Repeat After Me: The Effects of Exclusion on Children's Language Behavior

by

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Author's Declaration

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

I understand that my thesis may be made electronically available to the public.

Abstract

Childhood is a unique period of development, characterized by rapid changes in language behavior, especially once children begin attending school and interacting with peers. Some of these changes may be driven by socio-affiliative motivations, including instances of anticipated or felt ostracism. Across two experiments, we examined whether ostracism would affect children's 1) lexical alignment rates and 2) learning of novel words. In Experiment 1, we did not find significant effects of ostracism on alignment but observed some differences as a function of language background. In Experiment 2, analyses on the preliminary sample also revealed no significant difference as a function of ostracism. This line of work has the potential to provide insight into factors motivating children's linguistic behaviors in different social contexts.

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Introduction

Human communication is complex – we use our structured language system to transfer information to others in an efficient manner while minimizing cognitive effort for parties on both sides (Bard et al., 2007; Clark & Wilkes-Gibbs, 1986). As a joint act, communication is also inherently social. Infants begin their attempts to communicate with others through gestures such as pointing, which can be seen right around their first birthdays (Tomasello et al., 2007). Although early communication is via means other than language, infants increasingly begin to use language to communicate over the first two years. As children's language skills develop and their social worlds become bigger, the ways in which they use language change. This thesis examines how social motivations may shape children's language behaviors.

Past work has given us a general understanding of how children come to learn various aspects of language such as grammar, sounds, and words through exposure to their input. A great deal of attention has been paid to children's acquisition of words (perhaps because it is more tractable to study than other areas of language development). Children must learn words from the input around them, as every language has distinct (and mostly arbitrary) form-meaning mappings. To date, most of the work on children's word learning has focused on the impact of input from adults. For example, one foundational study by Hart and Risley (1995) examined the linguistic environments of children from various socioeconomic (SES) backgrounds and the potential effects of these environments on children's vocabulary development. This work inspired many subsequent inquiries into the relation between parental input and children's word learning, with the majority demonstrating that increases in the amount of child-directed speech are associated with larger vocabularies (Goodman et al., 2008; Hoff, 2003; Hoff et al., 2011; Huttenlocher et al., 2002; Parra et al., 2011; Place & Hoff, 2011; Rowe, 2008).

Despite being a norm in Western societies, child-directed speech is not the only means of language exposure for children. Overheard speech is unavoidable, and studies have also investigated the role of overhead speech in word learning with North American children. One study by Akhtar and colleagues (2001) found that 2-year-olds reliably learned new words, whether they were addressed directly or not by the speaker, and that 6-year-olds retained not just nouns, but also novel verbs that were overheard. In a different study, Floor and Akhtar (2007) investigated overheard word learning in 18-month-olds. Participants were randomly assigned to either the overheard or addressed condition: in the former, they heard the experimenter and a confederate mention a novel word to each other, in the latter, they were addressed directly by the experimenter. They found no difference in word learning between conditions. These studies serve as evidence that children's word learning is not exclusively driven by child-directed speech from adults.

Children in many communities hear less speech directed to them than children in North American homes. One such community resides in southern Mexico, where indigenous Tzeltal speakers carry their infants on their backs, thus offering a rich environment for overheard language. Foushee and Srinivasan (2024) demonstrated that, despite not being spoken to directly and thus not receiving the linguistically rich directed speech previously argued to be the key to language learning, infants in the Tzeltal-speaking community showed knowledge of nouns and honorifics which they could have only learned by listening and observing. Moreover, in some communities, children receive most of their input from other children. For example, in the Shipibo-Konibo community in Peru, children often grow up surrounded by other children, with very little supervision by adults compared to Western norms. Shick and Stoll (2025) observed that, although direct input predicted more speech production in 12-57-month-old children, it was

input received from other children (peers, or older), rather than adults, that best predicted their output. These results suggest that children learn a great deal from other children.

In line with the idea that parental input isn't the only input children learn from, there is some evidence that, even in North American families, children's language learning may be more influenced by other children, whether they are friends at school or siblings, than it is by adults. This work has tended to focus on second language learning. Older siblings, in particular, seem to have a great deal of influence on younger siblings' language learning (Wang, 2008; Oshima-Takane et al., 1996). Bridges and Hoff (2012) conducted two studies aimed at investigating the influence of older siblings in their younger siblings' learning and acquisition of L2 English. They found that toddlers whose older siblings spoke more English at home, exceeding the mean household usage, demonstrated more advanced English skills compared to peers without older siblings. Similarly, Tsinivits and Unsworth (2020) demonstrated that 16–30-month-olds learning Dutch as an L2 who had older siblings scored higher on measures of receptive and productive vocabulary in Dutch. These effects were over and above the effects of parental proficiency in Dutch, as well as the proportion of Dutch each parent spoke with the children. This pattern highlights the role of sibling interaction, suggesting that sibling-level input can uniquely drive language development independently of parental linguistic input.

The influence of other children is not limited to older siblings. In the classroom, children's language learning also benefits from interaction with their peers. Schmerse (2021) demonstrated that 3-7-year-olds whose peers had higher vocabulary skills subsequently showed greater vocabulary growth within a three-year time frame. Many such studies highlight the importance of peers for children's language learning, particularly in the domain of vocabulary (Chen et al., 2020; Henry & Rickman, 2007; Ribeiro et al., 2017; Justice et al., 2014).

Experimental research has provided conflicting findings about how well young children learn from adults vs. other children. Some previous work suggests that children might learn best from adults: Cooper and colleagues (2018) demonstrated that toddlers recognize words better in adult voices than in children's voices, and Zygis (2023) similarly showed that 2-7-year-old children (especially younger children) performed better on a word recognition task when they heard an adult's voice. In contrast, Schick et al. (2024) recently presented experimental evidence using a head-turn procedure that children in two different communities—Swiss German infants and Shipibo-Konibo infants from Peru—paid more attention to surrounding speech from children compared to adults. Similarly, Erskine and Seidl (2026) employed a preferential looking paradigm and exposed two-year-olds to two novel words (*modi* and *blick*), one spoken by an adult and another by a child. At test, there was greater recognition of the novel word spoken by the child, offering further evidence of children's inclinations to attend to, and subsequently, learn words from other children.

Kory-Westlund and Breazal (2019) studied preschool children's language learning with peer-like robots. Children played a story-telling game with a robot who, in the second half of the experiment, told them a story that either 1) matched their linguistic ability (i.e., children with higher abilities heard harder stories, whereas children with lower ability heard easier stories) in the matched condition, or 2) did not match their linguistic ability (i.e. children with lower abilities heard harder stories and vice versa) in the unmatched condition. While the majority of children reported liking the robot, those in the *Matched* condition learned more vocabulary words compared to those in the *Unmatched* condition. Furthermore, higher rapport with the robot was linked to higher levels of mimicry, which in turn predicted learning of simple vocabulary words (nouns, verbs, adjectives, etc.). The more children liked the robot, the more they emulated

its speech (for example, by repeating phrases the robot commonly used such as “once upon a time…”), which in turn related to higher word learning scores.

The fact that children in both natural and experimental settings learn from other children, as well as the fact that increased rapport mediated learning in Kory-Westlund and Breazal (2019), suggests that there may be social motivations underlying children’s learning from other children. To date, there has been little work done examining the specific motivations young children might have in learning language from other children. For example, children beginning to attend school (i.e., around the age of four) may be motivated to learn from their peers to gain a sense of belonging and build meaningful connections within their social groups. The goal of the present study is to examine how social experiences may alter children’s word use and learning. In Experiment 1, I examine how social experiences influence young children’s language alignment.

Alignment

During dialogue, people often begin to speak like the person they are speaking with. Convergence in dialogue can happen along multiple dimensions, such as speech rate, accent, word choice, and syntactic structure (Garrod et al., 2018; Garrod & Clark, 1993; Giles et al., 1973; Suffill et al., 2021; Nielsen & Scarborough, 2024; Levelt & Kelter, 1982). This alignment occurs naturally during conversations (Branigan et al., 2016; Bortfeld & Brennan, 2009; Garrod & Pickering, 2004; Pardo, 2013) and can be driven by various factors.

At the speech level, one area in which people align is speech rate, and this has been found in different social settings (Giles et al., 1991; Manson et al., 2013; Street, 1982). In one study, Putman and Street (1984) examined alignment in job interview scenarios, where one participant

was given the role of interviewer, and the other interviewee. They found that interviewers and interviewees aligned significantly with respect to speech rate over the course of the interview. Schultz and colleagues (2015) asked participants to read scripts with a confederate who either spoke in a fast or normal pace. Their results indicated that participants significantly converged in their speech rate with the confederate throughout the experiment.

Aspects of speech alignment are also demonstrated in work done by Pardo (2006). Sets of participants (who were previously unacquainted and had provided pre-test recordings) were asked to complete a map task in a recorded session. Independent coders then generally assessed dyads' similarities in their pronunciations, finding that they increasingly converged throughout the task and that this effect persisted beyond the task to independent post-test recordings.

There is also evidence of alignment beyond the speech level. For example, in one study, players in a cooperative maze game began to converge on their spatial descriptions (Garrod & Anderson, 1987). Players who began by describing their locations differently (e.g., Player A: "I'm at A6" vs. Player B: I'm two along, two up") changed their descriptions to fit with each other over the experiment. Branigan and colleagues (2000) paired participants and a confederate together under the guise of a picture-matching task, where participants each had a set of cards with images on them. Their task was to describe the image on their card to the confederate, so that they could choose the correct one. The confederate used particular types of syntactic constructions (e.g., "X [verb] the Y to the Z"). Participants were found to reproduce the confederate's syntactic form when describing their own cards.

One of the most studied types of alignment and of primary importance to the present study is lexical alignment, where individuals reuse their conversation partner's referring terms and expressions. For example, if an individual refers to a fizzy drink as *soda,* then their partner is

more likely to refer to the drink as *soda* instead of *pop* (or vice-versa). Early work on lexical alignment by Brennan and Clark (1996) tasked participant duos with arranging their respective sets of image cards in a specific order. They found that participants overlapped significantly in the referring terms they used to describe the cards.

Several hypotheses have been proposed to explain lexical alignment. One hypothesis posits that alignment is a non-goal directed behavior occurring due to simple priming (Pickering & Garrod, 2004): labels are re-used in conversation as they are more easily retrieved from memory. On this account, there is no requirement for interlocutors to consider their partner's beliefs; they simply reactivate previously used terms. In line with this priming account, people are more likely to re-use labels initially used by an experimenter to describe an object when there are fewer intervening filler words (Branigan et al., 2011).

A second hypothesis posits that lexical alignment is a goal-directed behavior, intended to establish effective communication between parties by ensuring a mutual understanding of the conversation. In other words, like other aspects of audience design (Clark & Murphy, 1982), this account assumes that individuals take their conversation partner's knowledge and linguistic ability into consideration when deciding what to say. Speakers may infer that if their partner used a specific label, it means that they understand it, and it would therefore be easier for them to interpret that label than an alternative. On this account, then, people re-use referring expressions (for example *soda* instead of *pop*) as a means of maximizing ease of comprehension (Garrod & Anderson, 1987). Evidence for this account of lexical alignment comes from work demonstrating that speakers are more likely to re-use the same label as their conversation partner when the partner is a child (compared to an adult), or a non-native English speaker (compared to a native English speaker) (Cai et al., 2021). Similarly, Branigan and colleagues (2011) demonstrated that

people were more likely to align with an interlocutor they believed to be a computer if they believed that the computer's "linguistic" abilities were low.

A third and final hypothesis states that lexical alignment is a goal-directed behavior intended to express affiliation and reinforce social relationships. Mimicry, in its multiple forms, has generally been linked to a desire to affiliate (Chartrand & Bargh, 1999; Lakin & Chartrand, 2003). With respect to this account, lexical alignment and the repetition of a conversation partner's language can be viewed as a form of mimicry (Dideriksen et al., 2023; Ireland et al., 2011; Lakin et al., 2003). One recent study (Li & Rojas 2025) had participants play a resource-allocation game with a confederate and an AI (artificial intelligence) teammate. The AI teammate performed at either 100% accuracy or 60% accuracy, and conversations between the human participant and confederate were recorded and analyzed. Participants paired with the low accuracy AI teammate demonstrated higher levels of alignment with the confederate, an effect the authors interpreted as an affiliative response meant to repair trust after the AI's poor performance. Other work shows that alignment in college roommates depended on the quality of their relationships: the closer the roommates were, the greater their alignment (Pardo, 2012). Finally, social motivations for alignment are also demonstrated in work done by Babel (2012, 2014). In one study, Babel (2012) showed that women who perceived a speaker as more attractive were more likely to align with them on certain vowels compared to speakers they rated as less attractive.

Alignment in children

Although lexical alignment has been studied for years, there has been little work examining this phenomenon in children. Studying alignment in children may be particularly

informative, as it may help us understand their language behaviors and possible socio-affiliative motivations for learning language.

Branigan and colleagues (2016) studied 5-14-year-old children's lexical alignment with an experimenter in a picture-naming task. Their results showed that children, both typically developing and with an autism spectrum disorder (ASD) diagnosis, referred to objects with the same name as their conversation partner, demonstrating alignment. Garrod and Clark (1993) noted that convergence on labels in groups of older children was associated with communicative success, although less so for younger children. Paquette-Smith et al. (2021) demonstrated that Canadian children and adults alike aligned more with a Mandarin-accented model in speech imitation (shadowing) tasks compared to a Canadian-accented model, possibly because the non-native accent was more salient to them compared to the Canadian accent, and thus easily retrieved during the task.

Although these limited studies show alignment, they do not address the underlying mechanisms. However, one study found support for affiliative motivations underlying alignment: St. Pierre et al. (2024) showed that when placed into arbitrary groups of red shirts vs green shirts, children were more likely to lexically align with members of their own group, using language as a signal of group membership.

Taken together, these studies illustrate that children do show alignment with interlocutors under some circumstances. However, as previously mentioned, there is limited work in this area and the reasons underlying children's behavior are unclear. Additionally, studies investigating children's linguistic alignment have almost exclusively used adult models; children's language behaviors may very well differ based on who they are speaking with.

Childhood is a period characterized by rapid language growth and a rapid expansion of children's social circles where social motivations evolve. When interacting with peers and community members, children's desire for social bonding and peer acceptance might shape their language behaviors and how they adapt to their linguistic environments. The present study examines whether experiences of exclusion increase children's motivation to align and attend to linguistic material provided by others.

Ostracism

Ostracism is defined as the experience of social exclusion by others (Correia et al., 2024). Even from preschool years, children engage in socially exclusive behaviors such as leaving other children out of games and activities (Hwang & Markson, 2020). Ostracism threatens children's belonging, control, and self-esteem, leading to a shift in behavior and psychological needs (Abrams et al., 2011). The consequences of social exclusion are felt strongly by adults and children alike, yet this experience is not always explicit and may sometimes be anticipated instead of immediately felt. Take, for example, someone who is overlooked because of their language background; they might not be directly taunted by their peers but chosen last in a game, or they might anticipate that their difference will lead to ostracism. Feelings of ostracism have been shown to elicit facial and behavioral mimicry as well as an increase in prosociality (Molden & Manor, 2013; White et al., 2016; Watson-Jones et al., 2016). Mimicry, in turn, has been shown to strengthen social relationships and affiliation (Lakin & Chartrand 2003). In past studies, participants who were mimicked by others showed increased liking of their imitator and increased feelings of rapport (Chartrand & Lakin, 2013; van Baaren et al., 2003). Thus, experiencing social exclusion appears to lead to affiliative behaviors meant to repair relationships and increase liking.

To experimentally investigate the effects of ostracism, Over and Carpenter (2009) separated 5-year-olds into two conditions: ostracism or inclusion. In the ostracism condition, children were asked to watch two videos: the first was a video of three pentagons playing together as a group, with a fourth pentagon entering after a brief delay. Once the fourth pentagon entered, the other pentagons' actions signaled that they did not want to include the fourth. The second video in this condition depicted two shapes tossing a ball between themselves, refusing to throw it to a third shape, and moving away. The same videos were used in the inclusion condition, only without the exclusion elements. Children in the ostracism condition were more likely to subsequently imitate the object-directed actions of an experimenter compared to children in the inclusion condition. In a study investigating the effects of third-party ostracism on facial mimicry (de Klerk et al., 2020), toddlers were shown videos similar to Over and Carpenter (2009) in which a shape was being ostracized by a group of other shapes, or control videos where no ostracism took place. Toddlers' facial mimicry was higher at post-test in the ostracism condition compared to the control condition. There is also evidence that first person experiences of ostracism lead to an increase in mimicry. Watson-Jones et al., (2016) showed that exclusion from a member of the same group led to higher levels of imitative fidelity in 5-6-year-olds.

Much of the experimental work on ostracism has employed a ball throwing game. In a live version, experimenters played a ball game with 13-14-month-olds (Quadrelli et al., 2023): in the inclusion condition, experimenters passed the ball to each other and the participant an equal number of times while smiling the whole way through, whereas in the ostracism condition, experimenters ceased to throw the ball to the participant after the second throw and ignored them for the rest of the game. Toddlers exposed to ostracism subsequently demonstrated fewer positive behaviors such as smiling and leaning forward and instead exhibited higher negative emotions

such as crying. Testa and colleagues (2025) used the same ball throwing game and found that 3-year-olds displayed more over-imitation behaviors in the ostracism condition.

In addition to the affiliative behaviors that can result from ostracism, researchers have also examined whether ostracism has effects on cognitive processes. The general finding is that attention and memory decline as a result of exclusion (Baumeister et al., 2002; Xu et al., 2018). Fuhrmann and colleagues (2019) tested working memory in adults and adolescents following an experience of ostracism or inclusion. Participants first played a round of cyberball in either the inclusion or exclusion condition, followed by the n-back task as well as the dot-matrix task to assess working memory. Their results showed reduced memory in both tasks, especially for younger adolescents, highlighting the detrimental effects of ostracism.

However, some studies show that exclusion may heighten memory in some circumstances, specifically when there is a social aspect present. Gardner and colleagues (1999) found that adult participants were more likely to retain social information when they read a diary following an experience of ostracism. Marinovic and Trauble (2018) found similar effects with young children who witnessed third-party ostracism. Children were first separated into conditions of either inclusion or exclusion and were shown the same shape videos employed by Over and Carpenter (2009). Participants were then told a story and finally performed a memory task. Results of this study showed that excluded children, similar to adults, retained more social words (but not non-social words) than their included counterparts.

There is overwhelming evidence that ostracism, both third-party and first-person, leads children to increase their use of different forms of mimicry, likely in an attempt to affiliate with their excluder. Aspects of children's cognition are also affected by ostracism, sometimes

heightening their memory for social information. Despite much work on the outcomes of ostracism, we have yet to observe its impact on language.

Ostracism and Alignment

Reports abound of dramatic changes in children's language once they begin attending daycare or school in the broader community. For example, a monolingual child may start using words or phrases that they have picked up from their peers. A child who primarily speaks a heritage language at home may suddenly start answering their parents exclusively in the community language (e.g., English), mixing elements of their peers' language into their home language, or changing their pronunciations to match the community language. Anecdotally, we know that children with different language backgrounds sometimes experience ostracism from peers at school or simply anticipate being ostracized due to their linguistic differences (Sedivy, 2023).

However, the factors driving these rapid changes are unknown. One possible explanation is that children begin to talk like other children in their environment because they are motivated to signal that they are members of the same group. Ostracism may increase this desire to signal group membership. As described above, children show higher levels of affiliative and prosocial behaviors when exposed to ostracism. If lexical alignment is a form of affiliative behavior, then we might expect to see an increase in alignment rates in situations of experienced or anticipated ostracism. Although this hypothesis has not been studied extensively, one study by Hopkins and Branigan (2020) exposed monolingual 7–12-year-old English speakers to feelings of either exclusion or inclusion through the cyberball paradigm, an online ball throwing game used extensively in ostracism research. Participants were instructed to play the game and focus on winning, and to enhance the legitimacy of the game, the other players (both simulated) were

given names matched to children's respective gender. Children in the ostracism condition received the ball approximately 3 times out of 20 (while the other simulated players received it an equal number of times on the remainder of passes), while children in the inclusion condition were passed the ball an equal number of times as the other players. In a second phase, children played a picture-naming task with the experimenter, who referred to target objects using labels either commonly (preferred) or less commonly (dispreferred) used in the community. Target objects appeared twice, and the experimenter always named them before the child. Children exposed to ostracism showed significantly more use of the experimenter's dispreferred labels than children in the inclusion condition. Although there is ample evidence that ostracism increases non-linguistic affiliative behaviors, to our knowledge, this is the only study that investigates whether ostracism may lead to changes in language behavior.

The Present Study

We examined ostracism as a potential motivator for children's learning of language patterns by assessing 4-7-year-olds children's language behavior following an experience of exclusion or inclusion. In both experiments, children first played a game of cyberball, a computerized ball throwing game, with two other simulated "players" who they believed to be other children joining from home. In Experiment 1, children then played a picture-naming game modeled on the one used by Hopkins and Branigan (2020) to assess their alignment rates. In our second experiment, we examined whether effects would emerge when observing the learning of new words, rather than vocabulary already established in the children's lexicon. In this experiment, children were told that one of the cyberball players would read them a story. The story contained novel words referring to new objects, and after it concluded, children were tested on their recognition of the novel words. In our first experiment, we hypothesized that if children,

especially those with a different heritage language, are sensitive to the effects of ostracism, they would increase their re-use of dispreferred labels following an ostracism experience. In Experiment 2, we hypothesized that children's learning of novel words would be higher as a result of exclusion.

Experiment 1

In Experiment 1, children first played a game of cyberball where they were randomly assigned to one of two conditions (exclusion or inclusion). Following the cyberball game, children played a picture-naming game with the experimenter, and the session ended with one more game of cyberball, during which all participants experienced inclusion (Figure 1).

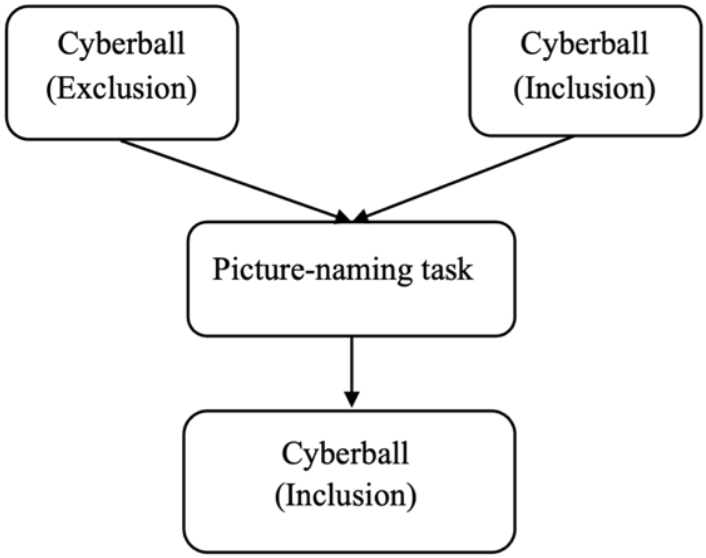


Figure 1. *Experiment 1 design*

Methods

Participants

To date, the data of eighty-two participants between the ages of 4-6 years (M= 4.95, SD= 0.84) recruited through the participant database of the Lab for Infant Development and Language have been analyzed. Eligible participants were bilingual (N=29) and monolingual (N=53) English speakers. Bilingual participants were children who spoke English and any other language, with between 45%-75% exposure to English. Our bilingual sample was highly diverse, such that a

wide range of languages were spoken in addition to English, including Tamil, French, Croatian, Italian, Bengali, Kannada, Urdu, Punjabi, Arabic, Wolof, Portuguese, Hindi, Cantonese, Vietnamese, Gujarati, Mandarin, Somali, Spanish, and Hebrew. Monolinguals were children whose exposure to English was 85% or higher and who did not regularly speak or hear another language. All participants were neurotypical, had normal or corrected-to-normal hearing and vision, and had no diagnosed language difficulties. All sessions were conducted online synchronously through Zoom.

Table 1

Participant distribution by language background, gender, and age

		Experimental Condition	
	Overall N = 82	**Exclusion** N = 41	**Inclusion** N = 41
Language Background			
Bilingual	29	13	16
Monolingual	53	28	25
Gender			
Female	42	15	27
Male	40	26	14
Age			
4	31	20	11
5	24	11	13
6	27	10	17

Measures

Cyberball

To induce a sense of ostracism or inclusion, participants played a game of cyberball, a computerized ball-throwing game that is played with two other simulated "players" (Williams & Jarvis, 2006). Each player was represented on the screen by a baseball glove and a name. Our

version of the game had participants engage with players Sam and Riley (gender-neutral names) by clicking on who they would like to throw the ball to (Figure 2). Participants were told that Sam and Riley were children also joining from home on their respective computers. In the ostracism condition, participants received the ball 10% of the time (three out of thirty total throws), while in the inclusion condition, they were thrown the ball 33% of the time (ten out of thirty throws). Cyberball and its modified versions have been widely used in research to induce feelings of ostracism (Correia et al., 2024; de Klerk et al., 2020). Following the critical task (see below), cyberball was played again; this time all participants received the ball 33% of the time. This was done to mitigate any negative feelings induced in the exclusion condition. This method has been shown to reliably return individuals to baseline mood levels following ostracism (Abrams et al., 2011).

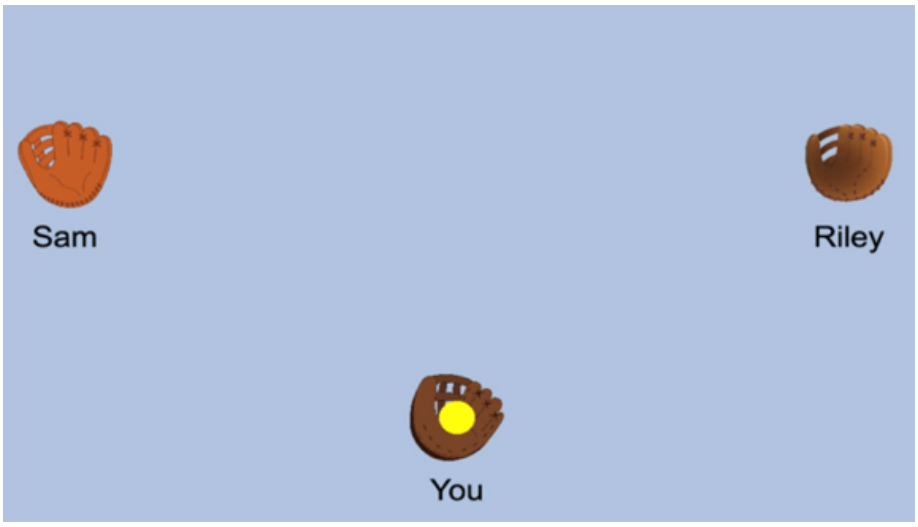


Figure 2. *Cyberball set up*

Picture-Naming Task

In the critical task, children played a picture-naming game with an English-speaking experimenter. We chose target objects that had two possible labels (one preferred – or common –

and one dispreferred – or uncommon). Target objects and their preferred and dispreferred labels were determined through piloting conducted with twenty-eight children of the same age and from the same community. In this pilot, participants were asked to name a series of pictures. Objects were chosen for the picture naming task if most children (70-90%) referred to the object using one label (which would become the preferred label, such as cat) while the rest employed a different label (which would be the dispreferred label, such as kitten). In total, twenty target objects were established (e.g., cap, lollipop, ship, icing; see Appendix for full list).

In the game, the child and experimenter took turns naming pictures as they appeared on the screen one at a time (see Figure 3). During the game, each of the twenty target objects appeared twice and was first named by the experimenter who labeled it with either the preferred or dispreferred label and then by the child on a later trial. Although the intent was for half of the experimenter-provided labels to be preferred and half to be dispreferred, due to programming error, participants received either 9 preferred labels and 11 dispreferred labels or vice versa (depending on counterbalancing group). There were forty-two filler objects, with two intervening between the experimenter's naming of the target object and the child's naming of the same object. We prepared four separate lists, counterbalanced for label type (whether a particular object was assigned a preferred or dispreferred label) and the order in which the items appeared; participants were randomly assigned to one of the lists (see Appendix). To retain children's attention and create an enjoyable game, we instructed children to yell out "*snap!*" when two of the same filler objects appeared one after another.

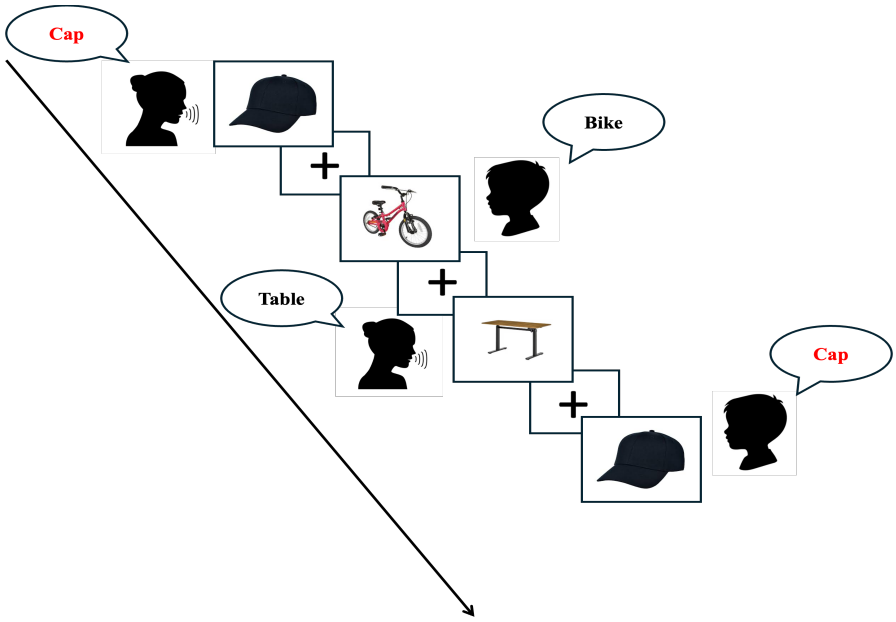


Figure 3. *Picture-naming task*

Following the task and second cyberball game, participants were debriefed about the deception and informed of the true nature of their fellow players. We also informed them that the other players' throws were pre-programmed and assured those in the exclusion condition that their exclusion was not a result of other children's actions. Once the debrief took place, the experimenter ended the session by asking for the participants' consent to retain the information gathered throughout the session.

Results

Data Analysis

Following previous work, data analyses were restricted to trials in which the experimenter had used a dispreferred label (Hopkins & Branigan, 2020). The logic is that children are more likely to use the preferred label regardless of what the experimenter says, and so preferred label trials

are less informative[1]. Data were analyzed in R using a Generalized Estimating Equation (GEE) to evaluate lexical alignment on dispreferred trials based on Condition (exclusion vs inclusion), Language Background (bilingual vs monolingual), and their interaction.

The GEE analysis showed no significant main effect of Condition, F (1, 793) = 0.26, p = .612, meaning children who experienced social exclusion did not align significantly more frequently than those who were included. There was also no significant main effect of Language Background, F (1, 793) = 0.87, p = .353, indicating that monolingual and bilingual children had comparable alignment rates. Finally, the two-way interaction between Condition and Language Background was not significant, F (1, 793) = 0.56, p = .455. Despite the lack of interaction, excluded bilingual children aligned at a numerically lower rate for dispreferred labels than their monolingual counterparts. Although this observation remained non-significant, it was contrary to our initial hypotheses that children would show higher alignment rates because of exclusion (Figure 4).

[1] As expected, means for preferred trials in this experiment did not differ across conditions: M= 0.86 for the exclusion condition and M= 0.88 for the inclusion condition.

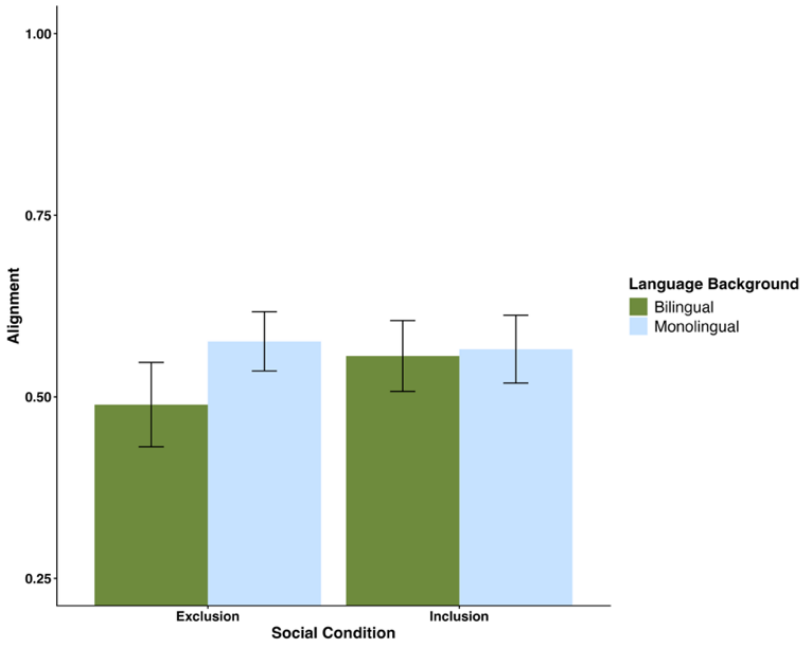


Figure 4. *Alignment rates for dispreferred labels*

We then analyzed lexical alignment on dispreferred trials as a function of Condition, Age, and their interaction. The GEE analysis showed no significant effect of Condition, F (1, 793) = 0.11, p = .741. However, there was a significant effect of Age, F (1, 793) = 5.83, p = .016, indicating that older children aligned at a significantly higher rate than younger children. Finally, the two-way interaction between Condition and Age was not significant F (1, 793) = 0.020, p = .887 (Figure 5).

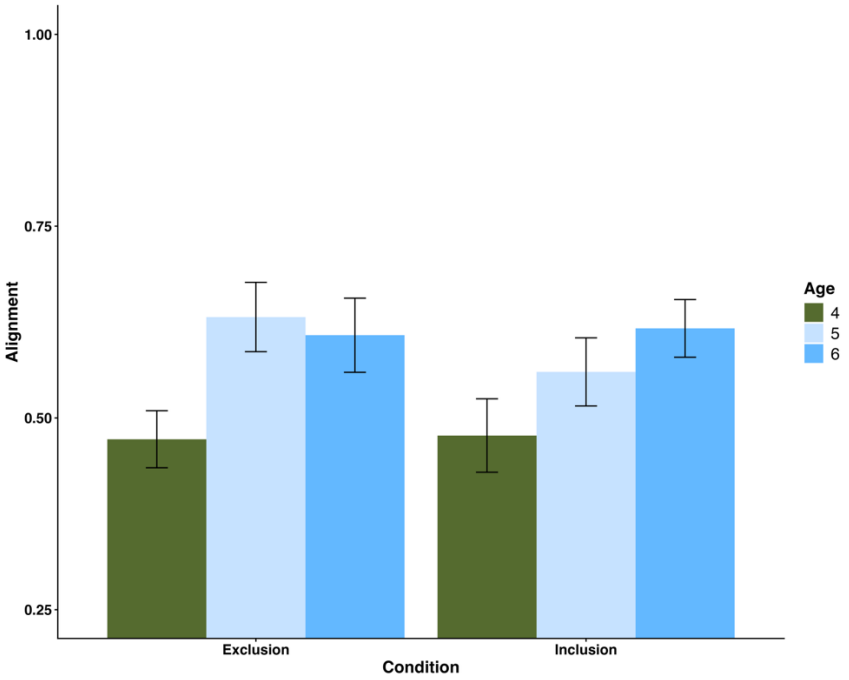


Figure 5. *Alignment rates for dispreferred labels by age*

Discussion

In Experiment 1, we asked whether ostracism would alter preschool children's language behavior by assessing rates of lexical alignment during a picture-naming task. We additionally asked whether language background would influence children's behavior. Our results indicated no significant differences as a function of either exclusion/inclusion condition or language background. However, our results did show that older children aligned at a significantly higher rate than younger children in our sample.

The design of Experiment 1 was based on a previous study (Hopkins & Branigan, 2020). In that study, excluded children aligned significantly more with an experimenter's use of dispreferred labels compared to children in the inclusion condition. We did not replicate this effect, which could have been due to several factors. First, our age range was much lower. In

contrast to 7-12-year-olds in the previous study, we tested 4-6-year-olds. This age range was chosen because it is the point at which children typically enter school, gain exposure to linguistically diverse environments and likely begin to experience peer influences on their language behavior. It is possible that children in this younger age group do not show exclusion-based changes in their lexical alignment.

However, it is also possible that we did not observe effects of exclusion for methodological reasons. For example, children this young may not have been motivated to align with the experimenter. Our work aimed to investigate children's experiences with their peers, yet the picture-naming task was done with an adult. Children were first excluded (or included) by simulated players they believed to be other children, yet once the cyberball game was over, their interactions with their "peers" were over. Although this was the same procedure followed in Hopkins and Branigan (2020), it may not be effective for a younger age group. In line with this argument, our results showed that older children (5-6-year-olds) in our sample aligned at a higher rate than the younger participants (4-year-olds).

Interestingly, we observed a pattern whereby excluded bilingual children aligned *less* on dispreferred trials than included bilingual children; in contrast, monolingual children performed similarly in the two conditions. Although both interactions and main effects were statistically insignificant with the current sample size (which has only 29 bilinguals distributed across the two conditions), this could indicate that there are indeed differences in the way preschool children respond to exclusion as a function of their language background. Some aspect of the exclusion may have driven them away from the experimenter, instead of resulting in repair and affiliation. It is important to note that bilinguals in the inclusion group performed similarly to monolingual children, indicating that any differences in behavior in the exclusion group were not

due to differences in the familiarity of labels. These preliminary findings, although contrary to our initial hypothesis, suggest that specific motivations could indeed be driving alignment.

In Experiment 2, we set to tackle the limitations present in the first. Following the cyberball game, children heard a story read to them by a simulated peer, one of the children they played with during the game. In addition, rather than focus on alignment behavior, this experiment asked whether children's word *learning* is affected by feelings of ostracism. In addition to re-using previously known words to align with a social partner (Experiment 1), we hypothesized that children might be motivated to *learn* words as a signal of group membership and connection (Experiment 2). Thus, if children feel ostracized by a peer, they might be more inclined to attend to and retain words produced by their excluder in an effort to reduce the gap between them. Previous work has demonstrated that children show heightened word retention for social words following experiences of ostracism (Gardner et al., 2000; Marinovic & Trauble, 2018), yet they do not examine whether ostracism impacts word *learning*, which we set out to investigate by using novel words.

Experiment 2

The design of Experiment 2 was based on studies investigating word learning from stories (Blewitt et al., 2009; O'Fallon et al., 2019). Once children played cyberball and heard the story, they were tested on their novel word recognition. As in Experiment 1, children played an inclusion game of cyberball to finish the session (Figure 6).

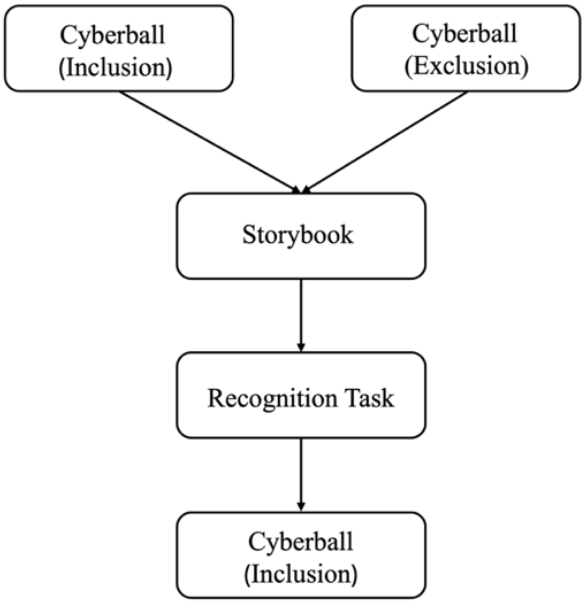


Figure 6. Experiment 2 design

Methods

Participants

We recruited thirty-two participants between the ages of 5-7 years (M= 6.4, SD= 0.72) through the lab's database (data collection is ongoing). A slightly higher age range was chosen for this study as the younger children in the first experiment often showed signs of restlessness and inattention. Although we intended, as in Experiment 1, to compare children's performance as a

function of language background, all but one of our participants to date were monolingual English speakers, by the criteria laid out in Experiment 1. Therefore, for the purposes of this preliminary analysis, we have chosen to solely focus on our monolingual sample (n=31). All participants were neurotypical, had normal or corrected-to-normal hearing and vision, and had no diagnosed language difficulties. All sessions were conducted online synchronously through Zoom. Three additional participants were excluded from our sample as they did not believe that Riley was another child reading to them.

Table 2

Participant distribution by gender, and age

		Experimental Condition	
	Overall N = 31	**Exclusion** N = 16	**Inclusion** N = 15
Gender			
Female	15	6	9
Male	16	10	6
Age			
5	4	2	2
6	10	4	6
7	17	10	7

Measures

Cyberball

As in Experiment 1, cyberball was used to induce a sense of exclusion or inclusion. Following the primary task, participants again played cyberball to mitigate any negative effects of their first game.

Story Book

To introduce novel words, we created an original story about a young boy named Spencer who woke up as a troll and needed to find a wizard to help him turn back into a human boy. Four novel words (*cheema, modi, tanzer, kita*) for objects and animals were embedded into the story, each appearing three times. The novel words we used were chosen from the NOUN database (Horst & Hout, 2016) to be simple enough for our age group (each word being two syllables), while distinct enough that children would not mistake one word for another. Pictures were generated for the story using ChatGPT for key plot points, such as Spencer waking up as a troll (Figure 7). The video of the story book was created using iMovie, a video-editing software, and to simulate the appearance of a real book, we included a page-turning like transition in between each picture. The recorded video also contained a picture of a Zoom window with the name "Riley" intended to be that of the child reading the story, to further create the illusion that a real child was present during the Zoom meeting and reading the story to the participant.



Figure 7. *Storybook stimuli*

The story was recorded by a 6-year-old child. Two separate introductions were recorded to match the conditions participants were assigned to. Before reading the story, the "player" introduced themselves as "Riley", one of the players from the cyberball game, mentioned their age, and depending on the condition, gave a warm and inclusive comment or no comment at all (*"it was so fun playing that game with you!"* for inclusion vs "*I will read a story now"* for exclusion). This was done to strengthen the effects of the cyberball game.

Following the cyberball game, participants were told that one of the "players" from the cyberball game would read them a story. The experimenter then proceeded to play the recording.

Recognition Task

To assess children's learning of the novel words found in the story, a recognition task was administered following the story. In the recognition task, all four novel objects appeared on the screen at once and the experimenter asked participants to indicate the box containing each novel object (e.g., "*Can you tell me which colored box the* ***cheema*** *is in?")* (Figure 8). Each participant

had 4 test trials, one per novel word. The location (upper left, upper right, lower left, lower right) and color of each box was different on each trial. For example, if the *cheema* appeared in the upper left box in green on trial one, it would occupy a different location on trial two. This was done to ensure that participants were not just eliminating previously chosen locations for later trials. Across participants, the presentation order of the target objects and the box location and color associated with the target object was counterbalanced. Pictures of target objects were screenshotted directly from the images used in the story.



Figure 8. *Recognition task*

After the recognition task and cyberball game, participants were debriefed about the study's deceptions using the same protocol as Experiment 1. They were informed that the story was a pre-recorded audio clip rather than a live reading from Riley. Lastly, they were asked about their beliefs regarding whether their peers were real or simulated and for their consent to retain information gathered during the session.

Results

Each participant received an accuracy score (the number of correct answers divided by 4). Data were analyzed in R by conducting an independent samples *t*-test to compare the exclusion and inclusion groups. With only 31 participants across the two conditions, this analysis revealed no significant differences, t (29) =0.3, p=0.8, d= 0.12. However, children in the exclusion group (M = 0.48) slightly numerically outperformed children in the inclusion group (M =0.45).

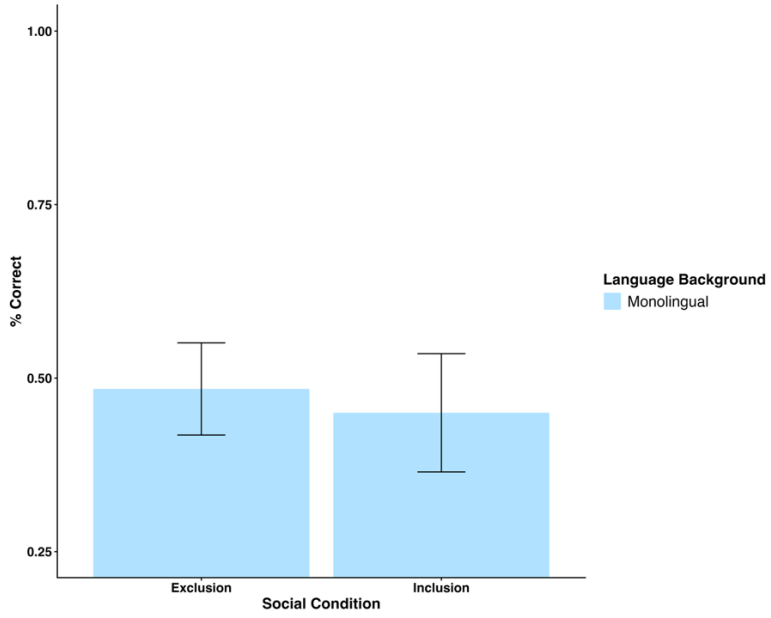


Figure 9. Proportion of correct answers by condition

Discussion

In Experiment 2, we asked whether ostracism would impact children's learning of novel words. We drew inspiration from previous work demonstrating that preschool children are more likely to retain social words/information following exclusion. In the present study, we did not ask about the retention of social information; instead, we asked about the learning of new words

from a social partner. Our current results with our limited sample size indicate no significant differences between exclusion and inclusion conditions.

General Discussion

Across two experiments, we asked how ostracism would affect children's language. In both experiments, we used the cyberball paradigm to induce feelings of either exclusion or inclusion. Experiment 1 examined children's lexical alignment following exclusion; Experiment 2 examined novel word learning.

Previous work has demonstrated the effects of ostracism on non-linguistic affiliative behaviors (Correia et al., 2024; de Klerk et al., 2020; Vacaru et al., 2020; Watson-Jones et al., 2016). However, despite suggestions that linguistic alignment may be partially affiliative, very little work has examined this possibility with children directly. In Experiment 1, we hypothesized that children's use of dis-preferred labels would increase following an experience of ostracism. However, the results to date reveal no significant effect of condition on children's lexical alignment, nor was there an effect of language background. As previously mentioned, these results might have occurred for several reasons. First, children's cyberball interactions were with simulated players that they never spoke to or heard, possibly weakening the feeling that they were playing with, and therefore being excluded by, real children. Although this is plausible, many children verbalized their discontent with the other players to the experimenter. For example, children were noted saying "they're not giving me the ball!", "they're not passing it to me, I want to have a turn", and "I think they don't like me or something" in the exclusion condition, and "oh you're being so nice to me, I will pass it to you" in the inclusion condition. Children also showed visible signs of distress during the game by pouting, making angry faces, and getting fussy when the ball was not being passed to them. Children's reactions, specifically in the exclusion condition, indicate that the cyberball game was indeed effective at inducing feelings of ostracism, and that these effects were felt deeply by children, an effect reported in

many other studies utilizing the game (Abrams et al. 2011; Correia et al., 2024; Hopkins & Branigan 2020; Over & Carpenter, 2009; Watson-Jones et al., 2016).

Possibly, children might not have been motivated to align with the experimenter. They might have viewed the experimenter as a novel third party, and since they were neither their age nor the person excluding them, the effects of the cyberball did not carry over into the picture-naming task. Other studies using cyberball and adult experimenters have had the experimenters' reactions and facial expressions remain congruent with the participants' cyberball condition, such that in an exclusion condition, experimenters ignored the child, showed no positive emotion, and continued the exclusion (Quadrelli et al. 2023). In our experiment, experimenters remained neutral with children but did not go out of their way to ignore them. Furthermore, children might have viewed the experimenter as a person of authority rather than a peer that they would like to connect with; in some cases, children called the experimenter "teacher", showing the separation between them.

Participants' age might have also played a role in our results; our sample consisted of very young children, with a mean age of five years. Initially we chose this age range as it represents a critical point whereby children's linguistic environments broaden and diversify, yet it may be that the structure of our experiment was inappropriate for the younger children in this age range (Garrod & Clark 1993). Indeed, children did show signs of fatigue and boredom during the picture-naming task, possibly due to its length.

Although our analyses showed no significant main effects or interactions, it did reveal, surprisingly, that excluded bilingual children numerically aligned less on dispreferred labels than included bilingual children did. Perhaps ostracism affected bilingual children differently than we previously thought; instead of increasing their desire to affiliate, it might instead cause them to

focus more narrowly on their own behavior. Although Hopkins and Branigan (2020) revealed that excluded children showed higher alignment rates for dispreferred labels, their sample consisted of a higher age range and included only monolinguals. It is possible that bilingual children have different responses following exclusion, due to insecurities about their language background, especially when navigating the dominant community language. Rather than aligning with their partner, they may have retreated to the preferred labels they already felt comfortable with and knew were correct. Finally, as shown in Table 1, our current sample is imbalanced in terms of participant gender and age between conditions. As these factors may influence alignment (and indeed, we found a significant effect of age in Experiment 1), conclusions about the effects of exclusion on alignment must await the full, balanced sample.

In Experiment 2, we turned to word learning. Here, too, analyses with our preliminary sample show no significant differences in word learning accuracy between conditions. Previous studies have not yet investigated the motivating factors of word learning following an experience of ostracism; most of the available work focuses on the effects of exclusion on cognitive processing, and the type of information participants retain. Past work (Marinovic & Trauble 2018; Wölfer & Scheithauer 2013) reported better memory for social information. However, the characterization of social information remains somewhat unclear. Marinovic and Trauble defined "social" mainly as people (i.e., neighbors, friends, etc.) while others characterize social information as relational or collective events (Gardner et al., 2000; e.g., going out with a roommate or university affiliations, respectively). Regardless, past work agrees that socially relevant information is more likely to be retained following experiences of ostracism.

Should we find no effect of ostracism in the full sample, a few limitations might explain this. First, perhaps the social relevance of the information (and not just the person delivering the

information) is truly important. In our story, the novel words referred to objects and creatures that had no relevance to the child themselves. Second, the social manipulation during the story might have been ineffective. While we only coded data from children who said they believed that they played cyberball with and heard a story from “Riley", it's possible some had unvoiced doubts they didn't share with the experimenter.

Conclusion

The present study represents a first step in experimentally examining potential motivations underlying changes in children’s language when they begin to interact more with peers. Specifically, our goal was to understand whether social experiences, like ostracism, increase affiliative language behaviors (such as lexical alignment) and attention to novel language input. To date, the mechanisms underlying children’s rapid adoption of community language patterns remain poorly understood. However, anecdotal reports suggest that an important factor is a desire to fit in with peers (Sedivy, 2023). In fact, some have suggested that the loss of children’s home language in favor of the community language can be a response to anticipated or direct exclusion by other children. Therefore, future work in this area should aim to recruit larger samples of children with different language backgrounds.

This line of work has both theoretical and practical implications. On a theoretical level, it will contribute to our understanding of linguistic alignment, and in particular, to understanding the role of affiliative motivations in driving alignment. It will additionally provide insight into the mechanisms underlying rapid change in language patterns as children enter the community. On a practical level, understanding children’s social motivations may help us support the maintenance of multilingual children’s home languages despite their desire to fit in with the broader community.

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Appendix A

Target Image Labels

Preferred	Dispreferred
Cat	Kitten
Icing	Cream
Boat	Ship
Lollipop	Sucker
Couch	Sofa
Bug	Insect
TV	Television
Bathtub	Bath
Dog	Puppy
Spaghetti	Pasta
Teddy	Stuffy
Pants	Jeans
Bread	Buns
Mittens	Mitts
Rabbit	Bunny
Purse	Bag
Hamburger	Burger
Boots	Rainboots
Store	Grocery store