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Does Children's Developing Understanding of Linguistic Register Impact Their Social Preferences?

Ishaan Ambrish[1] | Shreya Sodhi[2] | Zoe Liberman[2]

[1]Department of Psychology, University of Washington, Seattle, Washington, USA | [2]Department of Psychological & Brain Sciences, University of California, Santa Barbara, Santa Barbara, California, USA

Correspondence: Ishaan Ambrish (iambrish@uw.edu)

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ABSTRACT

People use different communication patterns based on the context and who they are addressing. These differences, known as linguistic register, are common across human speech and recognized early in development. Here, we examine 4–11-year-old American children's ($N = 227$) ability to use linguistic registers to determine a speaker's addressee as well as their social preferences for people who use correct registers. Although children's ability to recognize linguistic registers improved with age, even the youngest children tested (Ages 4 and 5) could correctly identify a speaker's addressee and preferred speakers who had spoken "correctly" over those who made register errors. Interestingly, language background—measured by the amount of exposure children had to non-English language(s)—did not change children's preferences for people who spoke "correctly," and instead only impacted children's expectations about the likely target of foreign speech. Our work suggests that the development of linguistic register comprehension is nuanced, depending on a multitude of factors such as variety in social experience, and opens avenues for future research examining differences in linguistic register understanding and use across development.

1 | Introduction

Language is flexible. There are seemingly infinite ways to talk to another person. One property of language that demonstrates this flexibility is the linguistic register: People vary the way they speak (e.g., word choice, tone, prosody, conversational speed) depending on the context (Biber and Conrad 2009). For example, people use different registers if they are talking to a baby than to an adult: infant directed speech (IDS) is higher pitched, slower, and more repetitive than adult directed speech (ADS; e.g., Fernald and Simon 1984), and these differences between IDS and ADS are stable cross-culturally (see Hilton et al. 2022). Adults clearly use different registers (e.g., conversational vs. formal, see Goulart et al. 2020) in their communication and understand that other people also select registers appropriate to the situation. How do these abilities develop? Here, we build on past work suggesting that elementary school-aged children can use linguistic register to determine the addressee of a speaker's speech (e.g., Wagner et al. 2010) to ask: (1) whether this ability is evident in preschoolers (as well as how it develops across childhood), (2) whether children have social preferences for people who use "correct" registers, and (3) whether these abilities and preferences vary based on children's exposure to multiple languages.

The most basic register distinction may be that of IDS versus ADS. Two- to three-year-old children use features of IDS (e.g., simplified and repeated utterances) when speaking to their infant siblings (Dunn and Kendrick 1982), showing that not

much experience is required to acquire these speech patterns. Indeed, features that differentiate IDS from ADS may be relatively omnipresent, allowing even infants to quickly detect and use this register distinction. In line with this, 1-month-olds prefer to listen to IDS (e.g., Cooper and Aslin 1990), and 5-month-olds remember a speaker's previous register (IDS vs. ADS) and prefer people who had used IDS (Schachner and Hannon 2011). Early in the second year of life, infants even understand that IDS is *meant for* infants: 12–15-month-olds expect infants to be the recipients of IDS and adults to be the recipients of ADS (Soley and Sebastian-Galles 2020), and 18-month-olds are surprised when adults are addressed using IDS (Ikeda et al. 2018). Therefore, the ability to understand at least one register distinction (IDS vs. ADS) and the preference for people who use a specific register (IDS) appears to develop even in infancy.

Do young children also understand register differences with which they have less direct experience with the specific register distinction? Wagner et al. (2010) tested 3–5-year-old children's ability to use the register to identify who a speaker was talking to. They presented children with speech in which the speaker used IDS, casual speech (the way a child would talk to a peer), formal speech (the way a child would talk to a teacher), or foreign speech (a child speaking Spanish), and asked who the child thought the speaker was talking to. By Age 5, children were able to match each register with the expected conversation partner. For example, when kindergarteners heard a child speaking in casual native-accented English, they guessed that the listener was another child rather than a baby or a teacher. In addition, when asked for their reasoning, older children (5-year-olds) used more language-based justifications (e.g., "because people say 'hi' to kids") whereas younger children (3-year-olds) explained their choices with less relevant justifications (e.g., "because she had the same color hair as me"). This development across the preschool years suggests that experiencing a wider variety of conversational contexts may be required for learning register distinctions. For example, many children begin preschool between Ages 3 and 5, providing them with exposure to conversational partners who hold different social roles (e.g., teacher, classmate).

In addition to developing an ability to understand that speech patterns vary across social partners, experiences in which people use different registers (either in typical or atypical ways) may also influence children's social evaluations and interpersonal preferences. For example, 5-year-olds rate people who speak in the expected local register as better teachers than people who speak with foreign accents (Paquette-Smith et al. 2022), and 7-year-olds (but not 5-year-olds) prefer social partners who have not previously made register errors (Ikeda et al. 2019). Therefore, not only do children (in the early school years) learn that there *are* typical registers that people use in each context, but they also may develop certain *biases* against people who use registers they perceive as "incorrect" or "atypical."

Here, we study a wider age range of children (Ages 4–11) to not only probe the starting point of children's understanding of linguistic registers but also to test development. The existing literature on social preferences based on register use is limited to the early school years (Ages 5–7): Less is known about whether such preferences emerge in the preschool years, and whether preferences for people who use "correct" registers are stable across childhood. These preferences may be early-emerging and stable, or they may change across childhood. Indeed, preferences could shift in different directions: Perhaps older children become more biased as they gain experience understanding even finer-grained differences between registers, or perhaps older children become less biased as they understand that there may be multiple ways to communicate effectively (Cremona and Bates 1977; Giles et al. 1983).

Developmental differences in linguistic register judgments likely arise because older children have more experience with varying linguistic registers (e.g., as they enter school). However, age is not the only factor that changes a child's linguistic experiences. A growing body of literature demonstrates that bilingual children differ from monolingual children in their language learning, communicative reasoning, and social inferences (see Johnson and White 2020 for a review). Although research has not focused on the impact of exposure to multiple languages on understanding of register specifically, there are reasons to think that regularly hearing multiple languages could influence linguistic register development. Bilingual children code-switch across their languages (e.g., Meisel 1994). Interestingly, even quite early in development—in the first 2 years of life—code-switching behavior is highly flexible and sensitive: Bilingual children shift their language use to match their social partner (Petitto et al. 2001). Therefore, although languages themselves may not be typically thought of as linguistic "registers", bilingual children use tactics when code-switching that are required for understanding and using different registers. Choosing the "right" language or the "right" register each requires understanding aspects of a listener's social identity as well as the relationship between the speaker and the listener. Speakers must use context cues (e.g., their status relative to the addressee and their knowledge of the languages known by the addressee) to communicate most effectively. On the other side of the interaction, listeners can use speakers' choices to learn about both the speaker and the addressee (e.g., Labotka and Gelman 2024).

Children who are regularly exposed to multiple languages may be better at understanding a communicator's intended meaning (e.g., Fan et al. 2015; Yow and Markman 2011). Researchers have argued that children who are bilingual (or regularly exposed to more than one language) have an enhanced ability to integrate communicative cues outside of literal meaning. For example, bilingual children may have more experience with communication breakdowns, which may increase their likelihood to look for additional (nonlinguistic) cues to resolve ambiguous communication (Yow and Markman 2016). In addition to this potential shift in attention to language cues outside of specific spoken words, exposure to multiple languages also changes the sheer amount of experience children have with some of the registers we are testing. For example, children of all language backgrounds likely have experience with IDS and casual speech, but children exposed to multiple languages have more experience with foreign speech (making foreign speech a particularly interesting "register" to probe in our study).

Differences in language exposure could lead to differences in comprehension of registers, and in social preferences based on register use. For example, children who regularly hear foreign

languages could be less judgmental of people who make errors in their choice of register. In line with this possibility, Iannuccilli et al. (2021) found that bilingual children were more permissive of language (e.g., referring to a common object using a nonword), moral, and social mistakes compared to monolingual children. Bilingual children may be more forgiving of such mistakes because they know that social conventions are context-dependent and/or because they have more experience with people making speech errors (such as if a parent fails to communicate successfully in a non-native language). By investigating children with different amounts of exposure to non-English language(s), we hope to understand whether children with more exposure to non-English language(s) show (1) an earlier developing ability to use the register to determine who a speaker is addressing and (2) less harsh judgments of people who make register errors.

On the other hand, language exposure may not impact social preferences. For example, bilingual children are as likely as monolingual children to demonstrate social preferences for native-accented speakers over foreign-accented speakers (e.g., DeJesus et al. 2017), and familiarity with foreign-accented speech does not decrease children's preferences for native-accented speech (Spence et al. 2021). Therefore, it is possible that despite the greater amount of experience with (some types of) linguistic registers, language exposure will largely not impact children's social preferences based on register use. Our method allows us to probe whether exposure to multiple language impacts either register comprehension, social preferences based on register use, both, or neither.

Current work. Here, we examine the development of register comprehension and social judgments of people who make register errors in a population of children from the United States with varying levels of exposure to non-English languages. Prior research has mostly studied children's linguistic register comprehension and social preferences independently. By examining both understanding and preferences in the same study, we can better understand how development in one may impact the other. For example, as children get better at understanding the intended addressee based on register, they may also become more critical of others who make register-based errors. Or, if children of a certain age do not understand the intended address of a particular register, they may not be judgmental of someone failing to use that "appropriate" register. In other words, comprehension of which register is "correct" is necessary in order for social preferences to be meaningful. In this study, we tested 4–11-year-old children's comprehension of three common linguistic registers (IDS, casual speech, and formal speech) as well as their recognition of foreign speech (French). We hypothesize that register recognition will increase with development and that children will prefer people who use correct registers. We also test the role of exposure to multiple languages in these two domains. Specifically, do children with more exposure to non-English languages recognize addressees of speech based on register use earlier in development? Additionally, are children with more exposure to non-English languages more forgiving of people who make register errors? All materials, including data and R analysis code, can be found online via the Open Science Framework (OSF): https://osf.io/kwcdn/?view_only=4bf6a755005a4cb2a3f93d0207b4530c.

TABLE 1 | Languages to which participants were exposed (other than English), as indicated by a parent on a demographic questionnaire.

Language region	Language reported by parent
Spanish ($n = 59$)	Spanish ($n = 59$)
European ($n = 32$)	Russian ($n = 11$)
	French ($n = 10$)
	German ($n = 4$)
	Italian ($n = 3$)
	Portuguese ($n = 2$)
	Czech ($n = 1$)
	Polish ($n = 1$)
East Asian ($n = 30$)	Chinese/Cantonese/Mandarin ($n = 27$)
	Korean ($n = 2$)
	Japanese ($n = 1$)
South Asian ($n = 21$)	Hindi ($n = 7$)
	Telugu ($n = 4$)
	Marathi ($n = 3$)
	Urdu ($n = 3$)
	Malayalam ($n = 2$)
	Gujarati ($n = 1$)
	Tamil ($n = 1$)
Semitic ($n = 12$)	Arabic ($n = 7$)
	Hebrew ($n = 5$)
Southeast Asian ($n = 9$)	Filipino/Tagalog ($n = 3$)
	Vietnamese ($n = 3$)
	Thai ($n = 2$)
	Burmese ($n = 1$)
Signed language ($n = 1$)	American sign language ($n = 1$)

Note: Some children were exposed to multiple non-English languages and are counted more than once in this list.

2 | Method

2.1 | Participants

We tested 226 4–11-year-olds (117 females, 109 males; M_{age} = 7.47, SD_{age} = 2.19). Participants were recruited via an existing lab database and Facebook. Parents reported that their children identified as the following races/ethnicities: White (n = 115), multiracial (n = 46), Asian (n = 42), Hispanic or Latino (n = 8), Middle Eastern (n = 5), Black or African American (n = 4), or other/not listed (n = 6). To assess language background, parents provided information about each language to which their child was exposed (Table 1), the percentage of time that the child was exposed to each language, and the child's fluency with each language. As a measure of language experience, we

TABLE 2 | Sentence stimuli used in both tasks.

Register	Intended addressee	Inquiry type	Sentence
IDS	Infant (baby)	Name	Hi cutie! What is your name?
		Wellbeing	Hi! How are you today?
Casual	Blonde child (near)	Name	Hey! What's good? What's your name?
		Wellbeing	Hey! What's up? How are you doing?
Formal	Adult (teacher)	Name	Pardon me, but what is your name?
		Wellbeing	How are you doing today?
Foreign	Dark-haired child (far)	Name	Comment ça va? Comment tu t'appelles?
		Wellbeing	Ça va mon pote?

used each child's percentage exposure to English (out of 100). Most parents provided percentages across languages that added up to 100%. But, for a few parents, the total language exposure summed to a number over 100%. In these cases, the English exposure percentage was calculated as the reported percentage of English divided by the total of the percentages provided (e.g., if they indicated that a child had 100% exposure to English and 5% exposure to a second language, their English exposure was calculated as 100/105 = 95.24%). On average, children were exposed to English 86.91% of the time (SD = 17.53, range = 35–100).

Additionally, we had parents self-categorize their child's language group by reading descriptions of the following four backgrounds: monolingual (over 90% English, child only speaks and understands English), exposure (~75%–90% English, child mostly speaks English but may understand some of a different language), bilingual (~30%–75% English, child speaks and understands English and another language), and multilingual (child speaks and understands English and (at least) two other languages). Parents identified their children as falling into these groups as follows: monolingual (n = 129), exposure (n = 36), bilingual (n = 58), or multilingual (n = 3). One additional child was tested but excluded for failing a sound check. This study was approved by the Institutional Review Board at The University of California, Santa Barbara.

2.2 | Stimuli

Cartoon characters (gender-matched to the participant) were the nominal speakers.[1] The cartoons spoke with the voice of one college-aged woman (for female participants) or one college-aged man (for male participants). The registers used in the task were the same as those in Wagner et al. (2010): IDS, casual speech, formal speech, and foreign language. The addressees were static images, which were chosen to have similar properties to the stimuli in Wagner et al. (2010): an infant (for infant-directed speech), a blonde child (for casual speech), an adult in front of a chalkboard (for formal speech), and a dark-haired child (for French speech). In addition to replicating past work on registers, these registers were interesting to us because language exposure may differentially impact how much experience children have with each register. For example, children of all language backgrounds tested are likely to have experience with infant-directed speech and casual speech, but children exposed to multiple languages have more experience with foreign speech. Register was manipulated by changing multiple linguistic variables (e.g., prosody, lexical choice, syntax). Infant-directed speech was high-pitched and included large-pitch excursions. Formal speech used politeness terms and did not contract across words phonologically. Casual speech was informal and included contractions. Foreign language speech was similar to casual speech but spoken in French (both speakers were native bilinguals of English and French). Two sentences (one asking for a person's name, one about a person's well-being) were recorded for each type of register (see Table 2 for the full list).

2.3 | Procedure

Children participated using the unmoderated online platform Discoveries Online (https://discoveriesonline.org; Rhodes et al. 2020). Before the main task, children completed a sound check (to confirm they would be able to hear the speech), which required them to click on a picture that matched an animal's noise; only one child did not pass this check and was therefore not included in analyses.

Introduction. Participants were introduced to pictures of each type of addressee with a descriptive label: the baby ("This is a baby. S/he is really young."), the blonde child ("This is a boy/girl from nearby. S/he goes to school here."), the dark-haired child ("This is a boy/girl from far away. S/he lives in France."), and the adult ("This is a teacher. S/he teaches second grade."). Participants were shown all four images on the same screen and were asked two check questions as follows: (i) to click on the teacher, and (ii) to click on the boy/girl from far away. 97.36% of children were correct in their first response to both questions. Children who answered either question incorrectly were asked to repeat it; all children were correct on their second attempt.

Paired Response Task. Children were introduced to Alex and told that their job was to determine who Alex was talking to, which they could do by clicking on one of two possible addressees. For each test trial, children saw a pair of pictures: a target (correct) and a distractor (incorrect). The distractor was always a target for a different register (e.g., when children were asked about casual speech, they might see the blonde child [target] paired with the baby [distractor]; see Figure 1 for an example). A linguistic stimulus (which varied in register across trials) was played and

FIGURE 1 | Example trial for the Paired Response Task for female participants. Alex (center) is paired with a baby (left) and the blonde child ("from nearby"; right).

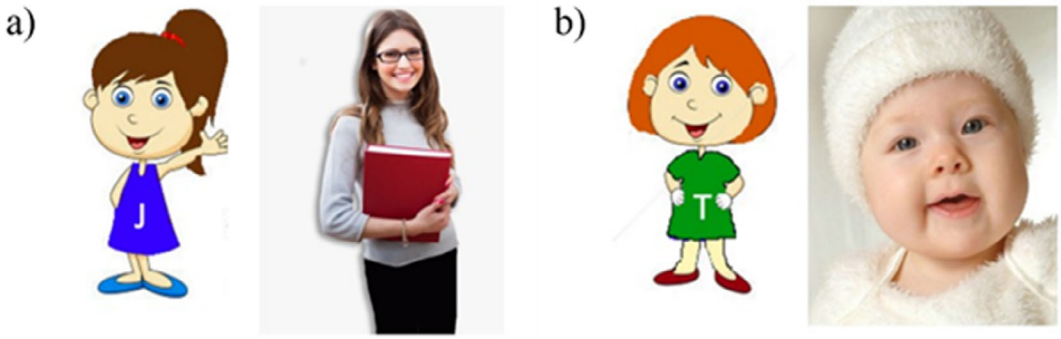

FIGURE 2 | Examples of the Single Response Task for female participants. (a) Jordan paired with the teacher; (b) Taylor paired with the baby.

the participant heard a voice-over state, "Click on who Alex is talking to!" Participants responded by selecting one of the two possible addressees. Children were scored as "correct" for all cases in which they selected the target. Children participated in four trials, one for each register. Children were assigned to one of four random orders such that, across children, each target was paired with each of the possible distractors and was presented in each trial position (i.e., sometimes first, second, third, or last). The target/distractor pairing and sentence stimulus were counterbalanced across orders. These orders were also counterbalanced such that the target appeared on the right or left side half of the time. Therefore, any systematic pattern of responding could not be due to a side bias.

Single Response Task. Then, the children were introduced to two new cartoon characters as follows: Jordan and Taylor. They were told that each character would say something, and their job was to say whether what the person said was "right" or "not right." Participants each participated in two trials as follows: first, they saw Jordan speak to a teacher, and then they saw Taylor speak to a baby. On each trial, the character (Jordan or Taylor) was presented on the left side of the screen and the addressee (teacher or baby) was presented on the right side of the screen (Figure 2).

Participants were assigned to one of four conditions that varied in terms of whether each character (Jordan and Taylor) used the correct or incorrect register (for the teacher, the correct register was formal and the incorrect was casual; for the baby, the correct register was IDS and the incorrect register was foreign speech). The sentence types (name vs. well-being) were counterbalanced across trials and conditions. After hearing Jordan or Taylor speak, participants were asked whether the way the speaker talked to the addressee was "right" or "not right." They answered this question by clicking on either a green checkmark (right) or a red X (not right). Then, children were asked how much they wanted to befriend the speaker. To answer this question, participants used a smiley-face scale, where faces indicated levels of friendship (from leftmost face = "Really don't want to be friends" to rightmost face = "Really want to be friends"; see Figures S1 and S2 for scale examples). Children were trained on how to use the scale before completing the task and were further excluded from analyses on this task if they did not pass the training (1.32% of children). We used friendship as a marker for social preferences as research has shown that children's liking is highly correlated to their friendship preferences (e.g., Guimond et al. 2022).

3 | Results

3.1 | Paired Response Task

To investigate development in children's understanding of linguistic register, we first ran a logistic mixed-effects model on accuracy in the Paired Response Task. Predictors included target/register (teacher/formal vs. baby/IDS vs. nearby/causal vs. far/foreign), age (in years; mean-centered), and percentage

TABLE 3 | Model output for the reduced binomial regression conducted on children's accuracy (1 = accurately identifying speaker, 0 = inaccurate) on the Paired Response Task. Predictors included target as a within-subjects factor (with far/foreign register set as the reference), age (in years; mean-centered) and English exposure (mean-centered) as between-subjects factors, interactions between all variables, and random effects of distractor and subject.

Effect	*b*	SE	*z* value	*p* value	OR	95% CI for OR
Intercept	3.373	0.542	6.228	<0.001***	29.34	[10.13, 84.92]
Teacher	−1.698	0.436	−3.892	<0.001***	0.18	[0.08, 0.43]
Baby	−1.260	0.413	−3.051	0.002**	0.28	[0.13, 0.64]
Near	−1.501	0.434	−3.458	<0.001***	0.22	[0.09, 0.52]
Age	0.635	0.171	3.713	<0.001***	3.97	[1.92, 8.22]
English exposure	0.034	0.013	2.538	0.011*	1.81	[1.14, 2.85]
Teacher*Age	−0.628	0.189	−3.323	<0.001***	0.26	[0.11, 0.57]
Baby*Age	−0.408	0.187	−2.176	0.030*	0.41	[0.19, 0.92]
Near*Age	−0.213	0.191	−1.114	0.265	0.63	[0.28, 1.42]
Teacher*English exposure	−0.018	0.016	−1.082	0.279	0.73	[0.42, 1.29]
Baby*English exposure	−0.038	0.016	−2.305	0.021*	0.52	[0.29, 0.91]
Near*English exposure	−0.042	0.017	−2.502	0.012**	0.48	[0.27, 0.85]

*$p < 0.05$. **$p < 0.01$. ***$p < 0.001$.

English exposure (mean-centered), as well as interactions between all variables, and random effects of distractor (which image was paired with the target) and subject (to account for repeated measures). For the target, we used the "far" character as the baseline, which was then compared to all other targets. We chose "far" as the baseline as accuracy was highest for this target, and as the foreign register was the one for which language exposure may have the largest effect (as children with more exposure to non-English languages have more experience hearing foreign speech). We then reduced the model by removing nonsignificant higher-order interactions one at a time. Each time we reduced the model, we compared the reduced model to the previous model to ensure that the reduced model was not a significantly worse fit. As a final model, we chose the most reduced model that fits the data as strongly as less parsimonious models. The final model included all main effects as well as the two-way interactions between target and English exposure and the two-way interaction between target and age. The full model output can be found in Table 3.

The model revealed a significant main effect of age ($b = 0.635$, $p < 0.001$), such that accuracy increased with age, a significant main effect of English exposure ($b = 0.0334$, $p = 0.011$), such that accuracy increased with English exposure, and a significant main effect of target, such that children were more accurate when the target was "far" ($M = 0.885$, SD = 0.320) compared to the "teacher" ($M = 0.810$, SD = 0.393, $b = -1.698$, $p < 0.001$), "baby" ($M = 0.783$, SD = 0.413, $b = -1.260$, $p = 0.002$), or "near" ($M = 0.783$, SD = 0.413, $b = -1.501$, $p < 0.001$).

Additionally, there were two-way interactions between target and age when the target was "far" compared to the "teacher" ($b = -0.628$, $p < 0.001$) and "baby" ($b = -0.408$, $p = 0.02830$), but not when compared to "near" ($b = -0.213$, $p = 0.265$). We conducted follow-up models for each target with only age as a predictor variable. As shown in Figure 3, accuracy increased with age when the target was "far" ($b = 0.587$, $p < 0.001$), "baby" ($b = 0.210$, $p = 0.010$), and "near" ($b = 0.342$, $p < 0.001$), but not when the target was "teacher" ($b = -0.008$, $p = 0.923$). However, for all targets, the intercept was significant (bs > 1.463, ps < 0.001), suggesting that, at the average age, children were above chance at choosing the correct target.

Finally, there were two-way interactions that indicated that English exposure affected children's answers differently when the target was from "far away" compared to when the target was either the "baby" ($b = -0.038$, $p = 0.021$) or the character from "nearby" ($b = -0.042$, $p = 0.012$). The effect of English exposure was not significantly different for the "teacher" compared to the character from "far" ($b = -0.018$, $p = 0.279$). We conducted follow-up models for each target with only English exposure as a predictor variable. As shown in Figure 4, accuracy increased with English exposure *only* when the target was from "far away" ($b = 0.031$, $p = 0.003$), but not when the target was the "teacher" ($b = 0.013$, $p = 0.172$), the "baby" ($b = -0.002$, $p = 0.862$), or from "nearby" ($b = -0.004$, $p = 0.704$). However, for all targets, the intercept was significant (bs > 1.375, ps < 0.001), suggesting that children were generally above chance at choosing the correct target.

3.2 | Single Response Task

As a second test of the development of children's understanding of linguistic register, we investigated the data from the Single Response Task. We ran a logistic mixed-effects model on children's choices for whether the speaker was correct as the outcome

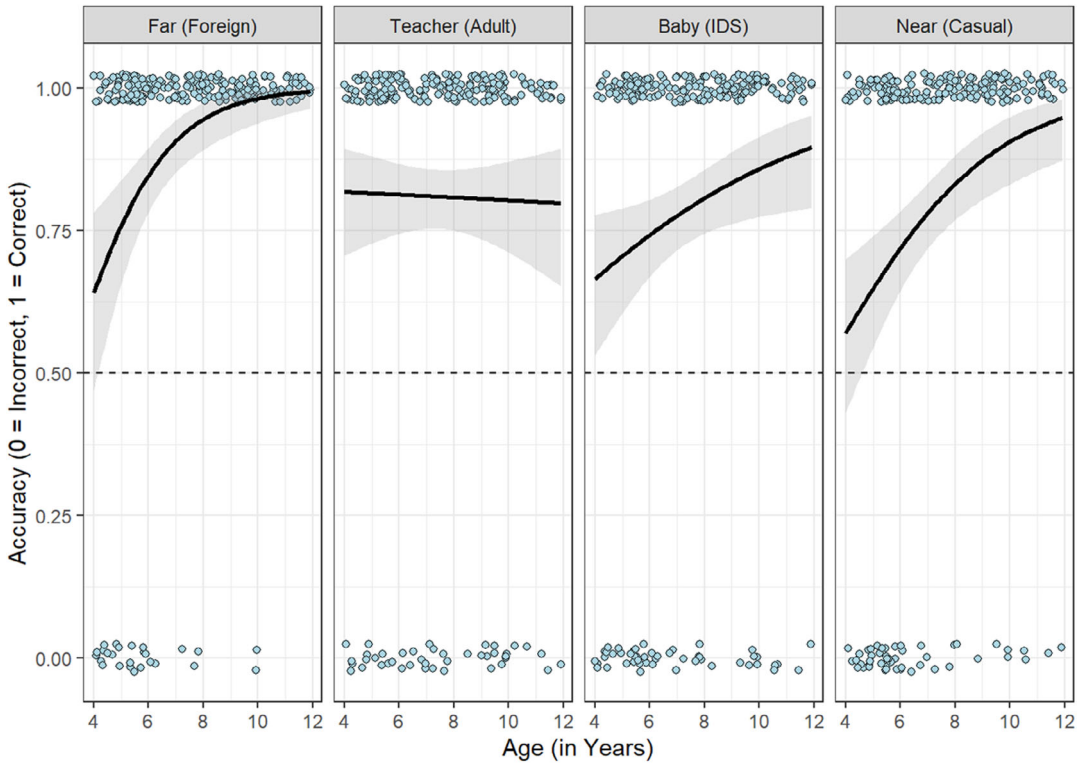

FIGURE 3 | Accuracy on Paired Response Task by target and age.

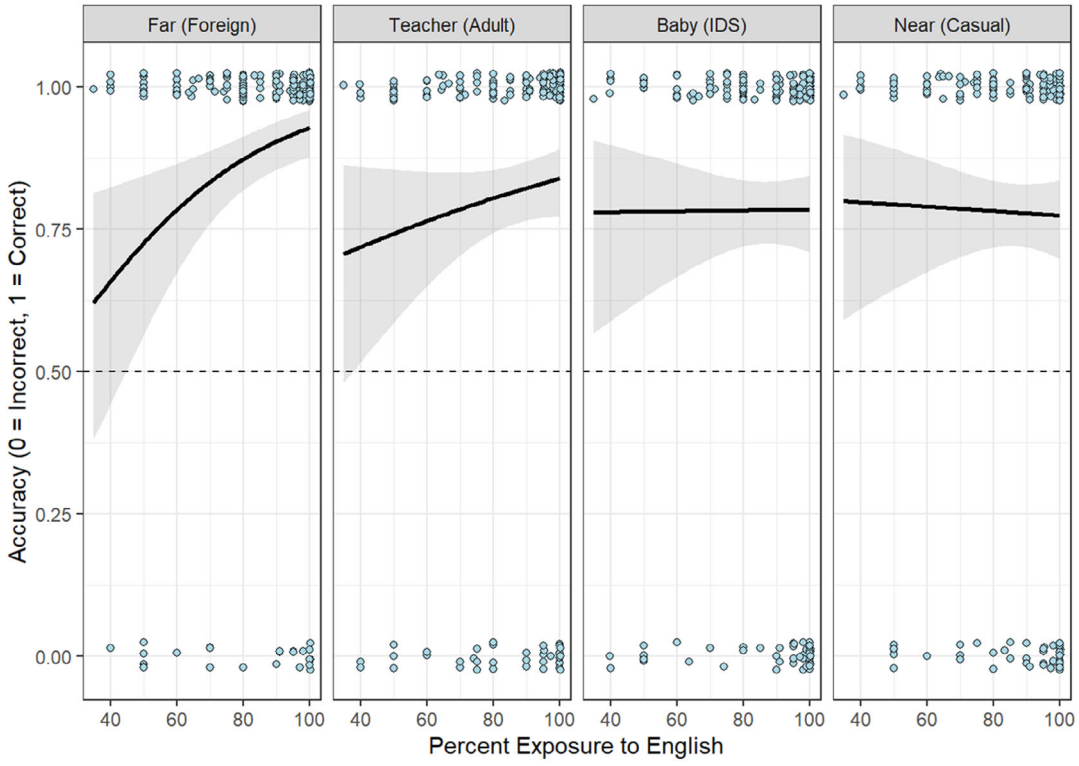

FIGURE 4 | Accuracy on Paired Response Task by target and percentage exposure to English.

TABLE 4 | Model output for the reduced binomial regression conducted on children's accuracy on the Single Response Task (1 = accurately identifying whether character spoke correctly, 0 = inaccurate). Predictors included addressee (teacher vs. baby) and register (correct vs. incorrect) as within-subjects factors, age (in years; mean-centered) and English exposure (mean-centered) as between-subjects factors, interactions between all variables, and a random effect of the subject.

Effect	*b*	SE	*z* value	*p* value	OR	95% CI for OR
Intercept	0.734	0.232	3.159	0.002**	2.09	[1.33, 3.30]
Addressee	1.275	0.399	3.192	0.001**	3.61	[1.64, 7.95]
Register	−0.404	0.347	−1.163	0.245	0.68	[0.35, 1.35]
Age	0.099	0.105	0.947	0.344	1.24	[0.79, 1.93]
English exposure	0.009	0.007	1.207	0.228	1.16	[0.91, 1.48]
Addressee*Register	0.219	0.553	0.396	0.692	1.2	[0.40, 3.57]
Addressee*Age	0.282	0.189	1.490	0.136	1.84	[0.82, 4.13]
Register*Age	0.692	0.182	3.808	<0.001***	4.49	[2.07, 9.71]
Addressee*Register*Age	−1.018	0.280	−3.633	<0.001***	0.11	[0.03, 0.36]

*$p < 0.05$. **$p < 0.01$. ***$p < 0.001$.

variable. Predictors included addressee (teacher vs. baby) and register accuracy (correct vs. incorrect) as within-subjects factors, age (in years; mean-centered) and English exposure (mean-centered) as between-subjects factors, interactions between all variables, and a random effect of the subject. We then reduced the model using the same process as in the Paired Response Task. The final model included all main effects as well as two-way interactions between addressee and register, addressee and age, age and register, and a three-way interaction between addressee, register, and age (see Table 4).

The model revealed a significant main effect of addressee ($p = 0.001$) and a significant two-way interaction between register and age ($p < 0.001$), which were qualified by a significant three-way interaction between addressee, register, and age ($b = -1.018$, SE = 0.280, $p < 0.001$, OR = 0.11, 95% CI for OR [0.03, 0.36]; see Figure 5), suggesting age effects varied based on the specific contrast examined.

In particular, age did not significantly impact children's responses when Jordan correctly used formal language to speak to the teacher ($b = 0.103$, SE = 0.097, $p = 0.292$, OR = 1.24, 95% CI for OR [0.83, 1.89]) or when Taylor incorrectly used French to speak the baby ($b = 0.041$, SE = 0.125, $p = 0.741$, OR = 1.09, 95% CI for OR [0.64, 1.90]). Instead, children across the age range tested reported that using formal language with the teacher was correct (significant positive intercept, $b = 0.697$, $p < 0.001$), and that using French to speak to the baby was incorrect (significant negative intercept; $b = -1.765$, $p < 0.001$). On the other hand, children became better with age at recognizing that it was *correct* for Taylor to use infant-directed speech to address the infant ($b = 0.385$, SE = 0.154, $p = 0.012$, OR = 2.30, 95% CI for OR [1.26, 4.73]), though children were generally accurate in this condition (significant positive intercept, $b = 1.938$, $p < 0.001$). Additionally, children became better with age at recognizing that it was *incorrect* for Jordan to address the teacher using casual language ($b = 0.770$, SE = 0.141, $p < 0.001$, OR = 5.68, 95% CI for OR [3.20, 11.26]).

Finally, we tested our second question of interest: Which factors impact children's willingness to befriend people who made linguistic register errors? To do so, we ran a linear mixed-effects model on children's responses to the friendship question as the outcome variable. Predictors included choice (whether the participant previously said the character was right vs. wrong in their register use) as a within-subjects factor, age (in years; mean-centered) and English exposure (mean-centered) as between-subjects factors, interactions between all variables, and a random effect of the subject. We reduced the model using the same process as above. The final model included only the main effects. Whereas there were no significant effects of age ($b = -0.056$, SE = 0.033, $p = 0.091$, $\eta^2_p = 0.01$, 95% CI [0.00, 1.00]), or English exposure ($b = -0.002$, SE = 0.004, $p = 0.599$, $\eta^2_p = 0.00$, 95% CI [0.00, 1.00]), there was a significant effect of choice ($b = 0.590$, SE = 0.093, $p < 0.001$, $\eta^2_p = 0.06$, 95% CI [0.03, 1.00]). In particular, children were more willing to befriend a character whom they reported as using the correct ($M = 3.68$, SD = 1.26) compared to the incorrect ($M = 2.97$, SD = 1.27) register.

4 | Discussion

The current study investigated the potential impacts of age and language exposure on linguistic register comprehension and social preferences based on linguistic register. Overall, children across the sample were able to identify register errors, though, in line with our hypotheses and prior research, performance did improve with age. In particular, even the youngest children tested were able to identify who a speaker was speaking with on the Paired Response Task. On the (more difficult) Single Response Task, age effects were largest for questions which likely required more nuanced social experiences. For example, only older children stated that it would be incorrect to speak informally to a teacher. It is possible that younger children expected it would be equally okay to talk to a teacher casually or formally because they have not yet been socialized into a formal

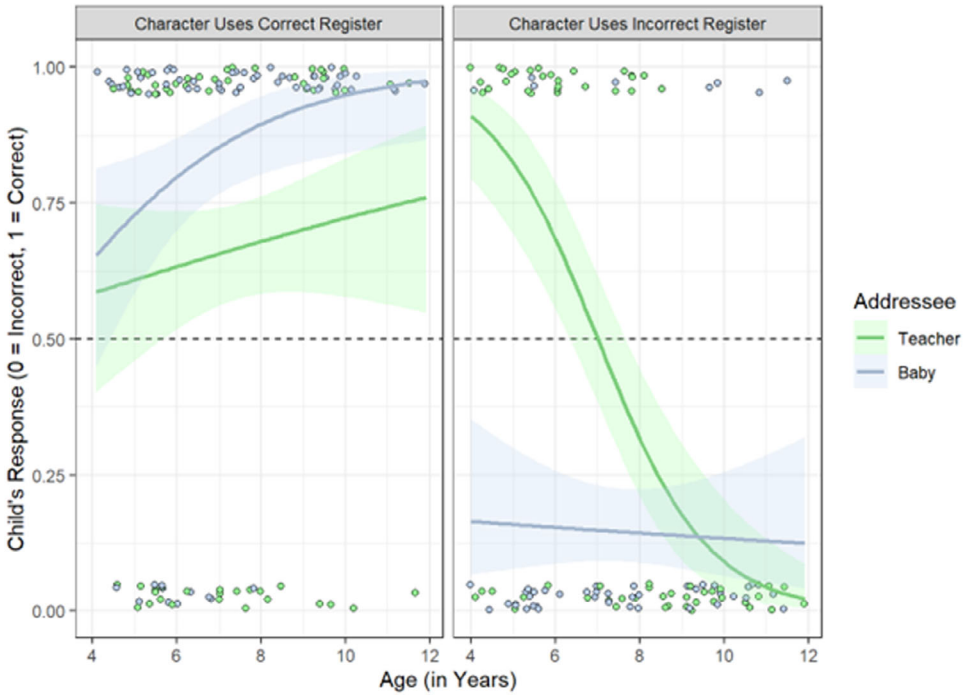

FIGURE 5 | Accuracy on Single Response Task by age. *Note:* Participants' response (0 = incorrect, 1 = correct) on the Single Response Task as a function of age (in months). The three-way interaction between addressee, register, and age visible in that age has the largest impact when a character (Jordan) responded incorrectly to a teacher by using a casual (rather than formal) register. This was due to younger children indicating that speaking casually to a teacher was OK, but older children saying that speaking casually to a teacher was not OK.

education system, and language in many daycare centers is highly informal.

Our results go beyond those of Wagner et al. (2010) by finding a link between children's comprehension of register errors and their preferences for speakers. Interestingly, we found that children preferred speakers who *they believed* had spoken correctly, though future research could examine if "actual" correctness would similarly predict children's preferences. This work builds on past research showing social preferences based on language and accent (see Kinzler 2021 for review). Some findings suggest that social preferences based on language may be due to infants and children expecting native speakers to be more competent and to be good teachers (Begus et al. 2016; Paquette-Smith et al. 2022). Interestingly, though, children prefer native-accented speakers even when the native speakers explicitly lack linguistic competence, such as in cases when a native speaker makes grammatical errors (Hwang and Markson 2018). Therefore, children may not always use "correctness" when deciding whom they like. An interesting area of future work is to investigate how children think about different types of speech that may be different from the norm, or not be seen as "correct." For example, research should compare how children feel about people who speak in unfamiliar accents, who use unfamiliar dialects, or who have speech impairments (Paquette-Smith et al. 2022; Kinzler and DeJesus 2013; Ezrati-Vinacour et al. 2001). By understanding which types of speech children believe to be "correct," how these beliefs develop over time, and the factors that influence children's judgments of others' speech, we will be better able to link speech patterns and social preferences. In this way, future research may be best able to identify how children gain "correctness"-based biases, identify how to intervene in such biases, and increase children's ability to interact with and learn from people whose speech patterns vary.

Interestingly, for most analyses, exposure to multiple languages did not have a significant impact on register comprehension *or* social judgments. That is, children with minimal exposure to non-English languages, and those with higher levels of exposure to non-English languages, generally understood each of the presented registers and preferred speakers whom they thought spoke "correctly." The one case in which language exposure did have an impact was in terms of children's understanding of foreign speech: Although children generally paired foreign speech with the target who was from "far away," this pattern was stronger for children with less exposure to non-English languages. Therefore, children who do not regularly hear non-English languages may be particularly attuned to which people have used those languages. Children with more exposure to non-English languages may be slightly less likely to assume that using a non-English language means that someone is from "far away." Indeed, their family members may live with them (quite "near") and use a different language. Regardless, children from all language backgrounds showed similar preferences for characters who used "correct" registers. One possibility is that exposure to multiple languages does not impact children's willingness to befriend people who made register errors. Indeed, previous research has shown that exposure to multiple languages does not necessarily impact language-related abilities (such as reference resolution in ambiguous situations; see van Wonderen et al. 2023) and that bilingual children's preferences for native-accented speech are as strong as monolingual children's (DeJesus et al. 2017; Spence et al. 2021), suggesting children from all language backgrounds may track which language patterns are considered

acceptable and high-status, even if they regularly hear other spoken varieties.

Our findings that the amount of exposure to non-English languages showed a specific effect on children's understanding of foreign speech suggests that there are cases in which language exposure influences children's perceptions of speech, and maybe their subsequent preferences. For example, children may respond differently to foreign registers that are relatively more familiar versus unfamiliar, or they may respond differently to foreign speech compared to foreign-accented speech. Our stimuli used French as a foreign language, which was not a common second language in our sample. Thus, children's language background may have a bigger impact on how they respond to a common "foreign" language (e.g., how a child exposed to Spanish responds to someone speaking Spanish, or the target of Spanish speech) or to familiar but foreign-accented English speech. While our study only examined exposure to other languages in American English-speaking children, future research can look at how children who speak other languages or live in other parts of the world view foreign registers, especially in countries where children are exposed to many languages in their environment. Another interesting possibility is that the effects of language exposure would be more prevalent at even younger ages (preschoolers or infants). Across ages in our sample, children were above chance at understanding the registers we presented. Thus, younger children might show more variability, which may be necessary in order to show the effects of language background.

Another important area for future research is investigating factors other than linguistic exposure that may influence children's comprehension of linguistic registers as well as their social preferences. For example, parental education and family socioeconomic status (SES) may be two important metrics to consider. Child-directed speech for children living in homes that are lower SES (measured based on parent education, income, or both) may be less frequent, less complex, and less diverse than child-directed for children living in high-SES homes (e.g., Hart and Risley 1995; Huttenlocher et al. 2010; Rowe 2012; Schwab and Lew-Williams 2016; though see Sperry et al. 2019), In fact, children's language development reflects the socioeconomic differences in the quantity and nature of parent input: Lower-SES children show lower vocabulary knowledge (Hoff 2003; Rowe 2012) and slower language processing speed (Fernald et al. 2013). Therefore, it is possible that children from lower-SES homes would also recognize register errors later in development. On the other hand, if children's recognition of register errors is tightly linked to their social experiences, differences based on SES may only emerge for registers with different frequencies in low- versus high-SES homes.

In conclusion, our findings replicate past work showing that age plays a critical role in comprehension of linguistic register. We also provide clear evidence that children show social preferences against people who make register errors. On the other hand, this work opens many questions about the potential role (or lack thereof) of exposure to different languages on these two topics. That is, future research is needed to examine whether and how a child's own experience with language(s) influences their early processing linguistic register and their developing social preferences based on language use.

Author Contributions

Ishaan Ambrish: conceptualization, investigation, writing – original draft, writing – review and editing, methodology. **Shreya Sodhi**: writing – review and editing, investigation, formal analysis, visualization, writing – original draft. **Zoe Liberman**: supervision, conceptualization, funding acquisition, writing – review and editing, writing – original draft, methodology, project administration.

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Data Availability Statement

The data that support the findings of this study are openly available in Does children's developing understanding of linguistic register impacts their social preferences? at https://osf.io/kwcdn/.

Endnotes

[1] Because stimuli were gender-matched to participants, we tested whether gender had any effects in our models. There were no significant effects or interactions of gender, so we do not discuss further.

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Supporting Information

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