not appear for preschool children who were exposed to teacher-led talk and peer-play talk characterized by a high density of types.

The time-on-task or competition hypothesis suggests that vocabulary skills are the result of the amount of exposure to a particular language. In other words, for children who primarily use one language at home and the other in the classroom we may expect context-specific effects on vocabulary. The interdependence hypothesis, on the other hand, proposes an

underlying cognitive proficiency that is common across children's languages. According to this framework, the acquisition of L2 skills is facilitated by prior L1 acquisition. Previous research has supported both of these hypotheses. As far as we know, no studies have considered how interaction effects between L1 vocabulary skills and L2 exposure may impact L2 vocabulary skills; that is, whether children with more developed L1 vocabulary skills are more prepared to make use of a the L2 environment. We consider the interaction effects found in this study to be consistent with the interdependence hypothesis. We also consider them consistent with the proposed socio-pragmatic perspective on young children's vocabulary learning: Children who have many words in their L1 may be more able to use the L2 environment in a beneficially way, building on assumptions about speaker intentions and other social and linguistic cues to support their emergent word understanding.

Although the amount and diversity of talk exposure correlated highly in both circle time and peer play, we found that children with more developed L1 vocabularies benefited from being exposed to L2 talk with a high density of tokens rather than to diverse L2 talk in both teacher-led talk and peer-play talk. These young bilingual children were still in the early phases of acquiring L2 vocabulary skills. Studies on monolingual children have concluded that types appear to be the more important talk-exposure predictor (e.g., Pan et al., 2005; Rowe, 2012), while there is some evidence that the sheer amount of talk may be a better predictor for young emergent bilingual children (Bowers & Vasilyeva, 2011; Rydland et al., 2014). Talk diversity may become more developmentally important when children acquire more words. This developmental perspective resembles Rowe's (2012) argument that monolingual children in the first phases of vocabulary learning depend mostly on the quantity of talk, while for children in their third year and above, more fine-grained and sophisticated input becomes increasingly important.

The measures of talk exposure employed in this study comprise talk produced in group settings. In circle time, the teachers contributed an average of three out of every four tokens, while only one out of four tokens was contributed by the children in attendance, implying that individual children contributed a very limited number of tokens. The target children interacted with a smaller number of interlocutors in play compared to circle time, with the average play group size being 3.5 participants. Thus, in peer play, each child contributed a higher ratio of talk, with the target children contributing approximately one out of every three utterances. In both situations, albeit in very different ways and to different extents, the target children were part of, and included in, the talk used to calculate tokens and types. It is worth noting that in spite of the differences in the children's contributions to the talk produced in the two settings, it was the density of tokens in group talk that interacted with L1 vocabulary in ways that predicted L2 vocabulary skills.

Some notes of caution should be considered when interpreting these findings. First, the relationships we revealed between L1 vocabulary and L2 talk exposure on L2 vocabulary are correlational; therefore, it is also possible that unmeasured variables account for the results. For example, even though all mothers reported speaking Turkish with their children at home, switching between languages might have been more common in some families. With observational data on actual language use in the home rather than maternal reports on language use, we would have been able to detect whether children with more advanced Turkish skills had mothers who also exposed them to more advanced Norwegian words. Additionally, home interactions that fostered L1 vocabulary skills may have enhanced the social and self-regulatory skills that prepared children for learning in contexts of group instruction and for forming social relationships that supported learning through peer interaction. L2 competency has been reported to influence L1 competency (Petersen, Thompsen, Guiberson, & Spencer, 2015), so we cannot exclude the possibility of bi-

directionality: Children with more developed L2 vocabularies might have benefited from high quality talk exposure in ways that also impacted their L1 vocabulary growth.

Second, some studies have suggested that cross-linguistic relationships vary across different domains of word knowledge and are stronger for tasks that tap more into metalinguistic, academically mediated skills than communicative tasks (Ordonez et al., 2002). The present study did not examine the potential interaction effects between various types of vocabulary knowledge. Clearly, a broader assessment of children's vocabulary skills in each language would have contributed to our understanding of the cross-linguistic relationships. The children in this study spoke languages with few cognates or other linguistic similarities and a regular transfer effect of vocabulary knowledge through cognates was not expected (see Genesee & Geva, 2006; Marinova-Todd & Uchikoshi, 2011). The interaction effects of L1 vocabulary and L2 exposure on L2 vocabulary thus extends our knowledge of the complex relationships existing between L1 and L2 in young emergent bilinguals.

Third, the present study had a small sample size and measured talk exposure based on only one teacher-led and one peer-play situation for each target child. Although we made efforts to ensure that we sampled typical everyday talk situations in the classrooms we visited, they represented only a small portion of the talk children were exposed to. Based on the present study, we are not able to conclude whether effects of interactions between L1 vocabulary skills and L2 talk exposure on L2 vocabulary appear similarly in other preschool situations, varying in formats and participants. However, the associations between classroom talk and vocabulary outcomes are consistent with prior research. Even though studies that examine classroom interaction in detail based on video- or audio-recordings have limited windows of observation, they may be better at identifying stable features of classroom-talk quality than more global ratings (Dickinson & Porche, 2011).

Finally, although the 20 preschool classrooms were similar in regard to organization, structural features, resources, and in the multilingual population they served, there may be differences among the classrooms relevant to interaction effects between L1 vocabulary and L2 talk exposure on L2 vocabulary above the variation in word exposure that we have examined. For example, teacher responsiveness to individual children's learning needs, teacher support for linguistic transfer through collaboration with parents, or student classroom composition related to age and linguistic competency might have impacted the talk exposure children with varying L1 vocabulary skills used as a resource for acquiring L2 vocabulary in the classroom.

Intervention studies are needed to disentangle the complex associations between bilingual development and classroom quality. We suggest that future research seeking to understand L1 and L2 relationships should consider a broader range of influences on bilingual children's transfer of linguistic knowledge. Our results suggest that interdependency among languages may be mediated by classroom talk quality. Rather than limiting the discussion to issues of direct transfer, future research should include children's experiences with successfully using socio-pragmatic skills and knowledge when interpreting word meaning. Young emergent bilingual children may draw on a reservoir of knowledge and skills that serve their L2 learning, including previous experiences with using talk contextually, to acquire word meaning.

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Table 1

Predicting L2 Vocabulary by L1 Vocabulary: Teacher-led Talk and Maternal Education

	Tokens in Teacher-Led Talk Predicting Norwegian PPVT-III			Types in Teacher-Led Talk Predicting Norwegian PPVT-III	
	A	B	C	D	E
Age	10.37^{***}	10.45^{***}	9.546^{***}	10.38^{***}	10.39^{***}
	(0.61)	(0.43)	(0.52)	(0.60)	(0.60)
Turkish Vocabulary	2.957^{**}	1.491	1.786	3.368^{**}	2.623^{*}
	(1.04)	(1.17)	(1.14)	(1.04)	(1.11)
Teacher-Led Talk Exposure	3.681^{***}	4.008^{***}	3.619^{***}	3.590^{***}	3.490^{***}
	(1.01)	(1.12)	(1.09)	(1.01)	(0.97)
Turkish Vocabulary by Talk Exposure		2.831^{**}	2.294^{*}		1.385
(RQ 1 & 3)		(0.98)	(0.97)		(0.88)
Maternal Education by Age			1.295^{**}		
(RQ 3)			(0.46)		
Intercept	40.86^{***}	40.72^{***}	40.66^{***}	40.90^{***}	40.80^{***}
	(1.02)	(1.27)	(1.23)	(1.02)	(0.99)
Level 2 Variance (Initial Status)	6.970^{***}	10.86^{**}	10.21^{*}	6.707^{***}	6.438^{***}
	(1.39)	(4.96)	(4.63)	(1.36)	(1.33)
Level 2 Variance (Rate of Change)	11.09^{**}			10.93^{**}	8.758^{*}
	(4.55)			(4.53)	(4.48)
Correlation (Rate and Initial Status)	0.124			0.356	0.412
	(0.43)			(0.49)	(0.57)
Level 1 within-person Residual Variance	40.61^{***}	80.35^{***}	74.98^{***}	41.10^{***}	41.83^{***}
	(4.15)	(6.55)	(6.13)	(4.25)	(4.40)
N	102	102	102	102	102
Deviance	715.26	734.91	727.57	715.78	711.80

Standard errors in parentheses

$^{*}\,p < 0.05$, $^{**}\,p < 0.01$, $^{***}\,p < 0.001$

Table 2

Predicting L2 Vocabulary by L1 Vocabulary: Peer-play Talk and Maternal Education

	Tokens in Peer-Play Talk Predicting Norwegian PPVT-III			Types in Peer-Play Talk Predicting Norwegian PPVT-III	
	F	G	H	I	J
Age	10.48^{***}	10.47^{***}	9.446^{***}	10.49^{***}	10.48^{***}
	(0.61)	(0.61)	(0.79)	(0.61)	(0.61)
Turkish Vocabulary	2.708^{*}	2.778^{*}	2.636^{*}	2.688^{*}	2.678^{*}
	(1.19)	(1.11)	(1.10)	(1.05)	(1.06)
Peer-play Talk Exposure	3.010^{*}	2.837^{**}	2.788^{*}	4.002^{***}	3.642^{**}
	(1.19)	(1.10)	(1.10)	(1.04)	(1.13)
Turkish Vocabulary by Peer Talk (RQ 2 & 3)		2.367^{*}	2.283^{*}		0.966
		(1.05)	(1.04)		(1.15)
Maternal Education by Age (RQ 3)			1.439^{*}		
			(0.73)		
Intercept	40.61^{***}	39.90^{***}	39.88^{***}	40.58^{***}	40.35^{***}
	(1.15)	(1.10)	(1.11)	(1.01)	(1.05)
Level 2 Variance (Initial Status)	6.913^{***}	6.982^{***}	6.383^{***}	6.944^{***}	6.938^{***}
	(1.39)	(1.38)	(1.34)	(1.39)	(1.38)
Level 2 Variance (Rate of Change)	18.30^{***}	12.94^{***}	13.63^{***}	10.59^{**}	10.74^{**}
	(5.32)	(4.56)	(4.63)	(4.16)	(4.23)
Correlation (Rate and Initial Status)	0.0406	0.305	0.0345	0.193	0.268
	(0.40)	(0.46)	(0.44)	(0.49)	(0.50)
Level 1 within-person Residual Variance	40.16^{***}	40.04^{***}	39.81^{***}	40.03^{***}	40.05^{***}
	(4.05)	(4.02)	(3.96)	(4.02)	(4.02)
N	102	102	102	102	102
Deviance	719.59	713.27	708.80	713.86	711.07

Standard errors in parentheses

$^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$

Appendix I

We fit preliminary models that included variance components at both intercept and time, although these were not significant in all models. As indicated in the results, in some cases, we reduced the models by eliminating the variance component associated with time. In these cases, we reported the reduced models but we also checked the overall deviance statistics to be sure that fuller models explained more variance than reduced models with similar random effects components. We also checked the estimates of key variables in the fuller models and they are similar in every case. We answered our research questions with several models fit with the L2 vocabulary scores of all children across all waves of data, applying the following equations:

Level 1:

$$NORWE\widehat{GIAN}\_PPVT = \pi_{0i} + \pi_{1i}AGE_{ij} + \varepsilon_{ij}$$

Level 2: $\pi_{0i} = \gamma_{00} + \gamma_{01}TURKISH\_PPVT_i + \gamma_{02}TALK_i +$

$$\gamma_{03}TURKISH\_X\_TALK\_EXPOSURE_i + \zeta_{0i}$$

$$\pi_{1i} = \gamma_{10} + \gamma_{11}MATERNAL\_EDUCATION_i + \zeta_{1i}$$

where $\varepsilon_{ij} \sim N(0, \sigma_\varepsilon^2)$ and $\begin{bmatrix} \zeta_{0i} \\ \zeta_{1i} \end{bmatrix} \sim N\left(\begin{bmatrix} 0 \\ 0 \end{bmatrix}, \begin{bmatrix} \sigma_0^2 & \sigma_{01} \\ \sigma_{10} & \sigma_1^2 \end{bmatrix}\right).$

The subscript i denotes individual children, and the subscript j denotes the centered age of the child. We included the transformed age five Turkish PPVT-III in each model: $\gamma_{01}TURKISH\_PPVT_i$, which estimates the difference in L2 vocabulary at age five associated with a one standard deviation difference in L1 vocabulary at age five. We tested four specifications of talk exposure. For each measure (tokens and types in teacher-led talk and tokens and types in peer-play talk), we fitted a model including the z-score transformed data collected at age five. $\gamma_{02}TALK_i$ estimates the differences in Norwegian PPVT-III associated with a one standard deviation difference in the relevant talk exposure measure. We

also created interaction variables by calculating the product of each child's standardized

Turkish PPVT-III performance and standardized talk exposure at age five. Examining the

parameter estimate associated with $\gamma_{03}TURKISH\_X\_TALK\_EXPOSURE_i$ answers research

questions one (for circle-time talk) and two (for peer-play talk). This parameter estimates

whether children benefit from talk exposure as a function of their L1 vocabulary, controlling

for L1 vocabulary and talk exposure at age five. To determine whether this interaction is

robust in models controlling for maternal education, we included

$\gamma_{11}MATERNAL\_EDUCATION_i$ in interaction with time in the final models in each series and

rechecked the $\gamma_{03}TURKISH\_X\_TALK\_EXPOSURE_i$ interaction to answer research question

three.