

## Appendix A

Originally, we planned to distinguish between children whose parents are both Poles and speak only Polish towards the child, and children whose parents speak a different language towards the child. However, we did not manage to obtain information on the child's language environment for more than half of the children in each bilingual group (see Figure A1). In the remaining families, though only 7 included parents of different nationalities, up to 19% of parents reported they used some majority language towards the child at home, and between 15% to 29% of parents reported both of them used only Polish towards the child. In the two groups of Polish-English and Polish-Norwegian bilinguals we filtered out the children who heard both the home language (Polish) and the majority language (English / Norwegian) from at least one of their parents, and those for whom we did not obtain any information on input patterns. We also filtered out children for whom the milestones were reported only in one language, as the research question aimed to compare the development across the two languages of a bilingual. We were left with 8 Polish-English bilinguals and 6 Polish-Norwegian bilinguals, which did not allow for including the input variable in any of our comparisons.

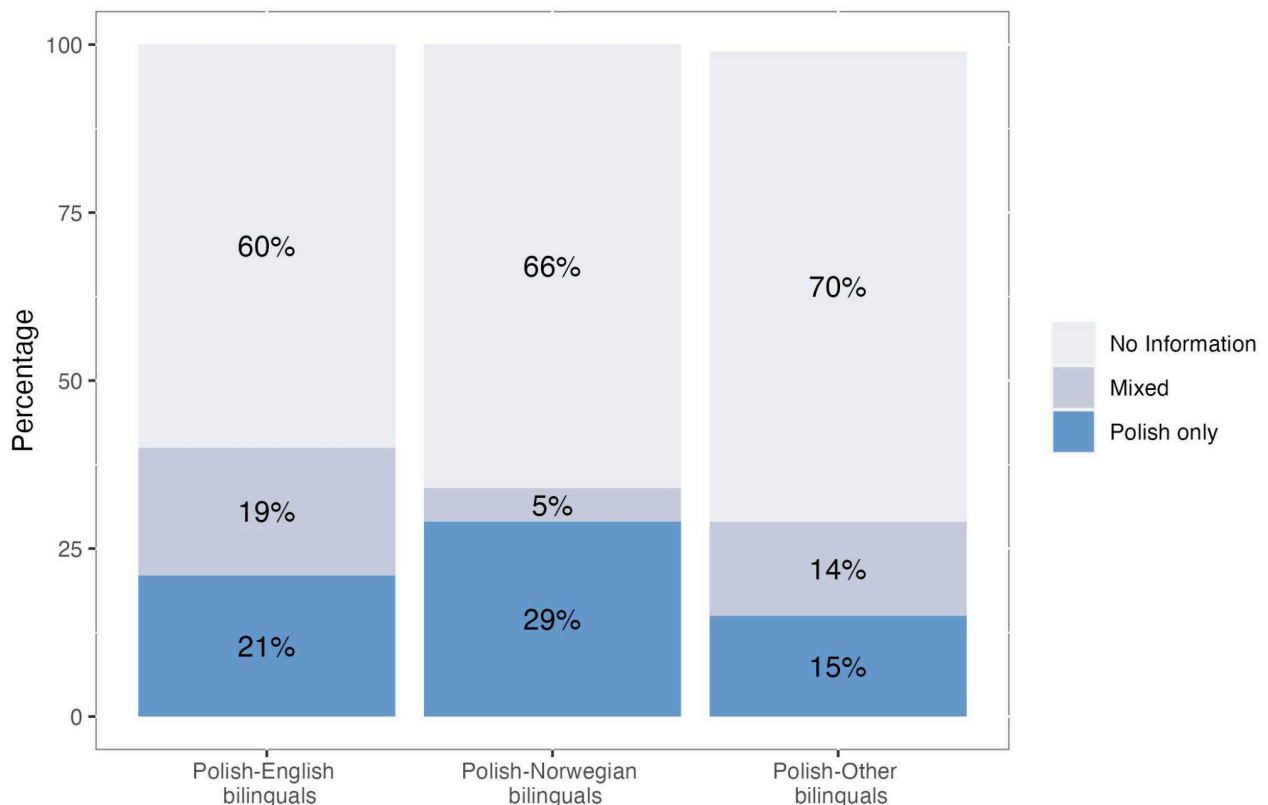


Figure A1. Language input from the parents of the Polish-English and Polish-Norwegian bilingual children: the proportion of parents who gave no information, mixed two languages, or used only Polish when talking towards the child.

[Table A5 here]

**Table A5**

*The relation between the relative input in the home language and the bilinguals' age of reaching each milestone in the home language (Polish) and the majority language*

Milestone	Home Language						Majority language					
	<i>n</i>	Spearman's <i>rho</i>	<i>p</i>	BF <sub>01</sub>	BF <sub>10</sub>	CI 95% for <i>rho</i>	<i>n</i>	Spearman's <i>rho</i>	<i>p</i>	BF <sub>01</sub>	BF <sub>10</sub>	CI 95% for <i>rho</i>
1st word	58	-0.15	0.3	1.54	0.65	[-0.39, 0.1]	38	-0.01	1	2.56	0.39	[-0.34, 0.26]
10 words	19	-0.11	0.6	1.7	0.59	[-0.49, 0.28]	11	-0.02	0.9	1.67	0.6	[-0.46, 0.48]
50 words	4	—	—	—	—	—	0	—	—	—	—	—
1st multiword utterance	14	-0.14	0.6	1.72	0.58	[-0.49, 0.37]	7	—	—	—	—	—
1st 3-word utterance	3	—	—	—	—	—	3	—	—	—	—	—
1st 4-word utterance	0	—	—	—	—	—	2	—	—	—	—	—

*Note.* BF<sub>01</sub> indicates support for the null hypothesis in the observed data. BF<sub>10</sub> indicates support for the alternative hypothesis: 1/BF<sub>01</sub>.

## Appendix B

Since the Polish monolingual group was large ( $n = 2,055$ ), we decided that - in order to make maximum use of the gathered data - we will match the bilingual children ( $n = 302$ ) with two separate groups of monolinguals, i.e. two separate control groups for our bilingual sample. Here we present the comparisons for the first research question including all three samples (“Will bilinguals reach particular motor milestones at a similar time as their Polish monolingual peers and language milestones at a similar time as their Polish monolingual peers, at least in one of their languages?”). We believe the fact that the results remained similar across the three groups (i.e. the bilingual results did not differ from either of the monolingual samples and the monolingual samples did not differ from each other) can additionally strengthen our inferences regarding the bilingual and monolingual age of reaching linguistic milestones.

As a result of the matching procedure, we had a group of 302 bilinguals and two separate groups of 302 Polish monolinguals (604 Polish monolinguals in total). The groups did not differ on the matching variables, i.e. gender ( $\chi^2(2) = 0, p = 1$ ), parental education ( $\chi^2(12) = 8, p = 0.8$ ), age of entering the study ( $F(2,903) = 0.03, p = 0.97$ ) or the length of parental reporting ( $F(2,903) = 0.04, p = 0.96$ ). The groups also did not differ in their mean age of crawling ( $F(2,226) = 0.21, p = 0.81$ ) or walking unassisted ( $F(2,131) = 1.75, p = 0.18$ ). Group characteristics can be viewed in Tables B1 and B2.

**Table B1**

*Frequency table of parental education by group*

Parental education level	Bilinguals n	Monolinguals 1 n	Monolinguals 2 n
0 (Not available)	179	181	180
PhD	8	6	3
Higher (university degree)	88	94	99
Unfinished higher	15	11	10
Vocational (technical)	4	2	1
Secondary	7	8	9
Primary	1	0	0

**Table B2***Group characteristics after the matching procedure*

Group	<i>n</i>	Sex	Entry age ( <i>M</i> )	Entry age ( <i>SD</i> )	Days reporting ( <i>M</i> )	Days reporting ( <i>SD</i> )	Days reporting (min)	Days reporting (max)
Bilinguals	302	155f 147m	12.79	7.16	31.91	79.69	1	528
Monolinguals 1	302	155f 147m	12.90	7.00	30.16	76.25	1	491
Monolinguals 2	302	155f 147m	12.94	7.07	30.70	79.07	1	468

*Note.* Entry age indicates a child's age (in months) at study entry. Days reporting indicates the number of days (mean) parents were reporting their children's development in the app.

Before running the analyses, we excluded 14 outliers – 1 bilingual, 10 monolinguals from group 1 and 2 monolinguals from group 2 (i.e. children with age reported values for a given milestone more than 1.5 IQR above the third quartile or below the first quartile). We first used a series of one-way ANOVAs to compare the mean reported age of reaching the motor and linguistic milestones between bilinguals and two monolingual groups (see Table A3). The ANOVA revealed no significant differences between the bilingual and monolingual groups in the mean age of reported babbling, the first reported word, 10th word, 50th word, age of the first reported multiword utterance, nor first 3-word utterance. We also calculated a series of Bayes factors. We found strong to very strong evidence in favour of the no-difference hypothesis in the age of babbling, first word, 10 words, first multiword production. For the 50 words milestone the evidence from Bayes was moderate, and for the 1st 3-word utterance the evidence from Bayes was weak. No statistical analysis was performed for the 4-word-utterance due to very small sample size. The results are presented in Table B3 and Figure B1.

**Table B3**

*Age of reaching each milestone in bilinguals (with Polish as home language and various majority languages) and two matched groups of Polish monolinguals*

Group	Bilinguals			Monolinguals 1			Monolinguals 2			<i>F</i> statistic	<i>p</i>	BF <sub>01</sub> (posterior probab.)	BF <sub>10</sub> (posterior prob.)	Sensitivity analysis	
	<i>n</i>	Age ( <i>M</i> )	Age ( <i>SD</i> )	<i>n</i>	Age ( <i>M</i> )	Age ( <i>SD</i> )	<i>n</i>	Age ( <i>M</i> )	Age ( <i>SD</i> )					BF <sub>01</sub> 2 x bg (posterior prob.)	BF <sub>01</sub> 3 x bg (posterior prob.)
Babbling	58	7.31	2.64	54	6.76	1.80	54	6.80	2.03	$F(2,163) = 1.11$	0.33	27.30 (0.97)	0.04 (0.03)	13.65 (0.93)	9.10 (0.90)
1st word	140	14.92	5.53	137	15.22	5.13	137	14.96	5.53	$F(2,411) = 0.12$	0.89	183.19 (0.99)	0.01 (0.01)	91.60 (0.99)	61.06 (0.98)
10 words	50	16.82	4.34	47	16.83	3.75	49	16.53	4.36	$F(2,143) = 0.08$	0.92	67.31 (0.99)	0.02 (0.01)	33.65 (0.97)	22.44 (0.96)
50 words	15	18.60	3.72	14	20.00	1.92	8	18.88	3.44	$F(2,34) = 0.80$	0.46	8.34 (0.89)	0.18 (0.11)	4.17 (0.81)	2.78 (0.74)
1st multiword	34	19.21	3.62	41	19.29	3.72	31	19.39	3.50	$F(2,103) = 0.02$	0.98	51.94 (0.98)	0.02 (0.02)	25.97 (0.96)	17.31(0.95)
1st 3-word utterance	14	20.36	3.03	18	21.44	1.98	16	19.38	3.22	$F(2,45) = 2.4$	0.1	2.18 (0.69)	0.46 (0.31)	1.09 (0.52)	0.73 (0.42)
1st 4-word utterance	3	17.67	0.58	6	22.83	1.94	5	21.60	0.55	—	—	—	—	—	—

*Note.* BF<sub>01</sub> indicates support for the null hypothesis in the observed data. BF<sub>10</sub> indicates support for the alternative hypothesis: 1/BF<sub>01</sub>. Posterior probability of a specified hypothesis is given in the parentheses.

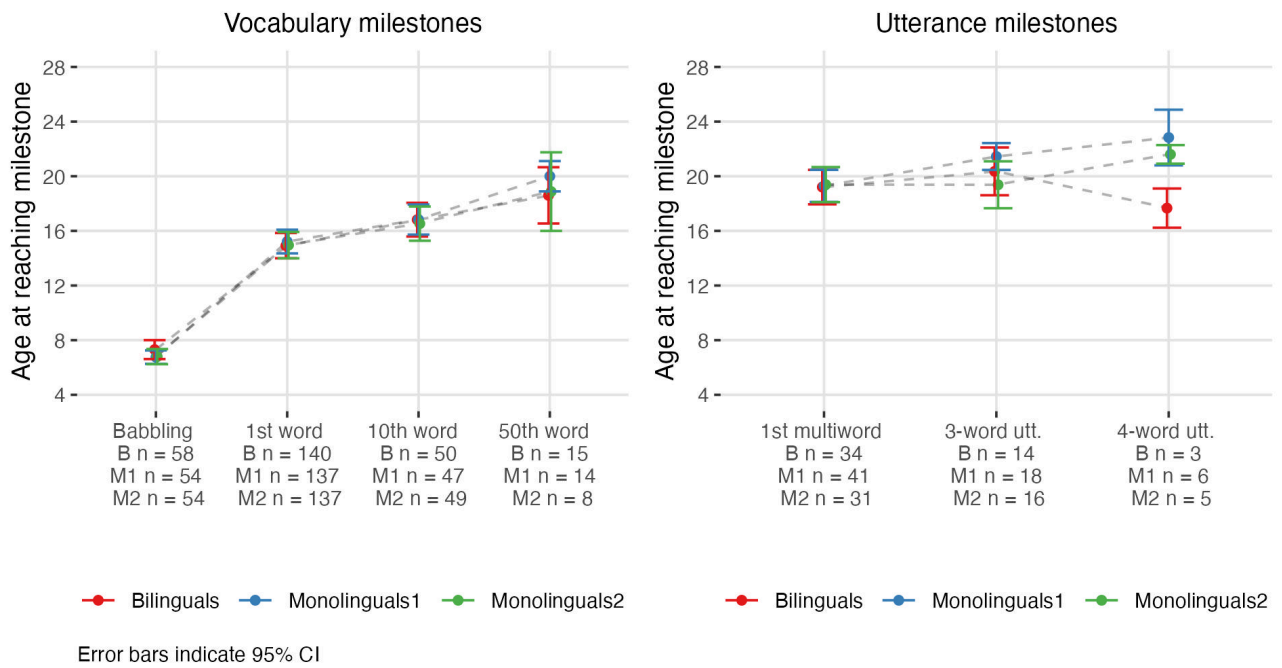


Figure B1. Age of reaching each milestone in bilinguals (with Polish as home language and various majority languages) and two matched groups of Polish monolinguals. Error bars indicate 95% Confidence Intervals.

## Appendix C

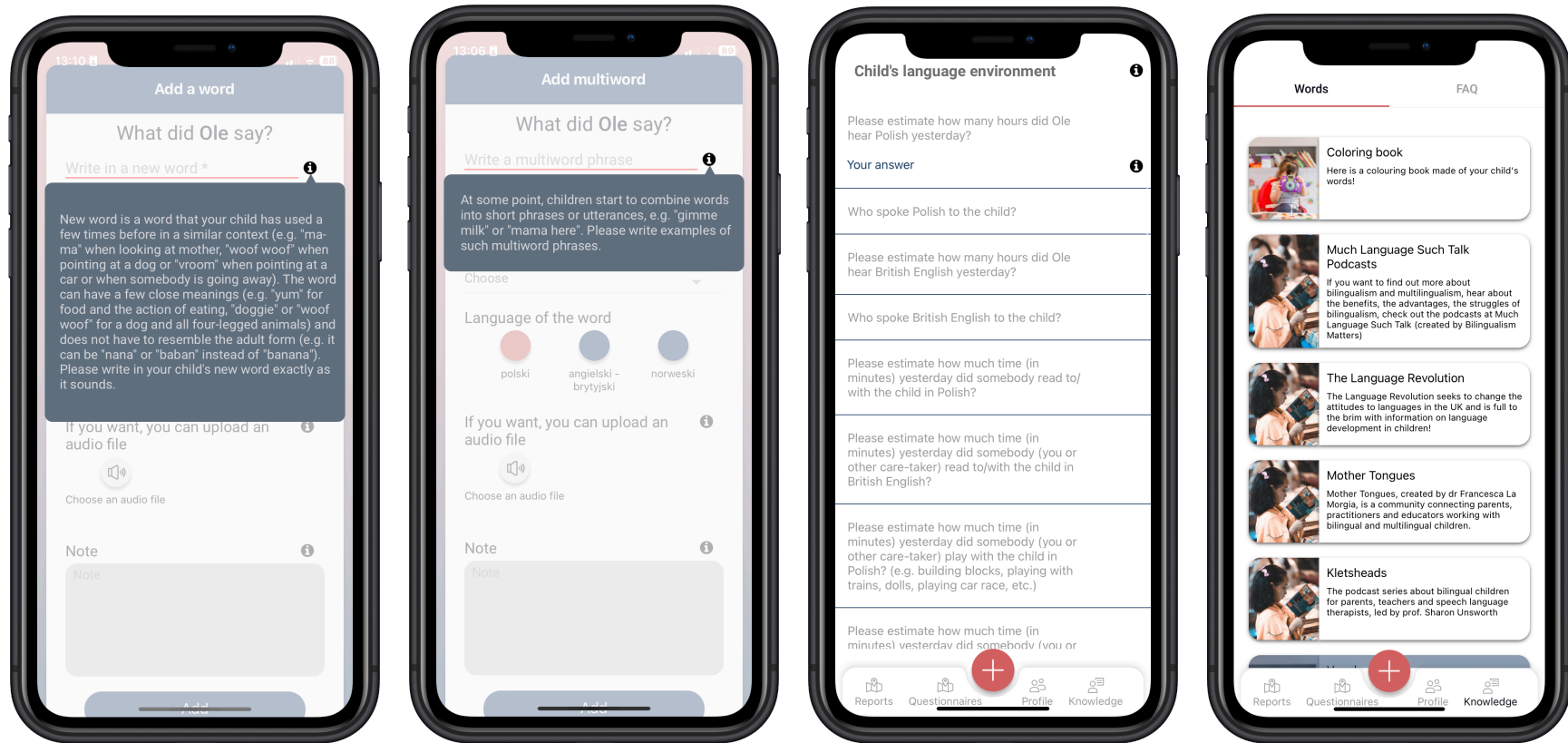


Figure C1. Screenshots of the “StarWords – every word counts” app showing (from left): tooltip explaining what a new word is in the study’s context, tooltip explaining what a multiword utterance is in the study’s context, questionnaire on input patterns, knowledge tab with resources for parents.

## Appendix D

Polish parents living in Norway often do not speak Norwegian, hence the language environment at home stays monolingual (Polish), in contrast to Polish-English in the UK who tend to incorporate English as a home language in addition to Polish (Miękisz et al., 2017). It is unclear whether such difference directly translates to early language development in children. The pre-registered plan was to conduct separate analyses for Polish-English and Polish-Norwegian bilingual children to check whether early development in the home (Polish) and majority language differs between children acquiring English and Norwegian as their other language. However, we were able to perform the comparison only on one milestone, i.e., the age of reporting the first word. For the remaining milestones in this pre-registered bilingual group, we either collected data from single participants or none (see Table D1). We found that neither bilinguals living in the UK or Norway differed significantly in the mean age of the first word reported in their home language (Polish) or the majority language (English/Norwegian). The Bayes factor yielded moderate evidence for the hypothesis stating no difference between the languages regarding the age of reported first word. The results are presented in Table D1 and D2 below.



**Table D1***Age of reaching each milestone in bilinguals: home language (Polish) vs. majority language (English)*

Milestone	Home language (Polish)			Majority language (English)			<i>t</i> statistic	<i>p</i>	CI 95%	BF <sub>01</sub> (posterior probab.)	BF <sub>10</sub> (posterior prob.)	Sensitivity analysis	
	<i>n</i>	Age ( <i>M</i> )	Age ( <i>SD</i> )	<i>n</i>	Age ( <i>M</i> )	Age ( <i>SD</i> )						BF <sub>01</sub> 2 x bg (posterior prob.)	BF <sub>01</sub> 3 x bg (posterior prob.)
1st word	27	15.70	6.62	27	15.89	6.33	<i>t</i> (26) = -0.68	0.50	[-0.75, 0.37]	7.32 (0.88)	0.14 (0.12)	5.18 (0.84)	4.23 (0.81)
10 words	3	14.67	7.51	3	20.00	4.36	—	—	—	—	—	—	—
50 words	—	—	—	—	—	—	—	—	—	—	—	—	—
1st multiword	2	19.00	2.83	2	20.50	3.54	—	—	—	—	—	—	—
1st 3-word utterance	—	—	—	—	—	—	—	—	—	—	—	—	—
1st 4-word utterance	—	—	—	—	—	—	—	—	—	—	—	—	—

*Note.* BF<sub>01</sub> indicates support for the null hypothesis in the observed data. BF<sub>10</sub> indicates support for the alternative hypothesis: 1/BF<sub>01</sub>. Posterior probability of a specified hypothesis is given in the parentheses.

**Table D2***Age of reaching each milestone in bilinguals: home language (Polish) vs. majority language (Norwegian)*

Milestone	Home language (Polish)			Majority language (Norwegian)			Sensitivity analysis						
	<i>n</i>	Age ( <i>M</i> )	Age ( <i>SD</i> )	<i>n</i>	Age ( <i>M</i> )	Age ( <i>SD</i> )	<i>t</i> statistic	<i>p</i>	CI 95%	BF <sub>01</sub> (posterior probab.)	BF <sub>10</sub> (posterior prob.)	BF <sub>01</sub> 2 x bg (posterior prob.)	BF <sub>01</sub> 3 x bg (posterior prob.)
1st word	11	14.91	4.83	11	15.82	4.81	<i>t</i> (10) = -1.4	0.18	[-2.30, 0.51]	4.26 (0.81)	0.24 (0.19)	3.01 (0.75)	2.46 (0.71)
10 words	2	16.50	2.12	2	18.00	4.24	—	—	—	—	—	—	—
50 words	—	—	—	—	—	—	—	—	—	—	—	—	—
1st multiword	—	—	—	—	—	—	—	—	—	—	—	—	—
1st 3-word utterance	—	—	—	—	—	—	—	—	—	—	—	—	—
1st 4-word utterance	—	—	—	—	—	—	—	—	—	—	—	—	—

*Note.* BF<sub>01</sub> indicates support for the null hypothesis in the observed data. BF<sub>10</sub> indicates support for the alternative hypothesis: 1/BF<sub>01</sub>. Posterior probability of a specified hypothesis is given in the parentheses.