

Article

A Four-Year Longitudinal Comparative Study on the Lexicon Development of Russian and Turkish Heritage Speakers in Germany

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Abstract: Russian and Turkish are the most frequently spoken and intensively investigated heritage languages in Germany, but contrastive research on their development in early childhood is still missing. This longitudinal study compares the trajectories of expressive lexicon development in Russian (n = 70) and Turkish (n = 79) heritage speakers and identifies predictors for their lexicon size at preschool age. Heritage lexicon size was tested with two comparable tests assessing the expressive lexicon at four test points between the mean ages of 3.3 (range: 25–49 months) and 5.6 (range: 54–78 months) years. The influence of language-related factors, such as input quantity, parents' heritage language proficiency and age of onset (AoO) of German, and other potential predictors, i.e., intelligence and socio-economic status, is evaluated. Results show that the Turkish group's abilities grow slower but are similar at the last test point. Common predictors for lexicon size are input quantity from siblings and AoO. Group-specific influences are parental input quantity in the Russian group and siblings' proficiency in the Turkish group. Our findings emphasize the interplay of input quantity and society language AoO for heritage lexicon development. The relevance of our results for the usage-based theory of language acquisition is discussed.

Keywords: expressive lexicon; heritage language; Russian; Turkish; predictors of lexicon size



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1. Introduction

Russian and Turkish are the most frequently spoken heritage languages in Germany. These migrant groups are among the largest in Germany, with 13% of all inhabitants with a migration background stemming from Turkey and 7% from the Russian Federation (this includes first- and second-generation immigrants; [Statistisches Bundesamt 2020](#)). The number of speakers is likely higher, as, e.g., Russian is spoken in many countries beside the Russian Federation, and these speakers are not represented in official statistics. In Berlin specifically (where this study was conducted), the proportion of residents with a migration background is higher than the national average and amounts to 32% as compared to 24% nationwide ([Statistisches Bundesamt 2020](#)). Regarding children, about one-third of kindergarten children under six years of age in Berlin have a non-German family language, i.e., their heritage language (HL) ([Autorengruppe Bildungsberichterstattung 2020](#)). Although Russian- and Turkish-speaking communities in Germany differ in many respects regarding their social, cultural, and demographic backgrounds, as well as their immigrant history, attitudes toward language retention (e.g., presence of HLs on an institutional level) and different language maintenance opportunities (e.g., access to HL media), both languages are vital and well retained in their respective communities (see, e.g., [Olfert and Schmitz 2018](#)). This especially applies to large cities with a high percentage of Russian- and Turkish-speaking populations such as Berlin. Thus, it is not surprising that Russian and Turkish as home languages are more vivid and more often the focus of investigation compared to

other HLs in Germany (Anstatt 2009; Chilla and Şan 2017; Dieser 2009; Gagarina et al. 2014; Klassert et al. 2014; Pfaff 1991, 1994; Uzuntaş 2008). However, to our knowledge, no study has targeted perennial longitudinal development from a comparative perspective. We aim to fill this gap by describing the developmental trajectories of the HL lexicon in Russian and Turkish during kindergarten, a sensitive period for lexicon development. Additionally, we aim to identify common and group-specific predictors of HL lexicon size. Understanding lexicon development in these HLs is important to support HLs and the language of education, i.e., German, since HL lexicon size can positively impact German lexicon acquisition (Grøver et al. 2018; Wolter 2006).

1.1. Trajectories of Lexicon Development in a Heritage Language

In the usage-based (UB) theory of language acquisition input plays a crucial role (Bybee 2008; Paradis 2011; Tomasello 2003). The driving forces for children's language learning are input together with intention reading and pattern finding (Tomasello 2003), which lead to the acquisition of specific domains, e.g., lexicon. Thus, language acquisition is the result of multiple interactions between the caretaker (and his/her input), the child equipped with socio-cognitive and cognitive skills and general learning mechanisms in social contexts.

The UB theory is fundamental for the present study since it considers input as the main determinant and not a trigger (as in the generativist theories in which the role of input is also acknowledged) of lexicon growth (Lieven and Tomasello 2008). Sustainable and rich input, based on social interaction of the communication partners plays a crucial role in HL development because its acquisition is often accompanied by a) reduced learning opportunities, since only a limited number of people in a child's social environment speaks this language; b) a shift in dominance from HL dominant in early childhood to dominance in the society language due to exceedingly intense participation in day care or school where the society language is spoken (Klassert 2011; Oller et al. 2007); and c) limited possibilities for literacy acquisition. Consequently, the role of input and the age of onset (AoO) of society language acquisition, which often marks a change in language use for children and their families and reduces the amount of HL input, are investigated in this study. Due to differences in input quantity and quality, HLs develop differently in children and their ultimate attainment also depends on these factors (for an overview, see Serratrice 2020).

1.2. Predictors for Lexicon Size in a Heritage Language

A decisive factor for the development of the HL lexicon is the amount of HL input (e.g., Cheung et al. 2018; Cohen 2014; De Houwer 2011; Quiroz et al. 2010; Thordardottir 2011). Accordingly, the strongest predictor for HL lexicon size is the amount of HL use at home (Klassert and Gagarina 2010; Leseman 2000), particularly the use within the nuclear family (Gagarina and Klassert 2018). Additionally, the number of parents speaking the HL influences language development, since lexicon size in children with two HL-speaking parents increases substantially more between the ages of two to four than the lexicon size of children in a one-parent-one-language setting (Correia and Flores 2017; Hoff et al. 2014; Place and Hoff 2011). Moreover, the consistent use of the HL by siblings influences HL acquisition. For example, Bridges and Hoff (2014) and Quiroz et al. (2010) report that the HL competences of Spanish-English primary school children are influenced to a large degree by the consistent use of HL with parents and siblings. Armon-Lotem et al. (2011) found that singletons in kindergarten age from Russian-German or Russian-Hebrew families outperform children with siblings in different lexical and morphosyntactic measures in Russian as the HL. They explain this difference by the increasing difficulty to maintain a monolingual HL household with a growing number of siblings who increasingly use the society language. Exposure to the HL and society language (i.e., the amount of language input a child is addressed in HL or the society language, and the cumulative amount of time spend in the HL/society language environment) correlates with language skills in the HL (e.g., Haman et al. 2017 for Polish-English bilingual children). Another source of input

are language programs; the time spent in day care (Leseman 2000) and a bilingual school program including both the heritage and society language (Oller et al. 2007) positively impacts HL proficiency. For Russian–German bilinguals, Klassert (2011) reports that their HL lexical abilities are behind Russian monolingual norms, but that a bilingual education program also including the HL supports Russian development so that the lexical abilities of bilinguals are comparable to monolingual Russian children. Kupisch et al. (2014) also show that German–French adults who spend the majority of their childhood in Germany but attended formal instruction in their HL French performed at monolingual norms for various linguistic properties. The pattern that emerges from this domain of research is that an increasing amount and more diverse sources of HL input improve the development of the HL lexicon during childhood (see reviews by Hoff and Core 2013; Unsworth 2016). However, the relation between language experiences and language proficiency is also strongly modulated by the social setting. Dixon et al. (2012) assessed children living in Singapore who speak a home language, Chinese, Malay, or Tamil, and English as the society language. They found that, amongst other aspects, the community influences lexicon development in the ethnic languages because some languages have more prestige or certain communities consider their HL as important part of their identity and support its acquisition.

Beside quantity, the quality of input impacts lexicon development. Quality comprises the variability in input (for an overview, see Unsworth 2016), which depends, e.g., on the number of HL speakers in a child’s environment (see above or, e.g., Hoff et al. 2014; Quiroz et al. 2010). Additionally, there seems to be a connection between the variety in the input and improved language acquisition. Gámez and Levine (2013) found that second-language (L2) English vocabulary depends on the diversity of lexical and syntactic input from their English teachers.

Little is known about the impact of HL use, i.e., the amount a child speaks HL, on HL lexicon development itself. There is some evidence that language output influences semantics and morphosyntax (Bohman et al. 2010), phonology (Kupisch et al. 2020), and lexicon (Ribot et al. 2018). However, further research is necessary, despite the difficulties investigating this relation because input and output are often linked. For example, children speaking more in their HL might also experience more communicative situations in which they perceive the HL, or education in the HL comprises both more input as well as more HL use by a child.

Additionally, diverse non-linguistic factors can predict HL lexicon acquisition. Studies investigating the impact of variables like intelligence and socio-economic status (SES) on bilingual lexicon acquisition provide contradictory results. For example, in Leseman (2000), intelligence at age three was related to the HL Turkish receptive and productive lexicon at age four, while intelligence at age six predicted the receptive but not the productive lexicon in Spanish–English children (Buac et al. 2014). In contrast, other studies found no impact of intelligence on the HL lexicon (Bohnacker et al. 2016; Buac et al. 2014; Öztekin 2019; Quiroz et al. 2010). Regarding SES, findings are also mixed. Most studies confirm an influence of SES in preschool children on HL lexicon size (Akoğlu and Yağmur 2016; Armon-Lotem et al. 2011; Oller et al. 2007). However, Leseman (2000) found that SES (i.e., education level of parents) influenced only L2 Dutch but not HL Turkish. Dixon et al. (2012), who compared predictors for HL lexicon size in different bilingual groups living in Singapore, show that the impact of SES depends on the community. In their Chinese and Tamil communities, higher SES was related to a shift away from the heritage language, but in Malay children, the opposite pattern was found. These differential effects can be explained by the indirect relation between SES and language development; SES is related to language practices in general (Hart and Risley 1995) and to HL use in bilingual families specifically (Willard et al. 2015 for Turkish–German bilinguals), and language use and input in turn predict language development (Hoff and Core 2013; Unsworth 2015).

1.3. Research Questions

This study aims to answer two research questions. First, does the HL lexicon develop differently over the course of kindergarten in Russian– and Turkish–German bilinguals? We followed the HL expressive lexicon development in children from age three to six on average and assessed their HL lexicon at four points. Based on previous research, we hypothesize that the HL Russian lexicon will significantly develop over this entire period (Gagarina et al. 2018; Klassert 2011) and will be similar to Turkish (cf. Maviş et al. 2016; Uzuntaş 2008).

Second, which predictors influence HL expressive lexicon size at the last test point in each group of heritage speakers? We consider language-related predictors, such as input quantity (i.e., the amount of input from parents and siblings), parents' and siblings' self-reported HL proficiency and German AoO, as well as other predictors, such as intelligence and SES. Based on previous findings (e.g., Hoff and Core 2013; Unsworth 2016), we expect little influence from intelligence and SES, but significant effects from language-related predictors, especially input quantity. This prediction is grounded in the UB theory that considers input, together with the social interaction as a crucial determinant for lexicon growth (Lieven and Tomasello 2008).

2. Materials and Methods

2.1. Sample and Design

The HL Russian and Turkish expressive lexicon of 149 bilingual children with L2 German was assessed at four points during their kindergarten period. At the beginning of the study (pre-test), the children ($n = 147$) were on average 39 months old (age range: 25–49 months). The dropout amounted to $n = 3$ by the next test point (i.e., post1, but $n = 2$ Russian children could not participate in the pre-test and began at post1; mean age: 45 months, range 31–56), $n = 15$ by post2 (mean age: 55 months, range 42–66); and at the last test point, $n = 119$ children remained (mean age: 67 months, range: 54–78). Demographic information on the Russian and Turkish group are provided in Table 1. All children were born in Germany. Most parents grew up as monolinguals of their respective heritage language (Russian: 83%, Turkish: 78%), some grew up as bilinguals with German (Russian: 11%, Turkish: 21%), and only a few as monolingual Germans (Russian: 4%, Turkish: 1%), or 2% with another HL in the Russian group. Only children with no language, motor or psychological problems were included. From $n = 167$ recruited participants, children were excluded from the analysis if the results from the intelligence test indicated an intellectual disability ($n = 2$; IQ score < 80), if they likely had a language disorder ($n = 5$), participated in only one test session ($n = 7$), or if they gave no correct answer in the lexicon task at any test session ($n = 4$).

Table 1. Demographic information at pre-test and heritage language (HL) input and usage.

	Russian			Turkish			<i>p</i>
	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	
<i>n</i> (% female)		68 (44%)			79 (56%)		
Age	68	38.1	6.3	79	40.0	5.8	**
Intelligence	64	107.0	13.6	79	101.6	13.3	**
SES	46	3.3	0.9	35	3.2	0.9	
AoO	68	18.2	12.8	79	19.8	12.9	
Input parents	64	2.0	0.8	61	1.9	0.7	
Input siblings	37	2.5	1.1	32	2.7	1.1	
Proficiency parents	64	3.8	0.8	56	3.9	0.2	
Proficiency siblings	43	3.2	1.1	32	3.3	1.0	
Usage	63	2.0	1.1	63	2.2	1.2	

Note. *M*: mean; *SD*: standard deviation; *SES*: socio-economic status; *AoO*: age of onset. Age and *AoO* in months; intelligence measured by IQ; *SES* determined by parents' profession (1 = none to 5 = academic profession); input: 1 = only HL to 5 = only German; proficiency: 0 = none to 4 = proficient; usage: 0 = nowhere to 4 = at home, in kindergarten, with friends or other. ** $p < 0.01$.

The data were collected from 21 kindergartens in different areas of Berlin. Before the beginning of the study, parents gave written consent and filled out a questionnaire at the beginning of the study (Gagarina et al. 2010) on, amongst other things, their family's use of HL and German, language environment and SES. Trained staff conducted all tests with each child individually in a separate room in the kindergarten to ensure a quiet and familiar environment. The study was performed in accordance with the Declaration of Helsinki.

2.2. Material

2.2.1. Lexicon

The expressive lexicon in HL Russian and Turkish was measured with the corresponding subtests of the "Russian language proficiency test for multilingual children" (Gagarina et al. 2010) and the "Turkish language proficiency test for multilingual children" (see Table A1). Both picture-naming tasks comprised 52 items, i.e., colored drawings, which appeared in a fixed order. After two introductory pictures, 26 object pictures were presented to elicit nouns, followed by two introductory pictures and 26 action pictures to elicit verb naming. All items were controlled for frequency and included low, middle, and highly frequent words. The number of correct answers served as the evaluation measure. Answers were scored as correct when the target item could be clearly interpreted (e.g., including the use of diminutives or non-target inflections). In the Turkish test, four nouns and two verbs were excluded due to ambiguous pictures leading to an extremely low number of correct answers (<4% at last test point).

2.2.2. Language-Related Predictors

Based on the parental questionnaire, the language-related predictors of input quantity and HL proficiency of the core family, AoO, and the child's use of HL were determined. Parents indicated the German AoO and rated HL input quantity, i.e., how much each parent and sibling spoke in HL or German with the child (1 = only HL and 5 = only German). Parents also evaluated their and each siblings' HL proficiency level (0 = no knowledge of HL to 4 = proficient in HL). For each measure, the median for parents and siblings was calculated. Language use was calculated by adding the number of places where the child uses HL (0 = nowhere to 4 = at home, in kindergarten, with friends and in other situations).

2.2.3. Other Predictors

Intelligence was measured with subtests for reasoning (categorizing objects, finding analogies, and finding logical connections between situations) from the non-verbal intelligence test SON-R 2½-7 (Tellegen et al. 2007).

The median level of the parent's profession was used to estimate SES (based on Bettge and Oberwöhrmann 2018). Occupation was rated using the following scale: 1 = none, 2 = school education, 3 = semi-skilled worker, 4 = skilled worker, 5 = academic profession.

2.3. Statistical Analysis

Group comparisons were calculated with independent *t*-tests (see Table 1). HL development was analyzed using stepwise linear mixed regression models (Bates et al. 2014; all analyses were run with R; R Core Team 2015) with varying intercepts for subjects. All numeric variables were z-scaled in the subsequent analyses. First, group differences over time were calculated with fixed effects for and an interaction between HL (coded as Russian = 0, Turkish = 1) and TIME (coded as pre-test = 0 to post3 = 3). In a second step, fixed effects for AGE at pre-test and INTELLIGENCE were added to control for group differences at pre-test. To identify predictors of the HL lexicon, we calculated linear regression models for each predictor and HL group separately, since certain predictors were highly correlated. Lastly, Spearman correlation coefficients between all predictors for the HL lexicon were calculated to better understand their interplay.

3. Results

In our sample, the language groups differed significantly in certain aspects (see Table 1). The Turkish group was on average older and showed a lower performance in the intelligence test. Table 1 shows that this sample is heterogeneous regarding the AoO of German, which ranged from 0 to 42 months in both groups. Input quantity indicates that parents mainly used the HL, but siblings spoke both the HL and German. Parents' proficiency was at the ceiling, with only 8% indicating a lower proficiency than the maximum; due to this low variance, this variable was not included in the regression analysis in Table 2. Usage was distributed between the Russian/Turkish group in the following way: 88%/81% used the HL at home, 0%/13% in kindergarten, 38%/32% with friends, and 14%/26% at other places.

Table 2. Predictors for expressive lexicon at post3 derived from single regression models.

	Russian			Turkish		
	<i>b</i>	<i>p</i>	<i>R</i> ²	<i>b</i>	<i>p</i>	<i>R</i> ²
Intelligence	0.14	0.32		−0.07	0.58	
SES	−0.22	0.25		−0.09	0.59	
AoO	0.46	<0.01	0.17	0.27	<0.05	0.06
Input parents	−0.52	<0.001	0.22	−0.21	0.16	
Input siblings	−0.71	<0.001	0.37	−0.45	<0.05	0.18
Proficiency siblings	0.31	0.05		0.95	<0.001	0.56
Usage	0.25	0.10		0.22	0.10	

Note. All predictors are z-scaled.

3.1. Trajectories of HL Lexicon Development

The first regression model showed a significantly different development between Russian and Turkish heritage speakers (see also Figure 1). We found significant variance at pre-test in the Russian group (intercept: $b = -0.51$, $SE = 0.11$, $t = -4.52$) and this group's HL lexicon grew significantly over time (TIME: $b = 0.29$, $SE = 0.03$, $t = 10.9$). Turkish speakers performed significantly better at pre-test (HL: $b = 0.31$, $SE = 0.16$, $t = 2.00$), but their abilities grew less compared to the Russian group (TIME × HL: $b = -0.12$, $SE = 0.04$, $t = -3.12$). At post3, the groups did not differ significantly anymore (separate regression model; intercept: $b = 0.05$, $SE = 0.13$, $t = 0.41$; HL: $b = -0.11$, $SE = 0.19$, $t = -0.59$).

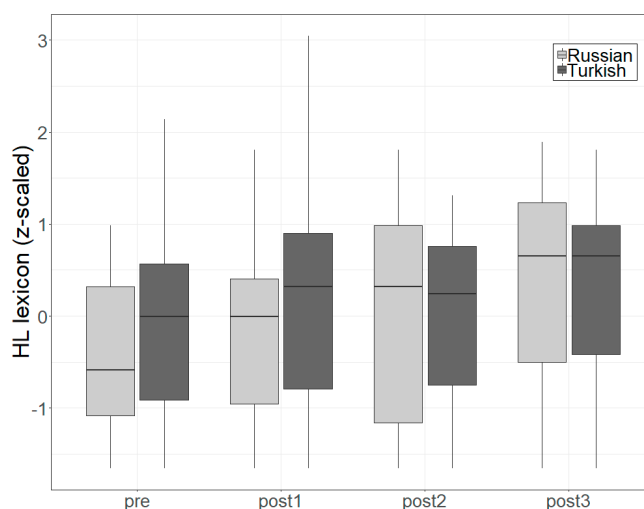


Figure 1. Development of the HL lexicon of Russian (light) and Turkish (dark) heritage speakers. Bars represent quartiles above and below the median (middle line), whiskers represent the extreme quartiles.

However, when we add intelligence and age to this regression model to control for group differences at pre-test, the language groups did not differ at pre-test (HL: $b = 0.23$, $SE = 0.15$, $t = 1.53$), but all previous effects remained similar (intercept: $b = -0.46$, $SE = 0.11$, $t = -4.25$; TIME: $b = 0.29$, $SE = 0.03$, $t = 10.90$), including the significant interaction (TIME \times HL: $b = -0.13$, $SE = 0.04$, $t = -3.31$), indicating a slower growth in the Turkish group. Age at pre-test was a significant predictor of lexicon size ($b = 0.35$, $SE = 0.07$, $t = 4.95$) but not intelligence ($b = 0.04$, $SE = 0.07$, $t = 0.50$).

3.2. Predictors of the HL Lexicon

The regression models identifying predictors for the HL lexicon at the last test point (see Table 2) revealed two common predictors for both groups: a later AoO of German and more HL input from siblings predicted better lexical abilities. The amount of input from parents was a significant predictor only in the Russian group. For the Turkish group, siblings' proficiency explained the largest amount of variance in lexical abilities. We consequently examined the number of siblings and birth order, but neither variable differed significantly between the groups (sibling number: Russian mean = 1.1, Turkish mean = 1.2, $p = 0.6$; birth order: Russian mean = 1.9, Turkish mean = 1.8, $p = 0.8$), nor did they correlate with HL lexicon size (sibling number: $r = -0.17$; birth order: $r = -0.17$).

Correlation coefficients between age, intelligence, SES, and language-related predictors are displayed in Table 3. Certain differential patterns between the groups reveal specific constellations in HL acquisition. A later AoO correlated with more HL use by parents in both groups, but only in the Turkish group with more HL use by siblings and only in the Russian group with higher parents' proficiency. In the Turkish group, families seem to use one language more consistently than Russian families, as indicated by higher correlations between input quantity and proficiency. If parents used the HL a lot, siblings did too; if parents were proficient in the HL, siblings were too, and a better command of the HL by parents was related to more HL use by siblings.

Table 3. Spearman correlation coefficients for Russian (below diagonal) and Turkish children (above diagonal).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) Age		-0.04	-0.13	0.42 *	-0.05	-0.19	0.17	0.28	0.11
(2) Intelligence	-0.05		-0.08	-0.03	-0.04	0.13	-0.23	0.37	-0.03
(3) SES	-0.14	0.0		-0.16	-0.07	0.12	0.01	-0.05	-0.23
(4) AoO	0.14	0.05	-0.15		-0.5 *	-0.53 *	0.24	0.06	0.2
(5) Input parents	0.15	-0.06	0.19	-0.45 *		0.45 *	-0.27	-0.06	-0.04
(6) Input siblings	-0.03	-0.11	0.26	-0.29	0.46 *		-0.48 *	-0.14	-0.11
(7) Proficiency parents	0.13	0.15	-0.19	0.32 *	-0.32 *	-0.1		0.31	-0.06
(8) Proficiency siblings	-0.22	0.29	-0.3	0.18	-0.22	-0.24	0.11		0.01
(9) Usage	0.2	0.05	-0.12	0.22	-0.06	-0.3	0.25	0.2	

Note. * $p < 0.05$.

4. Discussion

This longitudinal study compared the developmental trajectories of the expressive lexicon of the HLs Russian and Turkish in 149 kindergarten children in Berlin at four test points and scrutinized predictors of HL lexicon size at the primary school level. First, Russian and Turkish heritage speakers showed a similar development in their HL. At pre-test, Russian-speaking children had a lower lexicon size than their Turkish-speaking peers, which was mainly caused by the age difference between the groups. The slower growth rate in the Turkish group resulted in comparable performances between the groups at the last test point. The second goal of this study was to identify predictors of the HL expressive lexicon at the last test point. Only language-related predictors, which are naturally associated with socio-linguistic factors, but neither intelligence nor SES determined lexicon size. We found that a later AoO and more verbal communication with siblings predicted a greater lexicon size in both groups. For the Russian group, there was

also an effect of input quantity from parents, while sibling proficiency was the strongest predictor for the Turkish group.

These results show that the expressive lexicon development of Russian and Turkish in kindergarten age are comparable. The children's performance at the beginning and the end of the study was similar, although the Turkish groups' expressive lexicon grew at a lower rate. The individual differences in development seem to outweigh the impact of the language type (Russian or Turkish). Both groups also shared two predictors for HL lexicon size: input quantity from siblings and AoO of German. HL input quantity from siblings has already been identified as a crucial factor in HL success in previous research (Armon-Lotem et al. 2011; Bridges and Hoff 2014; Quiroz et al. 2010). In contrast to parents who used the HL more consistently in our study, siblings tended to use both the HL and German. Since HL input is provided mainly by the core family, social interaction with siblings plays a crucial role, since they act as providers of HL input. These findings support the UB theory which highlights the meaning of input as a part of social interaction and constrictive force of the acquisition and corroborate previous findings on the development of the lexicon in bilingual populations, e.g., on bilingual children acquiring L2 English in Canada (e.g., Paradis 2011).

Our analyses also revealed a significant effect of the AoO of L2 acquisition in both groups; later German acquisition was related to a better HL lexicon. Since an earlier AoO was also correlated with more German use by parents, two possible explanations are proposed. First, this relation could be interpreted in a way that acquisition of the society language constitutes a switch in speaking habits which negatively impacts HL development. A switch from the HL to society language dominance in HL speakers has been described in previous research, e.g., by Klassert (2011) and Gagarina and Klassert (2018) for Russian–German bilinguals. This switch reduces the amount of input from the HL and consequently leads to poorer HL development. An alternative theory is that the relation between AoO and HL reflects language use in the family; parents who use both languages daily with their child (and whose children have an earlier AoO) provide their children with less HL input, which results in a smaller lexicon size. At the same time, children in their communication with the peers (given the social importance of the peer-group) might have a more intensive uptake of an item from input.

Despite large commonalities, we could identify group-specific profiles of HL acquisition of the expressive lexicon. For the Russian group, besides the input from siblings, the input from parents also predicted the HL lexicon. Higher parent proficiency correlated with a later German AoO and more HL use by parents. One might speculate that parents with better Russian proficiency try to provide their children with as much Russian input in their early childhood before the impact of L2 German increases substantially. Therefore, their children might enter kindergarten later, since the age of kindergarten entry often coincides with the children's AoO. Parents' language competence thus is pivotal to ensure rich and correct input in HL for their children. In the Turkish group, the strongest predictor was sibling proficiency. This could be related to the slightly higher number of siblings and the organization of family communication in the Turkish-speaking cohort. More HL input from siblings correlated with a later German AOO and higher parent proficiency. Turkish parents with higher language proficiency might use HL more consistently with their children, which leads to more intensive HL use by siblings and a later German AoO. This group differed in intelligence from the Russian group, but intelligence did not predict HL lexicon attainment in our analyses and could be caused by sampling differences.

To conclude, our findings might be best explained by the UB theory, since factors measuring input properties like sustainable exposure and richness of the HL linguistic and, in a natural way, social environment predicted better expressive lexical abilities (Bybee 2008; Paradis 2011). Intelligence and SES did not (or only indirectly) influence children's lexicon development. Some open questions remain for further research; for example, how does language use and (the intensity of) social interaction in families change over time? Under which conditions can high proficiency be reached over the course of childhood?

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Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data supporting reported results are not available for public but can be obtained upon request from the principal investigators of the project at Leibniz-ZAS.

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Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1 displays all items from the Turkish lexicon task.

Table A1. Items of the subtest “Expressive Lexicon” of the Turkish language proficiency test.

Item Number	Noun	Translation	Verb	Translation
Practice 1	keci	cat	kesmek	to cut
Practice 2	üzüm	grape	uçmak	to fly
1	gözlük	glasses	söndürmek	to extinguish (fire)
2	fil	elephant	oturmak	to sit
3	araba	car	uyumak	to sleep
4	oyuncak	toy	vurmak	to hit
5	kaşık	spoon	yanmak	to burn
6	fırça	brush	havlamak	to bark
7	gökkuşağı	rainbow	kırmak	to break something
8	sepet	basket	okumak	to read
9	el	hand	sulamak	to water
10	martı	gull	boyamak	to paint
11	soğan	onion	dökmek	to spill something
12	dağ	mountain	yemek	to eat
13	ağaç	tree	düşmek	to fall down
14	balık	fish	içmek	to drink
15	gökyüzü	sky	fısıldamak	to whisper
16	televizyon	TV	dikmek	to plant
17	asker	soldier	çalmak	to steal
18	anahtar	key	okşamak	to pet, to caress
19	sandalye	chair	tuzlamak	to salt
20	buzdolabı	fridge	saklanmak	to hide
21	çekiç	hammer	banyo yapmak/etmek	to shower
22	küpe	earring	üzülmek	to sadden
23	çocuk arabası	stroller	yırtmak	to tear something
24	çay fincanı	teacup, mug	zıplamak,	to jump, to hop
25	tuzluk	saltshaker	toplamak	to gather, to pick something
26	şeftali	peach	inmek	to step out, to get out

References

- Akoğlu, Gözde, and Kutlay Yağmur. 2016. First-language skills of bilingual Turkish immigrant children growing up in a Dutch submersion context. *International Journal of Bilingual Education and Bilingualism* 19: 706–21. [CrossRef]
- Anstatt, Tanja. 2009. Der Erwerb der Familiensprache: Zur Entwicklung des Russischen bei bilingualen Kindern in Deutschland. In *Streitfall Zweisprachigkeit—The Bilingualism Controversy*. Edited by I. Gogolin and U. Neumann. Wiesbaden: VS Verlag für Sozialwissenschaften, pp. 111–31. [CrossRef]
- Armon-Lotem, Sharon, Joel Walters, and Natalia Gagarina. 2011. The impact of internal and external factors on linguistic performance in the home language and in L2 among Russian-Hebrew and Russian-German preschool children. *Linguistic approaches to Bilingualism* 1: 291–317. [CrossRef]
- Autorengruppe Bildungsberichterstattung. 2020. *Bildung in Deutschland 2020: Ein indikatorengestützter Bericht mit einer Analyse zu Bildung in einer digitalisierten Welt*. wbv Media. [CrossRef]
- Bates, Douglas, Martin Mächler, Ben Bolker, and Steve Walker. 2014. lme4: Linear Mixed-Effects Models Using Eigen and S4, pp. 1–7. Available online: <http://cran.r-project.org/package=lme4> (accessed on 31 October 2020).
- Bettge, Susanne, and Silke Oberwöhrmann. 2018. *Grundauswertung der Einschulungsdaten in Berlin 2017*. Berlin: Senatsverwaltung für Gesundheit, Pflege und Gleichstellung.
- Bohman, Thomas M., Lisa M. Bedore, Elizabeth D. Pena, Anita Mendez-Perez, and Ronald B. Gillam. 2010. What you hear and what you say: Language performance in Spanish-English bilinguals. *International Journal of Bilingual Education and Bilingualism* 13: 325–44. [CrossRef] [PubMed]
- Bohnacker, Ute, Josefin Lindgren, and Buket Öztekin. 2016. Turkish- and German-speaking bilingual 4-to-6-year-olds living in Sweden: Effects of age, SES and home language input on vocabulary production. *Journal of Home Language Research* 1: 17–41. [CrossRef]
- Bridges, Kelly, and Erika Hoff. 2014. Older sibling influences on the language environment and language development of toddlers in bilingual homes. *Applied Psycholinguistics* 35: 225–41. [CrossRef] [PubMed]
- Buac, Milijana, Megan Gross, and Margarita Kaushanskaya. 2014. The role of primary caregiver vocabulary knowledge in the development of bilingual children's vocabulary skills. *Journal of Speech, Language, and Hearing Research* 57: 1804–16. [CrossRef] [PubMed]
- Bybee, Joan. 2008. Usage-based grammar and second language acquisition. In *Handbook of Cognitive Linguistics and Second Language Acquisition*. Edited by Peter Robinson and Nick C. Ellis. New York: Routledge, pp. 216–36.
- Cheung, Shirley, Pui Fong Kan, Ellie Winicour, and Jerry Yang. 2018. Effects of home language input on the vocabulary knowledge of sequential bilingual children. *Bilingualism: Language and Cognition* 22: 986–1004. [CrossRef]
- Chilla, Solveig, and N. Hilal Şan. 2017. Möglichkeiten und Grenzen der Diagnostik erstsprachlicher Fähigkeiten: Türkisch-deutsche und türkisch-französische Kinder im Vergleich. In *Sprachen 2016. Russisch und Türkisch im Fokus*. Edited by Cemal Yildiz, Nathalie Topaj, Reyhan Thomas and Insa Gülzow. Berlin: Peter Lang, pp. 175–205.
- Cohen, Cathy. 2014. Relating input factors and dual language proficiency in French–English bilingual children. *International Journal of Bilingual Education and Bilingualism* 19: 296–313. [CrossRef]
- Correia, Liliana, and Cristina Flores. 2017. The role of input factors in the lexical development of European Portuguese as a heritage language in Portuguese-German bilingual speakers. *Languages* 2: 30. [CrossRef]
- De Houwer, Annick. 2011. Language input environments and language development in bilingual acquisition. *Applied Linguistics Review* 2: 221–40. [CrossRef]
- Dieser, Elena. 2009. *Genuserwerb im Russischen und Deutschen. Korpusgestützte Studie zu ein- und Zweisprachigen Kindern und Erwachsenen*. München/Berlin: Otto Sagner.
- Dixon, L. Quentin, Jing Zhao, Blanca G. Quiroz, and Jee-Young Shin. 2012. Home and community factors influencing bilingual children's ethnic language vocabulary development. *International Journal of Bilingualism* 16: 541–65. [CrossRef]
- Gagarina, Natalia, Sharon Armon-Lotem, Carmin Altman, Zhanna Burstein-Feldman, Annegret Klassert, Nathalie Topaj, Felix Golcher, and Joel Walters. 2014. Age, input quantity and their effect on linguistic performance in the home and societal language among Russian-German and Russian-Hebrew preschool children. In *The Challenges of Diaspora Migration Interdisciplinary Perspectives on Israel and Germany*. Edited by Rainer K. Silbereisen, Peter F. Titzmann and Yossi Shavit. Farnham: Ashgate Publishing, pp. 63–82.
- Gagarina, Natalia, and Annegret Klassert. 2018. Input dominance and development of home language in Russian-German bilinguals. *Frontiers in Communication-Language Sciences* 3: 40. [CrossRef]
- Gagarina, Natalia, Annegret Klassert, and Nathalie Topaj. 2010. *Sprachstandstest Russisch für Mehrsprachige Kinder/Russian language proficiency test for Multilingual Children*. ZAS Papers in Linguistics (ZASPiL 54—Sonderheft). Berlin: ZAS.
- Gagarina, Natalia, Nathalie Topaj, Dorothea Posse, and Sophia Czapka. 2018. Der Erwerb des Deutschen bei türkisch-deutsch und russisch-deutsch bilingualen Kindern: Gibt es doch einen Einfluss von Sprachfördermaßnahmen? *Diskurs Kindheits- und Jugendforschung* 13: 191–210. [CrossRef]
- Gámez, Perla B., and Susan C. Levine. 2013. Oral language skills of Spanish-speaking English language learners: The impact of high-quality native language exposure. *Applied Psycholinguistics* 34: 673–96. [CrossRef]
- Grøver, Vibeke, Joshua Lawrence, and Veslemøy Rydland. 2018. Bilingual preschool children's second-language vocabulary development: The role of first-language vocabulary skills and second-language talk input. *International Journal of Bilingualism* 22: 234–50. [CrossRef]

- Haman, Ewa, Zofia Wodniecka, Marta Marecka, Jakub Szewczyk, Marta Bialecka-Pikul, Agnieszka Otwinowska, Karolina Mieszkowska, Magdalena Luniewska, Joanna Kolak, Aneta Miekisz, and et al. 2017. How does L1 and L2 exposure impact L1 performance in bilingual children? Evidence from Polish-English migrants to the United Kingdom. *Frontiers in Psychology* 8: 1444. [CrossRef]
- Hart, Betty, and Todd R. Risley. 1995. *Meaningful Differences in the Everyday Experience of Young American Children*. Baltimore: Brookes.
- Hoff, Erika, and Cynthia Core. 2013. Input and language development in bilingually developing children. *Seminars in Speech and Language* 34: 215–26. [CrossRef]
- Hoff, Erika, Rosario Rumihe, Andre Burrigge, Krystal M. Ribot, and Stephanie N. Welsh. 2014. Expressive vocabulary development in children from bilingual and monolingual homes: A longitudinal study from two to four years. *Early Childhood Research Quarterly* 29: 433–44. [CrossRef]
- Klassert, Annegret. 2011. Lexikalische Fähigkeiten Bilingualer Kinder mit Migrationshintergrund. Eine Studie zum Benennen von Nomen und Verben im Russischen und Deutschen. Ph.D. Thesis, Philipps-Universität Marburg, Marburg, Germany.
- Klassert, Annegret, and Natalia Gagarina. 2010. Der Einfluss des elterlichen Inputs auf die Sprachentwicklung bilingualer Kinder: Evidenz aus russischsprachigen Migrantenfamilien in Berlin. *Diskurs Kindheits- und Jugendforschung* 4: 413–425.
- Klassert, Annegret, Natalia Gagarina, and Christina Kauschke. 2014. Object and action naming in Russian- and German-speaking monolingual and bilingual children. *Bilingualism: Language and Cognition* 17: 73–88. [CrossRef]
- Kupisch, Tanja, Tatjana Lein, Dagmar Barton, D. Judith Schröder, Ilse Stangen, and Antje Stöhr. 2014. Acquisition outcomes across domain in adult heritage speakers of French. *Journal of French Language Studies* 24: 347–76. [CrossRef]
- Kupisch, Tanja, Anika Lloyd-Smith, and Ilse Stangen. 2020. Perceived global accent in Turkish heritage speakers in Germany. The impact of exposure and use. In *Studies in Turkish as a Heritage Language*. Edited by Fatih Bayram. SiBil Series; Amsterdam: John Benjamins, pp. 207–28.
- Leseman, Paul P. M. 2000. Bilingual vocabulary development of Turkish preschoolers in the Netherlands. *Journal of Multilingual and Multicultural Development* 21: 93–112. [CrossRef]
- Lieven, Elena, and Michael Tomasello. 2008. Children's first language acquisition from a usage-based perspective. In *Handbook of Cognitive Linguistics and Second Language Acquisition*. Edited by P. Robinson and N. Ellis. New York and London: Routledge, pp. 168–96.
- Maviş, İlknur, Müge Tunçer, and Natalia Gagarina. 2016. Macrostructure Components in Narrations of Turkish-German Bilingual Children. *Applied Psycholinguistics* 37: 69–89. [CrossRef]
- Olfert, Helena, and Anke Schmitz. 2018. Heritage language education in Germany: A focus on Turkish and Russian from primary to higher education. In *Handbook of Research and Practice in Heritage Language Education*. Edited by Peter P. Trifonas and Themistoklis Aravossitas. Springer International Publishing: pp. 397–415. [CrossRef]
- Oller, D. Kimbrough, Barbara Z. Pearson, and Alan B. Cobo-Lewis. 2007. Profile effects in early bilingual language and literacy. *Applied Psycholinguistics* 28: 191–230. [CrossRef]
- Öztekin, Buket. 2019. Typical and Atypical Language Development in Turkish-Swedish Bilingual Children Aged 4–7. Ph.D. Thesis, Uppsala University, Uppsala, Sweden.
- Paradis, Johanne. 2011. Individual differences in child English second language acquisition. Comparing child-internal and child-external factors. *Linguistic Approaches to Bilingualism* 1: 213–37. [CrossRef]
- Pfaff, Carol W. 1991. Turkish in contact with German: Language maintenance and loss among immigrant children in Berlin (West). *International Journal of the Sociology of Language* 90: 97–130. [CrossRef]
- Pfaff, Carol W. 1994. Early bilingual development of Turkish children in Berlin. In *The Cross-Linguistic Study of Bilingual Development*. Edited by Guus Extra and Ludo Verhoeven. Amsterdam: Royal Netherlands Academy of Arts and Sciences, pp. 75–97.
- Place, Silvia, and Erika Hoff. 2011. Properties of dual language exposure that influence 2-year-olds' bilingual proficiency. *Child Development* 82: 1834–49. [CrossRef] [PubMed]
- Quiroz, Blanca G., Catherine E. Snow, and Jing Zhao. 2010. Vocabulary skills of Spanish—English bilinguals: Impact of mother—Child language interactions and home language and literacy support. *International Journal of Bilingualism* 14: 379–99. [CrossRef]
- R Core Team. 2015. *R: A Language and Environment for Statistical Computing*. Vienna: R Foundation for Statistical Computing.
- Ribot, Krystal M., Erika Hoff, and Andre Burrigge. 2018. Language use contributes to expressive language growth: Evidence from bilingual children. *Child Development* 89: 929–40. [CrossRef]
- Serratrice, Ludovica. 2020. What counts as the baseline in child heritage language acquisition? *Bilingualism: Language and Cognition* 23: 46–47. [CrossRef]
- Statistisches Bundesamt. 2020. *Bevölkerung und Erwerbstätigkeit. Bevölkerung mit—Ergebnisse des Mikrozensus 2019. (=Fachserie 1, Reihe 2.2)*. Statistisches Bundesamt (Destatis). Available online: https://www.destatis.de/DE/Themen/Gesellschaft-Umwelt/Bevoelkerung/Migration-Integration/Publikationen/Downloads-Migration/migrationshintergrund-2010220197004.pdf?__blob=publicationFile (accessed on 31 October 2020).
- Tellegen, Peter J., Jacob A. Laros, and Franz Petermann. 2007. *SON-R 21/2–7. Non-verbaler Intelligenztest*. Göttingen: Hogrefe.
- Thordardottir, Elin. 2011. The relationship between bilingual exposure and vocabulary development. *International Journal of Bilingualism* 15: 426–45. [CrossRef]
- Tomasello, Michael. 2003. *Constructing a Language: A Usage-Based Theory of Language Acquisition*. Cambridge: Harvard University Press.

- Unsworth, Sharon. 2015. Amount of exposure as a proxy for dominance in bilingual language acquisition. In *Language Dominance in Bilinguals: Issues of Measurement and Operationalization*. Edited by Carmen Silva-Corvalán and Jeanine Treffers-Daller. Cambridge: Cambridge University Press, pp. 156–73. [\[CrossRef\]](#)
- Unsworth, Sharon. 2016. Quantity and quality of language input in bilingual language development. In *Language and the Human Lifespan Series. Bilingualism Across the Lifespan: Factors Moderating Language Proficiency*. Edited by Elena Nicoladis and Simona Montanari. Berlin and Boston: De Gruyter Mouton, pp. 136–96. [\[CrossRef\]](#)
- Uzuntaş, Aysel. 2008. Muttersprachliche Sprachstandserhebung bei zweisprachigen türkischen Kindern im deutschen Kindergarten. In *Zweitspracherwerb: Diagnosen, Verläufe, Voraussetzungen*. Edited by Bernt Ahrenholz. Freiburg i. Br.: Fillibach Verlag, pp. 65–92.
- Willard, Jessica A., Alexandru Agache, Julia Jäkel, Christian W. Glück, and Birgit Leyendecker. 2015. Family factors predicting vocabulary in Turkish as a heritage language. *Applied Psycholinguistics* 36: 875–98. [\[CrossRef\]](#)
- Wolter, Bernt. 2006. Lexical network structures and L2 vocabulary acquisition: The role of L1 lexical/conceptual knowledge. *Applied Linguistics* 27: 741–47. [\[CrossRef\]](#)